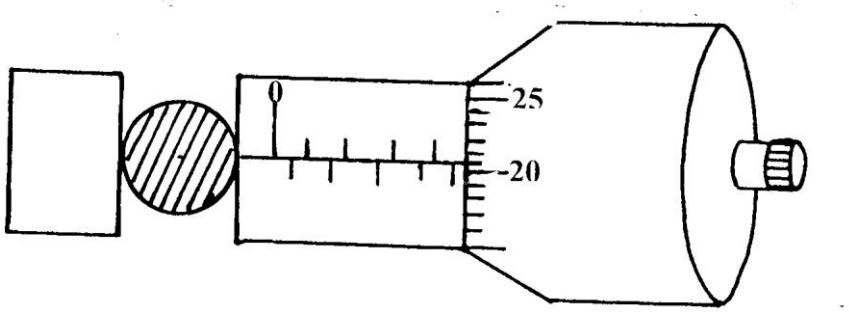
KIRINYAGA WEST
PHYSICS
PAPER 1
JULY/AUGUST, 2018
232/1

SECTION A (25 MARKS)
(Answer ALL the questions in the spaces provided)

1. A ball bearing is held between the anvil and spindle of a micrometer screw gauge as shown in the figure below.

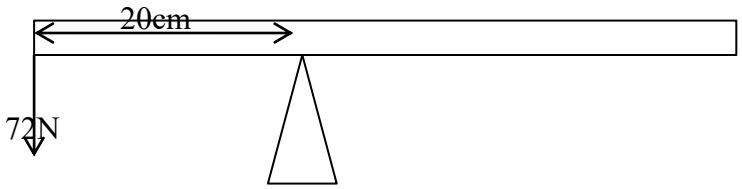


What is the diameter of the ball bearing? (2mks)

2. The volume of a bubble at the base of a container whose depth is 28cm when filled with water is 4 cm^3. Determine the volume of the bubble at 8cm below the surface of water. (2mks)

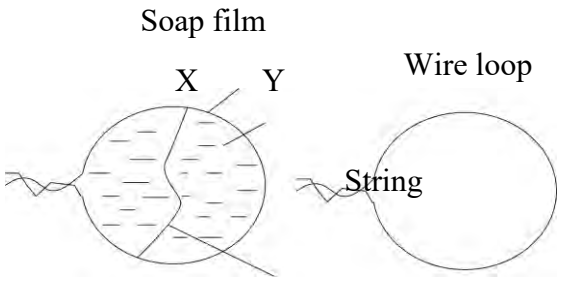
3. Distinguish between density and relative density of a substance. (1mk)

4. The figure below shows a uniform metre rule in equilibrium.



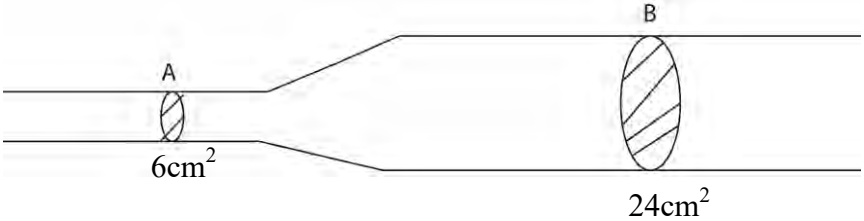
Determine the weight of the metre rule. (2mks)

5. The figure blow shows a wire loop with a string that has been dipped into a soap solution.



i) Sketch on the second figure to show the observed effect if the soap film is punctured at x. (1mk)
ii Explain the observation made in (i|) above (1mk)

6. The diagram below shows a section of a pipe with different cross-sectional area.



If water flows with a velocity of 5m/s in section A, what would be the velocity of water in section B? (2mks)

7. State two factors that would raise the boiling point of a liquid. (2mks)

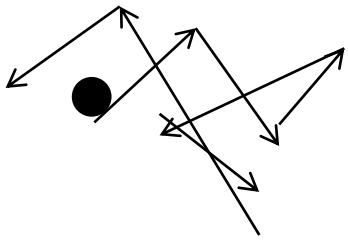
8. The barometric height at sea level is 76cm of mercury, while at a point on a highland is 72cm of mercury. What is the altitude of the point? (Take g = 10m/s^2, density of mercury 13600kg/m^3 and density of air is 1.25kg/m^3). (2mks)

9. Why is a gap left between one end of a metal bridge and the end of a road leading to the bridge. (1mk)

10. An object weighs 0.56 N in air and 0.42N when wholly immersed in water. Calculate the density of the object. (Density of water 1000Kg/m^3) (2mks)

11. A car of mass 1200kg negotiates a level roundabout of radius 40m at a speed of 12m/s. Calculate the centripetal force acting on the car. (2mks)

12. The figure below represents the path taken in air by a smoke particle as seen in a Brownian motion experiment. The smoke particles can be seen through a microscope but the air molecules cannot.



Explain what causes the smoke particles to move like this. (1mk)

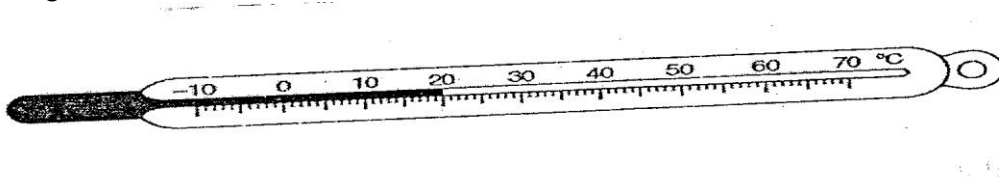
13. A ball of mass 200g is kicked horizontally from the top of a cliff. If the ball takes 6 seconds to reach the ground, determine the height of the cliff. (2mks)

Some water in a tin can was boiled for some time. The tin can was then sealed and cooled. Explain what is observed (2mks)

SECTION B (55 MARKS)

(Answer ALL the questions in the spaces provided)

14. a) The figure below shows an alcohol thermometer,

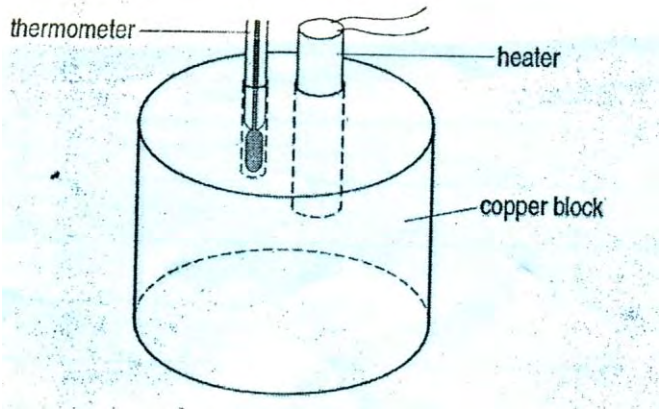


i) State two properties of alcohol which make it suitable for use in a thermometer. (2mks)

ii) State one change to the design of this thermometer which would make it more accurate. (1mk)

iii) Explain why it is an advantage for the glass surrounding the alcohol in the bulb of the thermometer to be very thin. (1mk)

b) i) The figure below show a copper block of mass 2.0 kg with two holes in the top. An 80W heater is placed in one hole and a thermometer in the other.



The heater is switched on for 5.0 minutes. Assume that no energy is lost from the block, determine

i) the energy supplied by the heater. (2mks)

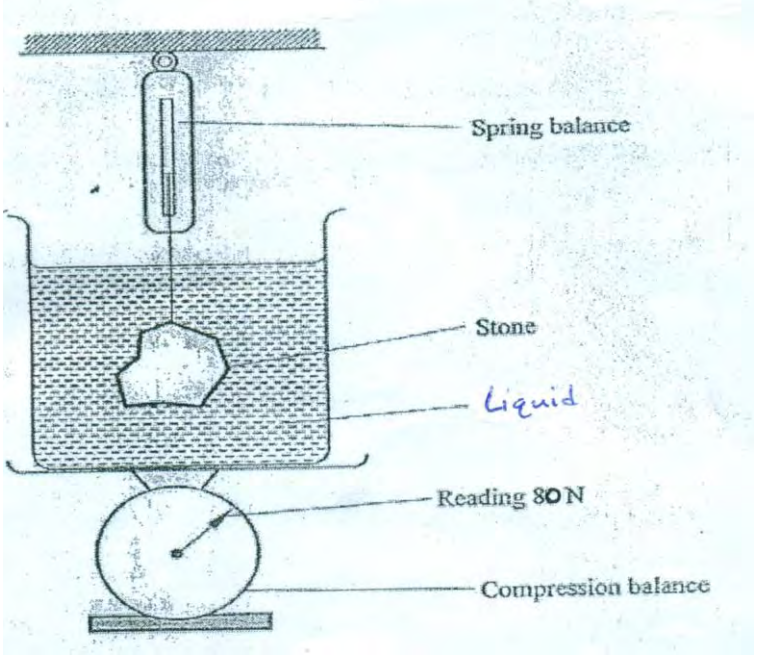
ii) the specific capacity of copper if the temperature changes from 20^{0}C to 50^{0}C. (3mks)

c) A faulty mercury thermometer reads 12^{0}C when dipped into melting ice. When in steam at normal atmospheric pressure it reads 92^{0}C. Determine the reading of this thermometer when dipped into a

liquid of 20^0C. (3mks)

15. a) State Archimede's principle. (1mk)

b) The figure below shows a stone of mass 6.0 Kg immersed in a liquid and suspended from a spring balance with a string. The beaker was placed on a compression balance whose reading was 80N. The density of the stone was 2400Kg/m^3, while that of the liquid was 750Kg/m^3.



Determine

(i) the volume of the liquid displaced. (2mks)

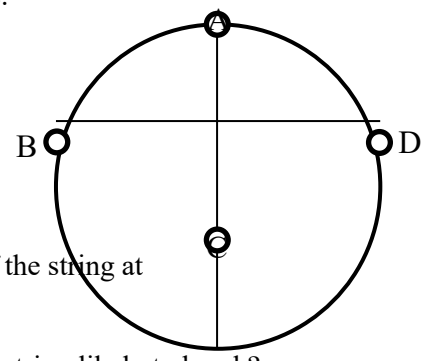
(ii) upthrust on the stone (2mks)

(iii) Reading of the compression balance when the stone was removed from the liquid. (2mks)

iv) Reading of the spring balance with the stone immersed in the liquid. (2mks)

16. a) Define angular velocity. (1mk)

b) The figure below shows an object of mass 0.4 Kg whirled in a vertical circle of radius 0.6m at a uniform speed of 4 m/s.



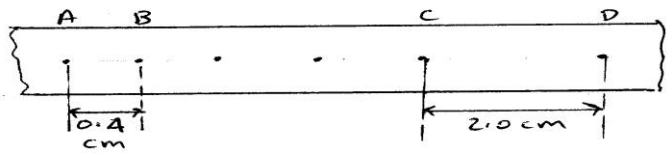
Determine the tension of the string at

(i) Position A (2mks)

(ii) Position B (2mks)

(iii) At what point is the string likely to break? (1mk)

c) The figure below shows the motion of a trolley on a ticker timer, whose frequency is 50Hz.



Determine

(i) the initial velocity between A and B. (2mks)

(ii) the final velocity between C and D. (2mks)

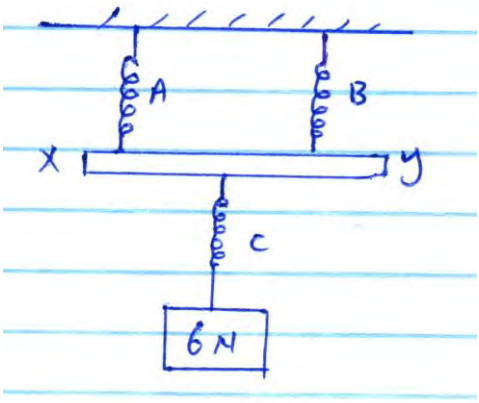
(iii) the acceleration of the trolley during the motion. (2mks)

18. a) In an experiment to estimate the diameter of an oil molecule, the following data was obtained.

- Level of oil in a burette = 26cm^3
- Level of oil in burette after adding 50 drops of oil = 25.2cm^3
- Diameter of oil patch = 7cm

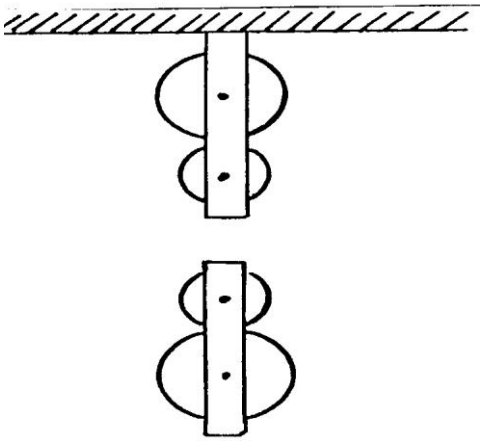
Use the information to determine

i) the volume of one drop of oil. (1mk)
ii) the thickness of a molecule (3mks)
iii) State any two assumptions made in this experiment. (2mks)
b) Three identical springs A, B and C of negligible weight are arranged as shown the figure below.



If C stretches by 3cm and bar xy is assumed to be weightless. Determine
(i) the spring constant. (2mks)
(ii) the extension in A. (2mks)
c) Sea water of density 1.04g/cm^3 is being pumped into a tank through a pipe of uniform cross-sectional area 3.142cm^2. If the speed of water in the pipe is 5m/s, determine the volume flux in SI units. (2mks)

19. a) Complete the diagram below to show how the pulley can be used to raise a load, L by applying an effort, E. (1mk)



b) The pulley system above has a mechanical advantage of 3. Determine
(i) the velocity ratio of the system. (1mk)
(ii) the efficiency of the system. (2mks)
(iii) the effort when a load of 60N is raised. (2mks)
c) i) State Newton's second law of motion. (1mk)
(ii) The figures below shows two mini-buses A and B at a speed of 40m/s and 20m/s respectively moving in opposite directions. They collided head-on.

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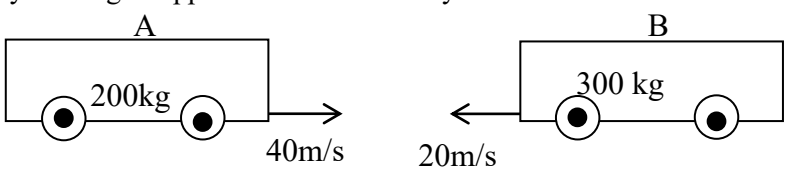

Determine the common speed of the vehicles, if their stuck to each other after collision. (2mks)
(iii) Distinguish between elastic collision and inelastic collision. (1mk)

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PAPER 2
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1. Figure 1 shows a pencil lying in front of a plane mirror. The pencil is moved 2cm towards the mirror in the same orientation.

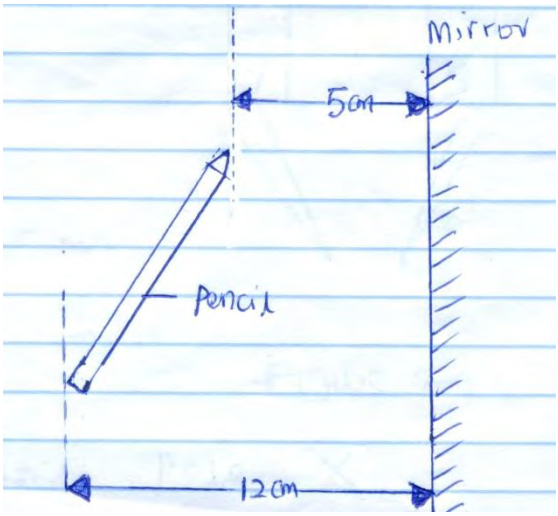
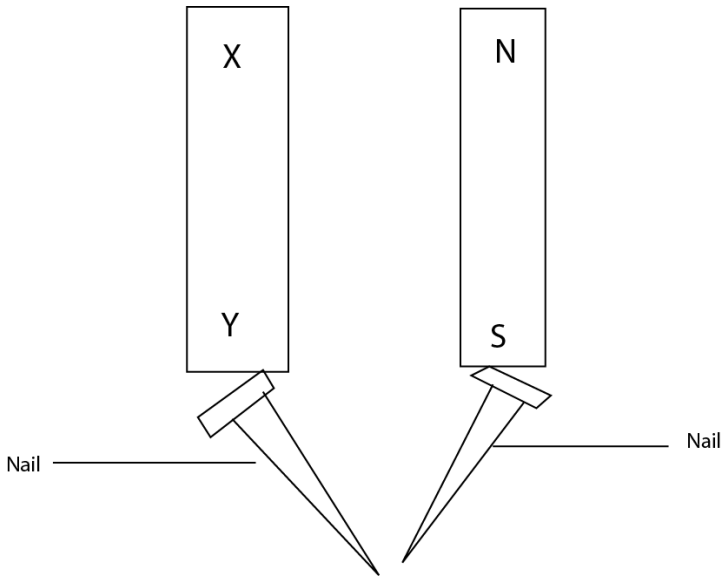


Figure 1

Determine the distance between the new position of the tip of the pencil and its image. (2mks)

2. a) State the basic law of magnetism. (1mks)

b) Figure 2 shows two bar magnets, one whose poles are labelled and a second one whose poles are labelled X and Y. Iron nails are attracted to the lower ends of the magnets as shown.



(1mk)

Figure 2

Identify pole **X**

3. State the reason why convex mirror is preffered over a plane mirror for use as a driving mirrors in cars. (1mk)

4. Figure 3 shows the displacement-time graph for a certain wave.

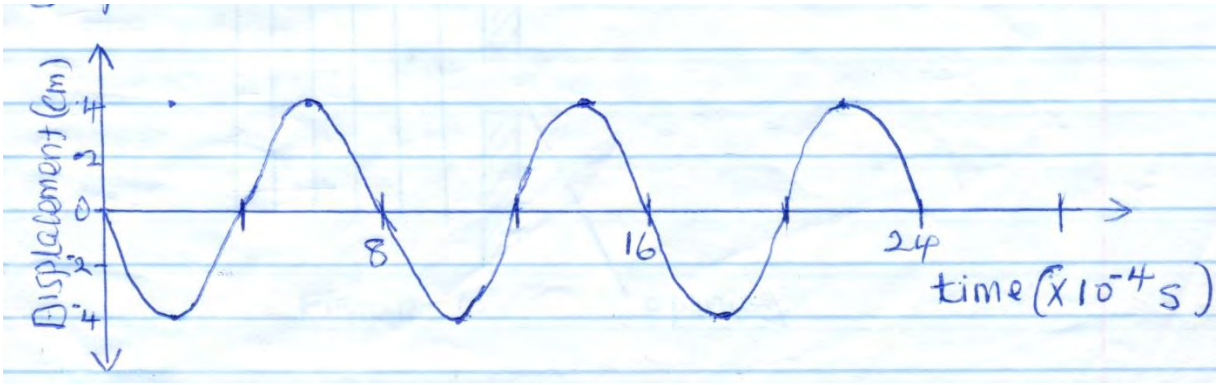


Figure 3

a) Determine the frequency of the wave. (2mks)

b) On the same diagram, draw a wave with half the amplitude and twice the frequency of the one shown. (1mk)

5. a) State the main difference between primary chemical cells and secondary chemical cells. (1mk)

b) State how the design of a dry Lechlanche cell reduces polarization. (1mk)

6. Figure 4 shows a wave incident on a narrow opening.

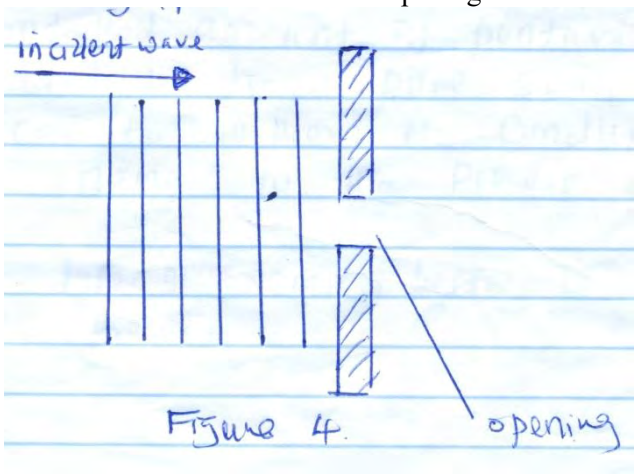


Figure 4

Draw the appearance of the wave after passing through the opening. (1mk)

7. A student stands between two classroom walls and claps. After 0.6 seconds, she hears the first echo and hears the second echo after 0.8 seconds. Determine the distance from the student to the further wall. Take speed of sound in air = 320m/s. (3mks)

8. The list below is some radiations in the electro-magnetic spectrum. Red light, Gamma rays, Ultra violet radiations and Blue light. Arrange the radiations in order of increasing wavelength. (1mk)

9. A controlled amount of pentavalent (donor) impurity atoms added in to a pure semi conductor such as silicon to improve its conductivity.

a) Give name to the process above. (1mk)

b) What type of semiconductor is obtained in the above process? (1mk)

10. Figure 5 shows the cross-section of two bar magnets and a current carrying conductor held between them. The direction of current is into the paper.

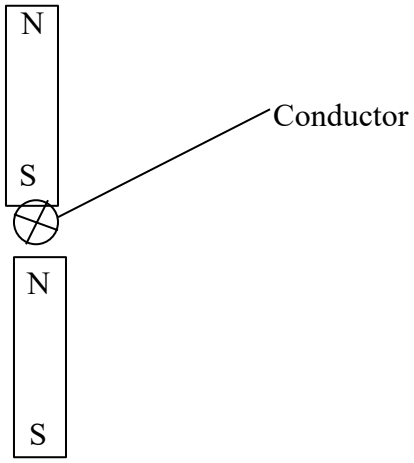


Figure 5

a) indicate with an arrow the direction of force experienced by the conductor. (1mk)
b) State one way in which the force on the conductor above can be reduced. (1mk)

11. a) State the reason why electrical power is transmitted over long distances at very high voltage and low current. (1mk)
b) An electric bulb is labelled 100W 20V. Determine the resistance of its filament at its operating temperature. (2mks)

12. a) State Ohm's law. (1mk)
b) Figure 6 shows an electrical circuit.

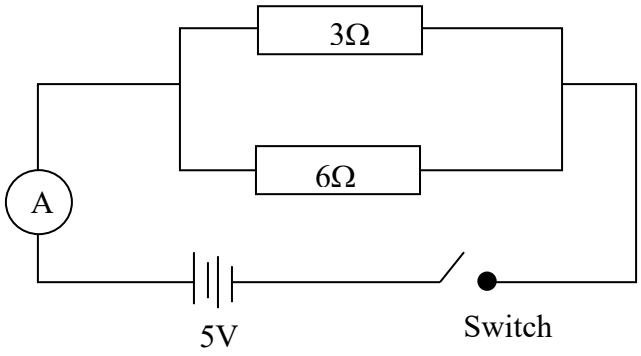


Figure 6

Determine the Ammeter reading in a closed circuit. (2mks)

SECTION B (55 Marks)

13. a) State Lenz's law of electromagnetic induction. (1mk)
b) Figure 7 shows stationary magnet and a solenoid being moved as shown.

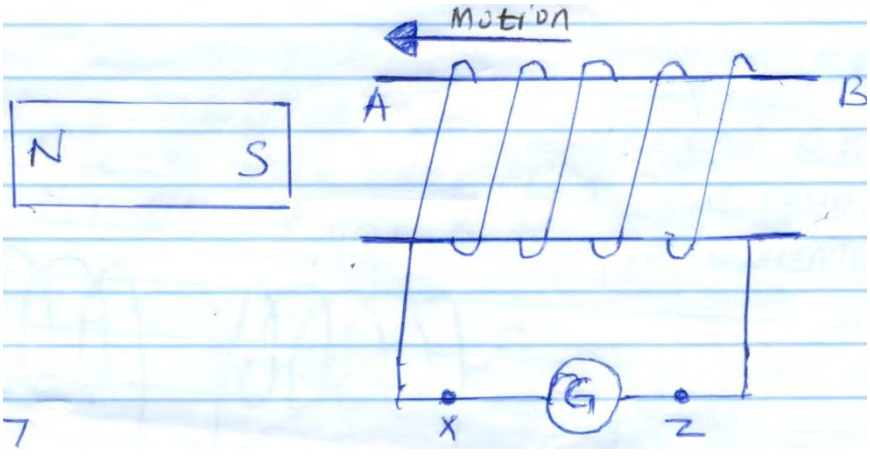


Figure 7

i) State with a reason the direction of deflection of the galvanometer. (2mks)
ii) State one way through which the size of deflection of the galvanometer can be decreased. (1mk)
c) State how energy losses in a transformer through eddy currents is minimized in its design. (1mk)
d) Figure 8 shows two identical coils C and D made of insulated copper wires and are placed close to each other. Coil C is connected to DC power supply and Coil D to a galvanometer.

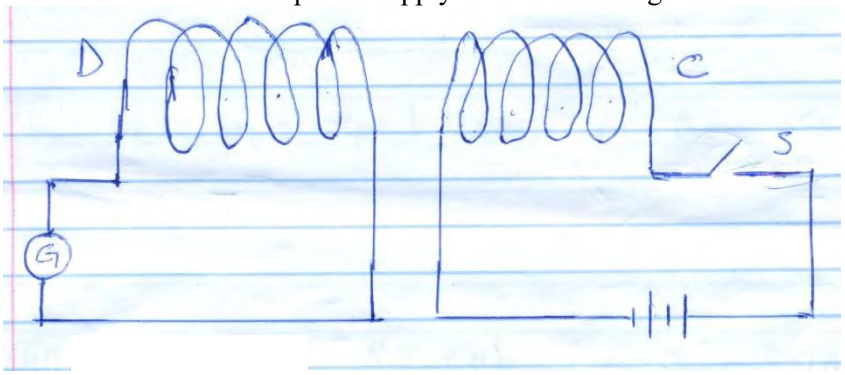


Figure 8

(i) State and explain what would be observed on the galvanometer immediately switch S is closed and then opened. (2mks)
ii) How would the observation made in d(i) differ if the number of turns in coil C were doubled but those in D remain unchanged? (1mk)
e) The primary coil of a transformer has 250 turns and the secondary coil has 50 turns. The primary coil is connected to a 120V AC supply.
i) State with a reason the type of transformer described above. (1mk)
ii) Determine the voltage in the secondary coils. (2mks)
iii) Given that the current in the primary coil is 0.50A and in the secondary coil is 2.0A. Determine the efficiency of the transformer. (2mks)

14. a) State the law of electrostatic charges. (1mk)
b) Figure 9 shows a highly positively charged glass rod being brought slowly near the cap of a negative charged gold leaf electroscope. It is observed that the leaf initially falls and then rises.

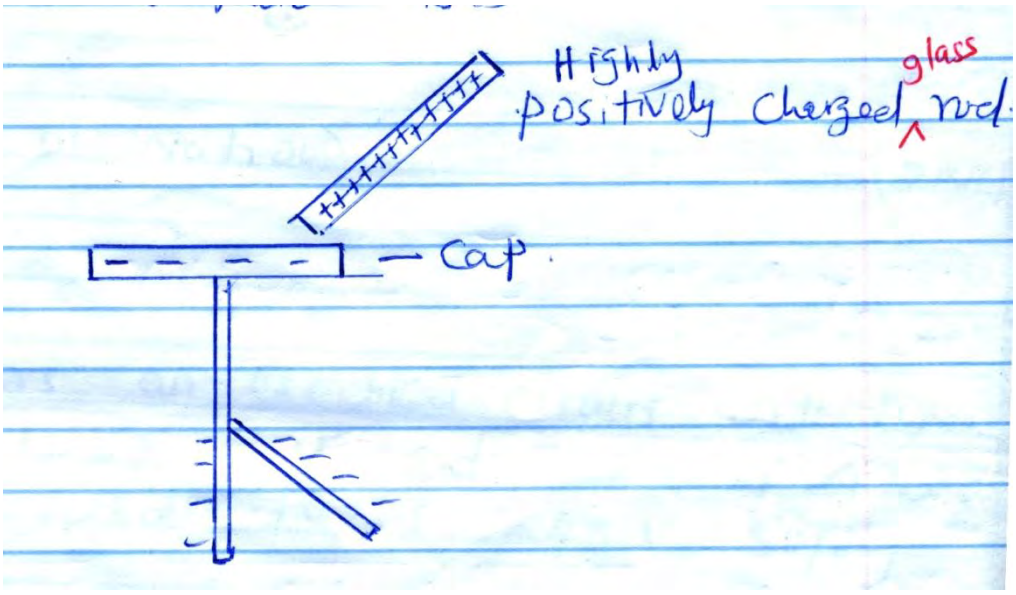


Figure 9

Explain this observation. (2mks)

c) Figure 10 shows an electric circuit used to charge a capacitor C. When switch is closed, it is observed that, the millimeter records some current which gradually reduces to zero with time.

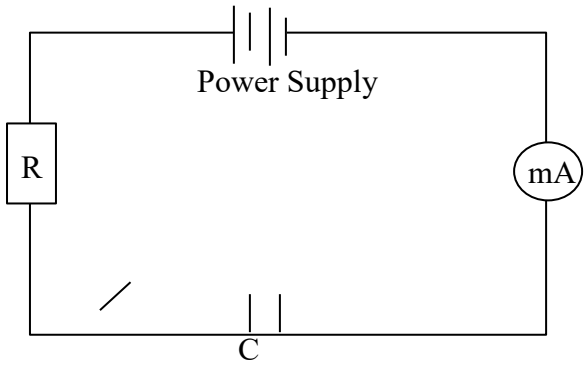


Figure 10

Explain the observation (2mks)

d) Figure 11 shows an electrical circuit with three capacitors of 10μF, 2μF and 3μF capacitance connected to a 240V supply.

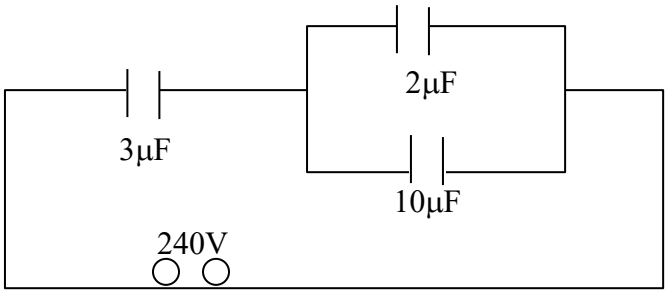


Figure 11

Determine

i) The effective capacitance of the capacitor combination. (2mks)

ii) The charged stored in the circuit. (2mks)

iii) The potential difference across the 2μF capacitor (2mks)

15. a) State one condition necessary for total internal reflection to occur. (1mk)

b) Figure 12 (a) shows a ray of light travelling in an optically denser medium to an optically rarer medium. The angle of incidence ***i*** and angle of refraction **r** are also shown.

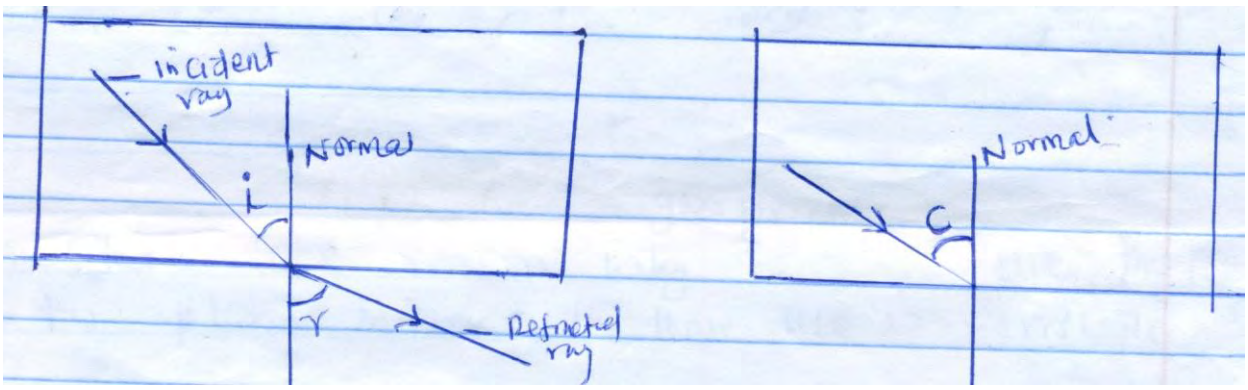


Figure 12 (a) **Figure 12 (b)**

Complete Figure 12 (b) to show the path of refraction ray when the angle of incidence is increased to reach critical angle. (1mk)

c) An optical pin placed at the bottom of a glass measuring cylinder filled with a liquid and appears to be 11.4cm below the surface of the liquid. If the refractive index of the liquid is 1.48. Determine The height of the column of the liquid in the measuring cylinder. (2mks)

d) i) State one reason why glass prisms are preffered to plane mirrors in their use in periscope.

(1mk)

ii) Figure 13 shows two right angled glass prism arranged to be used in a periscope.
An object is placed besides one prism as shown.

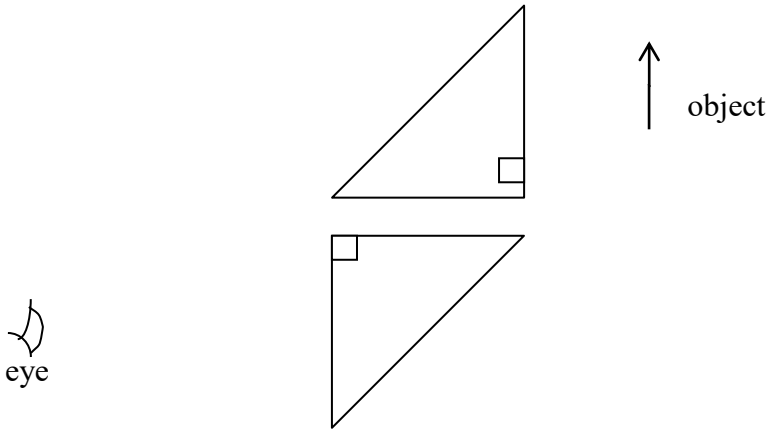


Figure 13

Complete the diagram by showing the path of rays of light from the object until they reach the eye.

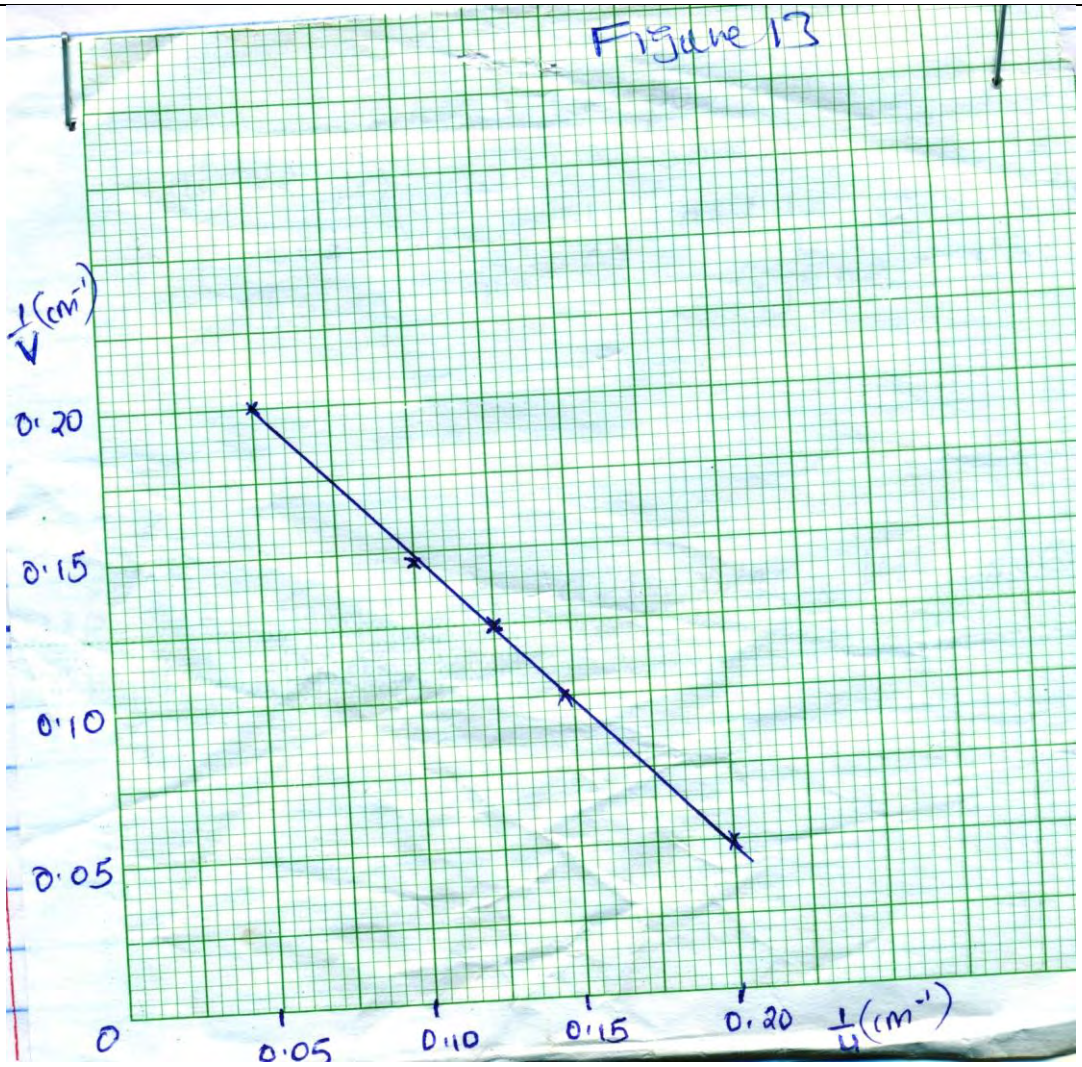
(1mk)

e) In an experiment to determine the focal length of a lens, you are provided with the following apparatus.

- A converging lens and a lens holder
- A lit candle
- A metre rule
- A white screen

i) State one measurements that you would take in the experiment. (1mk)

ii) In another experiment similar to the above, a graph showing the relationship between $\frac{1}{V}$ and $\frac{1}{u}$ was plotted as shown in figure 13.



- Use the graph to determine the focal length, f of the lens. (2mks)

e) Figure 14 shows a defeat of the eye

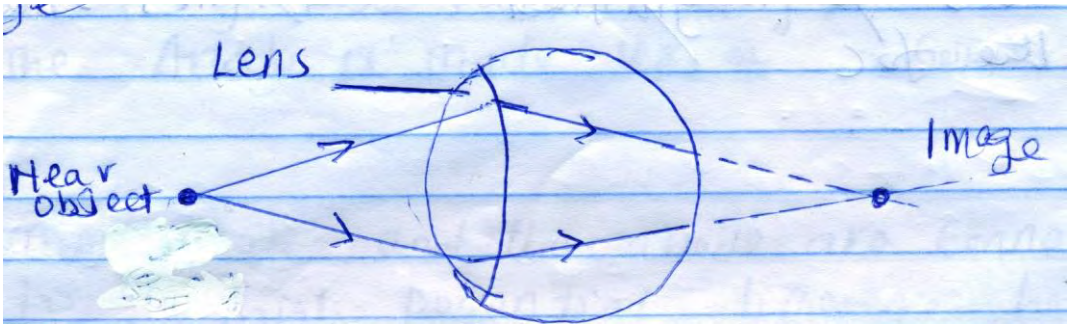


Figure 14

i) State two possible causes of the defect. (2mks)

ii) Explain how the defect is corrected. (1mk)

16. a) i) In an X-ray tube explain why

I. The anode is made up of copper. (1mk)

II. The cathode and the anode are connected to a high potential difference between them. (1mk)

ii) State the adjustments made in an X-ray tube in order to decrease the intensity of X-ray. (1mk)

iii) State the property of X-rays that makes it used in detecting foreign objects in human bodies. (1mk)

b) i) Explain the meaning of the term photoelectric effect. (1mk)

ii) A monochromatic light frequency 6.25 x 10^{14} Hz is incident on a metal surface. The minimum frequency that can cause photo emmission on the metal surface is 5.5 x 10^{14}Hz. Given that Planck's constant, h is 6.63 x 10^{-34} Js.

Determine

I. The energy of the source light. (2mks)

II. The work function of the metal surface. (2mks)

III. The average kinetic energy of the photo electrons. (2mks)

17. a) Figure 15 shows some features of a cathode ray tube.

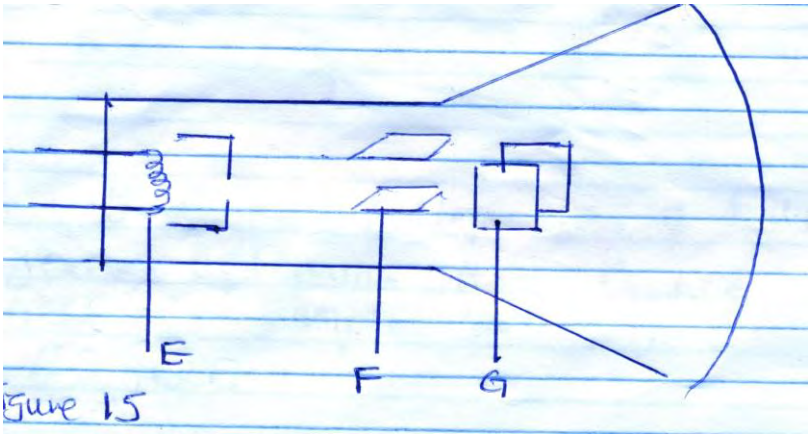


Figure 15

i) Name parts E & F (2mks)

ii) The process through which electrons are produced. (1mk)

b) i) Alpha (α) particles cause more ionization in a gas compared to Beta (β) particles. Give one reason for this. (1mk)

ii) The following is part of radioactive decay series. The symbols do not represent the actual symbols of the nuclides.

$$^{234}_{83}X \xrightarrow{\beta} {}^{a}_{84}Y \xrightarrow{\alpha} {}^{230}_{b}Z$$

Determine the values of a and b (2mks)

iii) A radioactive Isotope has a halflife of 5.25 years. Determine the fraction of the original mass in a sample that will remain after 42 years. (2mks)

KIRINYAGA WEST
PHYSICS
PAPER 3
JULY/AUGUST, 2018
232/3
CONFIDENTIAL

Section A

1. - 2 size D dry cells.
   - 100cm nichrome wire on a mm scale, labelled P at one end, 0 cm mark.
   - A bulb (2.5V) and a bulb holder.
   - 8 connecting wires (at least 4 with crocodile clips).
   - Cell holder
   - A switch
   - A volt Meter (0 – 5V)
   - An ammeter (0 – 1A)
   - A jockey

Section B

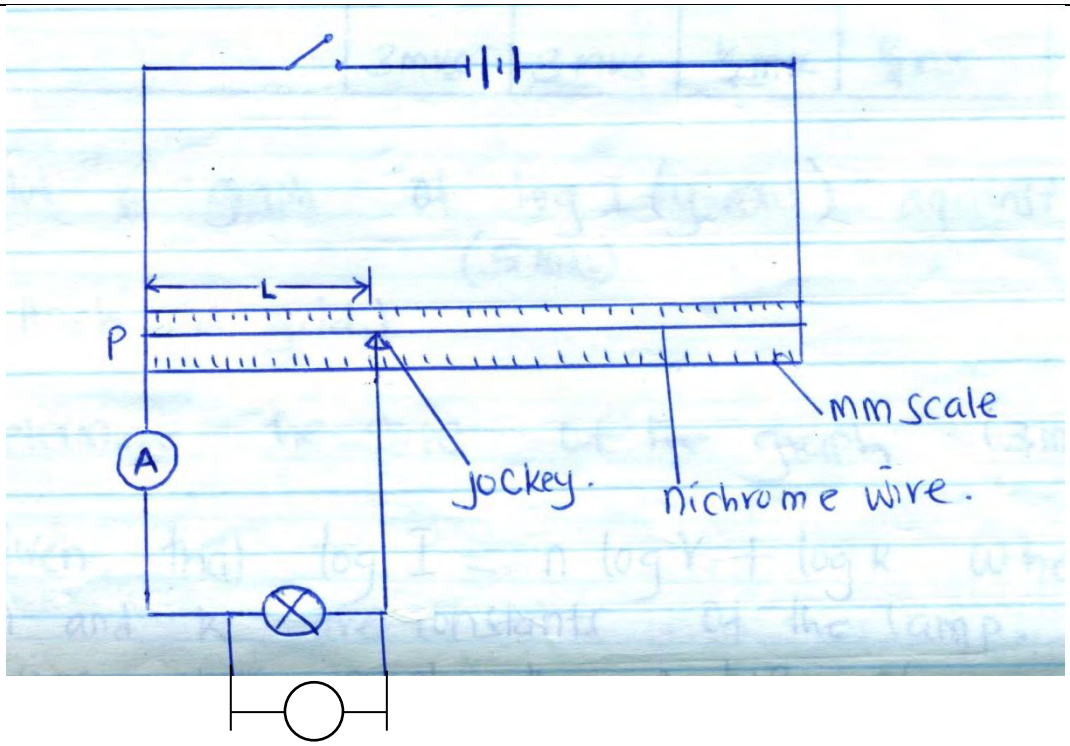
- A liquid labelled L (50 ml of paraffin).
- A measuring cylinder (50ml or 100ml).
- 2 boiling tubes.
- A thermometer.
- 50ml of distilled water in a beaker labelled W.
- A 250ml beaker containing some water.
- A stop watch
- A tripoid stand and wire gauze
- Clamp and stand
- A card board with a hold at the middle (3cm by 3cm)
- Copper wire of length 130cm. (0.28mm)
- Test tube of diameter 1.5cm (ordinally)
- Metre rule

KIRINYAGA WEST
PHYSICS
PAPER 3
JULY/AUGUST, 2018
232/3

Question 1

1. You are provided with the following apparatus:
   - 2 size D dry cells
   - 100cm nichrome wire on a mm scale, labelled P at one end.
   - A bulb (2.5V) and a bulb holder.
   - 8 connecting wires (at least 4 with crocodile clips)
   - Cell holder
   - A voltmeter (0-5V)
   - An ammeter (0-1A)
   - A jockey

   a) Connect the apparatus provided as shown in the diagram.



b) Place the jockey at x = 20cm from P, then close the switch.
Record the ammeter reading and the voltmeter reading in the table below.

c) Repeat the experiment by placing the jockey at x = 30, 40, 50, 60 and 80cm from P.
Record your readings and complete the table below.

engthl (cm)	I (A)	Pd, V(V)	I(mA)	Pd, v(MV)	log I	log V
20						
30						
40						
50						
60						
80						
	3mks	3mks	-½ mk	-½ mk	-½ mk	-½ mk

d) Plot a graph of log I (y-axis) against log V (5mks)

e) Determine the slope of the graph. (3mks)

f) Give that log I = nlog V + log K where n and k are constants of the lamp. Determine using your graph the value of:

i) K (2mks)

ii) n (2mks)

Question 2

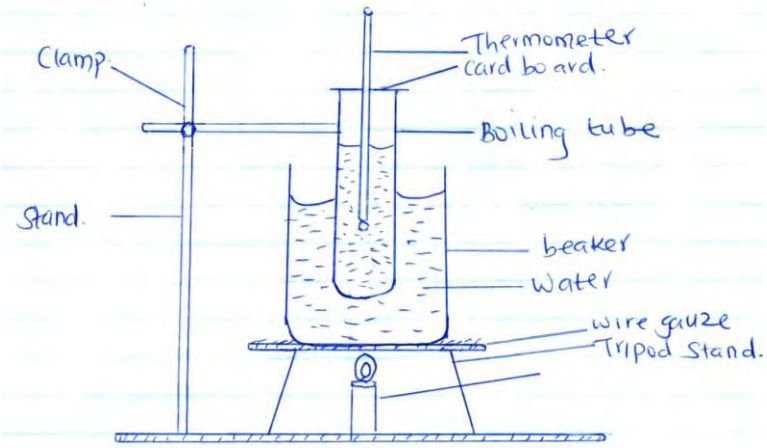
Part A

You are provided with the following:

- A retort stand, boss and clamp.
- 2 boiling tubes
- A thermometer
- Some distilled water in a beaker labelled W
- Some liquid in a beaker, labelled L
- A 250ml beaker containing some water.
- A measuring cylinder
- A stop watch
- A tripod stand and wire gauze
- A card board with a hole in the middle
- A burner.

Proceed as follows

a) Clamp one boiling tube on the retort stand. Measure and pour 45ml, of the distilled water, W into a boiling tube. Set up the apparatus as shown in the figure below.



b) Heat the water in the large beaker (250ml) until the temperature of the distilled water reached 85^0C. Remove the boiling tube from the hot water by lifting up the retort stand and placing it away from the burner.

c) Stir the water in the boiling tube using the thermometer. Record in the table below the temperature of the distilled water at intervals of 30 seconds starting at 80^0C until it drops to 60^0C (stir the distilled water before taking any reading).

Time in minutes	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5
Temperature of W(^{0}C)										
Temperature of L(^{0}C)										

Time in minutes	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5
Temperature of W(^{0}C)										
Temperature of L(^{0}C)										

(4mks)

d) Using the second boiling tube, repeat the procedure in b and c using 45ml of liquid L instead of distilled water. Record your results in the same table.

e) Using the same axis on the grid provided, plot a graph of temperature (y-axis) against time for
i) Distilled water, W
ii) Liquid L
(Label the graphs of L and W. (7mks)

f) From the graph, determine:
i) the time, t taken for the distilled water to cool from 75^0C to 65^0C.
t_w = _____ minutes (1mk)
ii) the time, t taken for liquid L, to cool from 75^0C to 65^0C
t_L= _____ minutes (1mk)

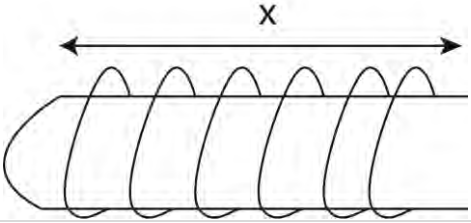
g) Determine the constant r given that $r = \frac{4.2t_l}{dt_w}$ where d, density of liquid, L = 0.8g/cm^3. (2mks)

PART B

You are provided with the following:
- Copper wire of length 130cm.
- Test tube of diameter 1.5cm (ordinary)
- Metre rule.

Procedure

By using the wire provided, make 20 closely packed turns around the said ordinary test tube as shown.



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Answer all the questions in this section in the spaces provided

1. Figure 1 below shows a burette that was initially filled to 15ml with a liquid of density 0.8g/cm3.

fig 1

The liquid is allowed to sum out for some time. If the volume of liquid removed from the burette has a mass of 20g. Determine;

i) Volume of the liquid removed. (2mks)

ii) Final reaching on the burette. (3mks)

2. In the study of free fall, it is assumed that the force F acting on a given body of mass m is gravitational. Given by F = ma. State one other force that acts on the same body. (1mk)

3. The figure below shows a flat bottomed flask containing some water. It is heated directly with a very hot flame.

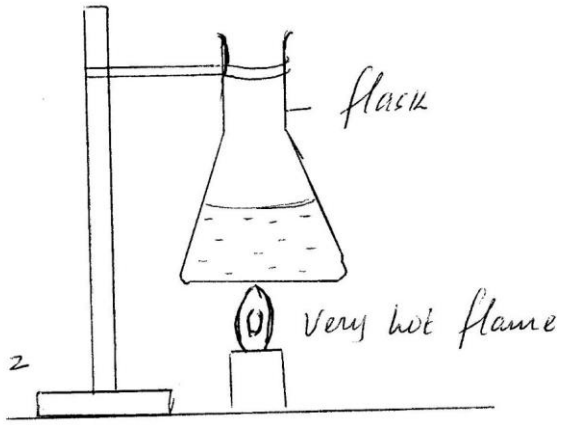


fig 2

4. The uniform rod of length 1 metre shown in the figure 3 in equilibrium

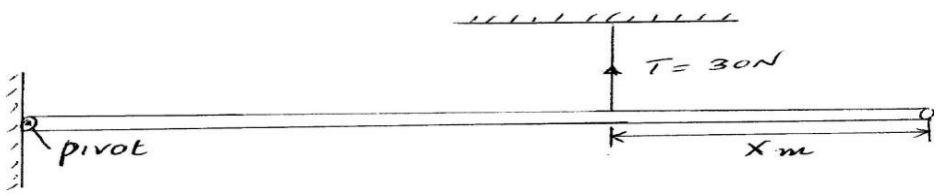


figure 3

Find the value of x if the weight of the rod is 40N. (3mks)

5. The figure below shows air flowering through a pipe of non-uniform cross sectional area. Two paper A and B are dipped into water as shown in figure 4.

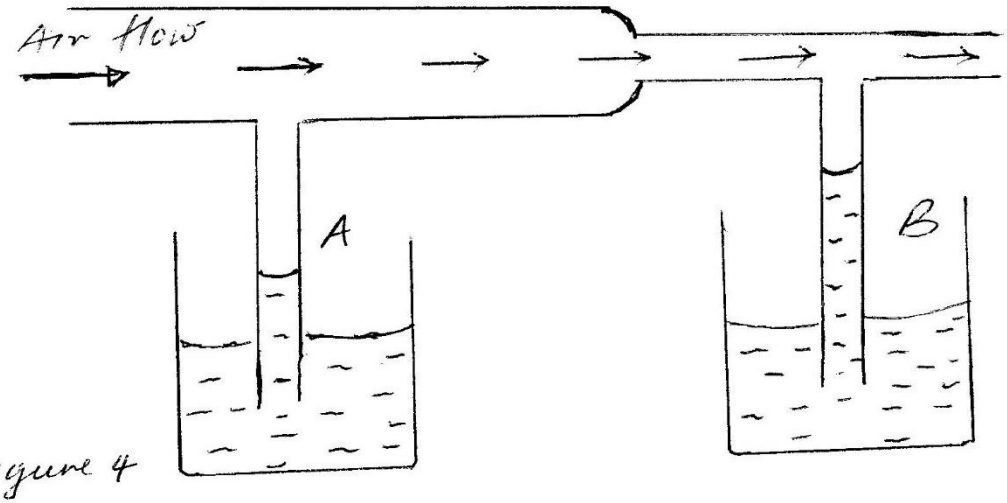


figure 4

Give a reason why the level of the water is higher in B than in A.

6) A steel ball of mass 0.10 kg was placed on top of a compressed spring on a level ground as shown in figure 5 below.

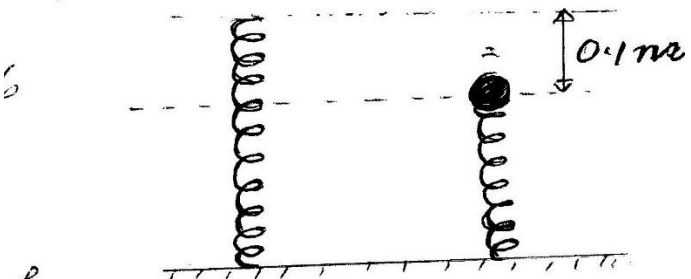


figure 5

Give that the spring constant is 20N/m. Determine the maximum height reached by the steel ball when the spring is released.

7. a) The cover of a ball point has a small hole one the stem as shown in figure 6 below. (1mk)

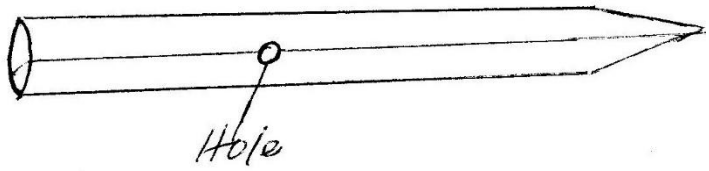


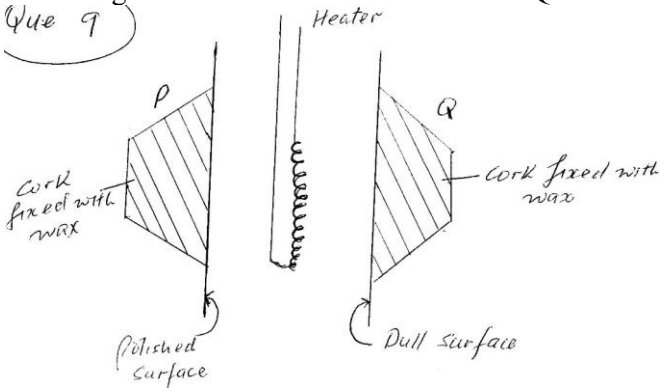
figure 6

Explain its functions.

b) The reaching on a mercury barometer at a place is 700 mm. The barometer contains some air which exerts a pressure of $10N/m^2$. Determine the pressure at the place. (2mks)

8. A particle revolves at $4H_3$ in a circle of radius 7 cm. Determine its linear speed.

9. The figure below shows two cones P and Q fixed on a polished and a dull surface with wax.



State and explain what happens when the heater is switched on for a short period of time. Given that the water is equidistant from the two surfaces.

10. Explain the cause of random motion of particle observed in Brownian motion experiment. (1mk)

11. In an experiment to estimate the diameter of an oil molecular, an oil drop is carefully placed on the surface of water. The drop spreads to form uniform circular patch.

i) State one assumption made in determining the diameter of oil molecule.

ii) State one negative effect or hazard of oil spreading on the surface of water.

SECTION B 55 MKS

12. a) Define the term velocity Ratio (1mk)

b) i) The figure 7 below shows a pulley system being used to raise a load of 90 kg

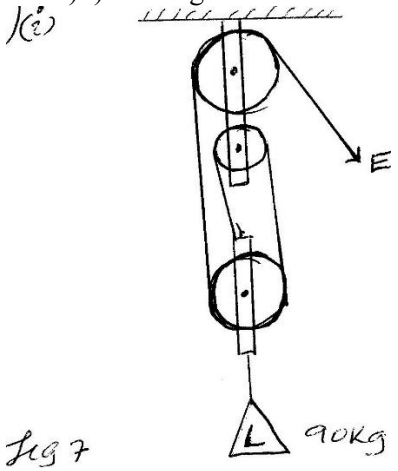
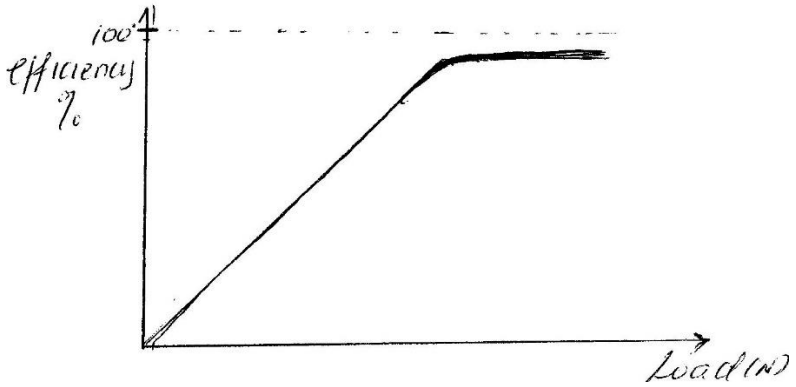


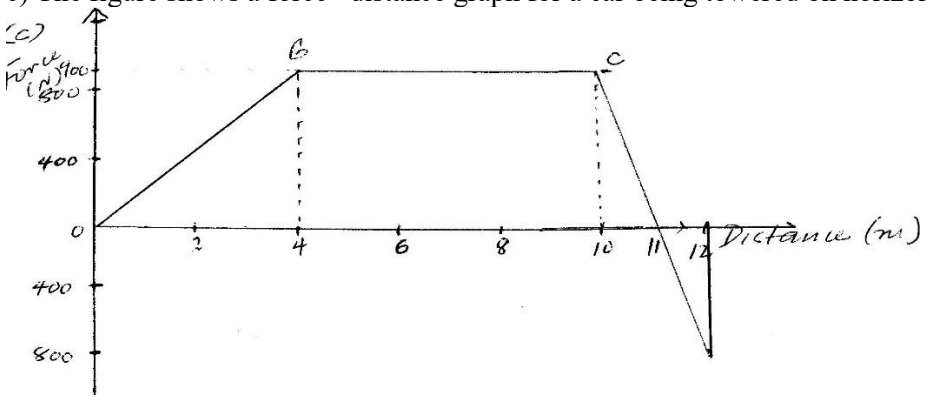
Fig 7

Given that the mechanical advantage is 3 determine the effort required to raise the load. (2mks)

ii) The figure shows the efficiency- load graph for a pulley system. Explain why the efficiency is wearily 100% at high values of load. (1mk)



c) The figure shows a force –distance graph for a car being towered on horizontal ground.



i) Calculate the total work done. (3mks)

ii) If the velocity just before reaching C is 0.6 m/s. Calculate the power developed by the agent providing the force at this point. (2mks)

13. a) Differentiate between speed and velocity (1mk)

b) An object moving at 26 m/s starts to accelerate at 2 m/s^2 so that its velocity becomes 49 m/s. Determine

i) The distance moved during this period. (2mks)

ii) The object decelerates so that it comes to rest in a time of 12 seconds. Determine its braking force if its mass is 2700g (3mks)

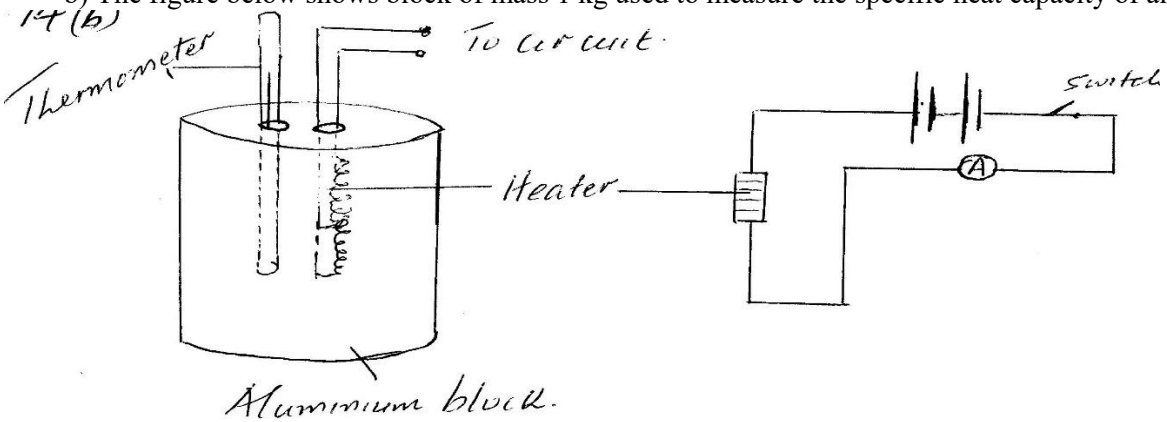
b) i) Distinguish between elastic and inelastic collision. (1mk)

ii) car of mass 800 kg collides heads on with a truck of mass 5000kg travelling at 40 m/s. The car thrown to the bonnet of the truck which continues to move after impact at 10 m/s in the original direction. How fast was the car moving? (3mks)

c) A ball of mass 100 g is dropped from a height of 1.25 m above the ground, it rebounds to height of 1.1 m. Determine the velocity of the ball before hitting the ground. (3mks)

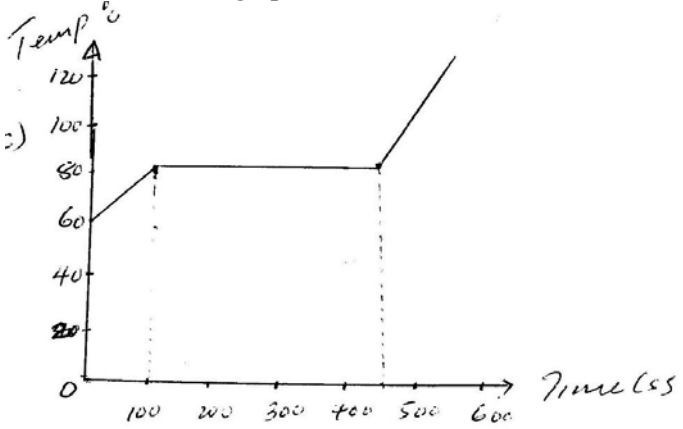
14. a) Define the term specific latent heat of fusion. (1mk)

b) The figure below shows block of mass 1 kg used to measure the specific heat capacity of aluminum



a heater fits into a hole in the centre of block and a thermometer fits into a second hole. The other part of Figure 14(b) shows the circuit containing the heater. When the switch is closed, the voltmeter and ammeter show steady reaching of 11. 6v and 4.7 A. Determine the specific heat capacity of the block given that after 3 minutes the temperature rises by 25°C. (3mk)

c) A certain substance of mass 100g was heated I a lagged container by an electric heater rated 100w for some time. The graph of the substance with time.



Use the graph to determine

i) Melting point of the substance. (1mk)

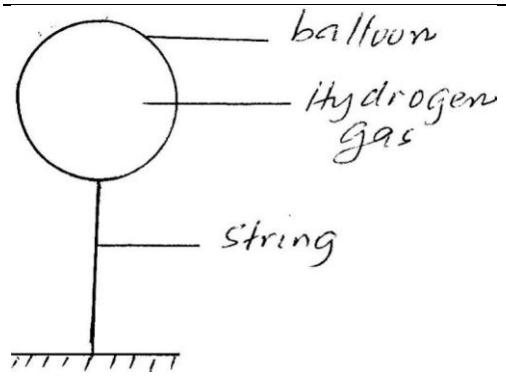
ii) Quantity of heat supplied by the heater from the time the substance starts to melt to the time it has all melted. (3mks)

iii) Determine the specific latent heat of fusion of the powder assuming the container absorbs negligible amount of heat. 3mks)

d) State one application of cooling by evaporation (1mk)

15. a) State Archimedes principal. (1mk)

b) A rubber balloon filled with hydrogen gas having volume f $2m^3$ held in position by a vertical string as shown below.



The mass of the balloon is 1.3 kg. Given that the density of hydrogen 150.1kgm^{3}density of air is 1.3kg/m^3. Determine;

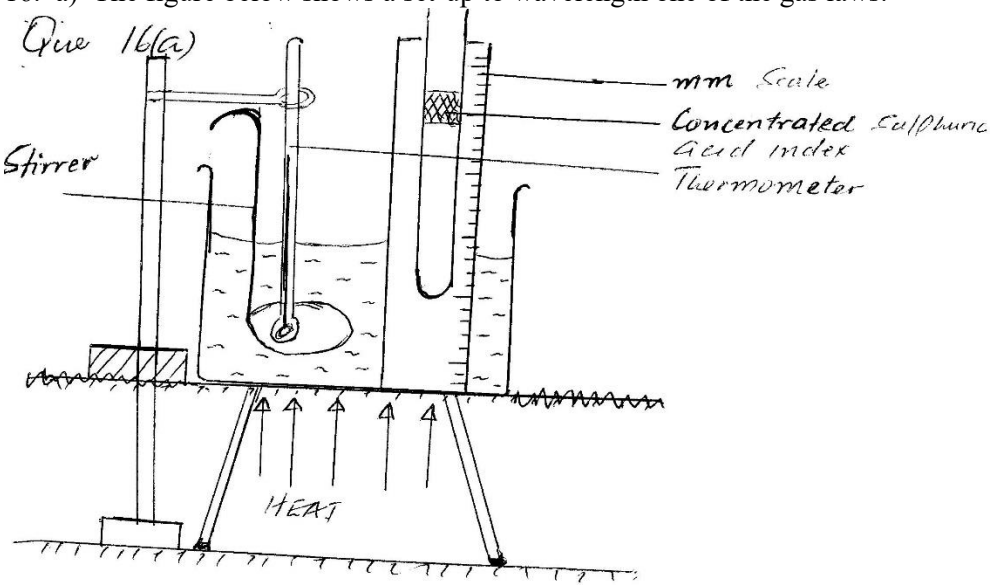
i) Total weight of the balloon including the hydrogen. (3mks)

ii) Up thrust on the balloon. (1mk)

iii) Tension in the string. (2mks)

c) A solid weighs 50N in air and 45N when completely immersed in water. Determine the density of the solid. (3mks)

16. a) The figure below shows a set-up to wavelength one of the gas laws.



i) Name the gas law being investigated (1mk)

ii) Give one reason for using the concentrated sulphuric acid index (1mk)

iii) What is the purpose of the water bath? (1mk)

iv) State two measurements that should be taken in this experiment. (2mks)

b) A gas has a volume of 30^3 at 18^{o}C and normal atmospheric of the gas if it is heated to 54^{o}C at same pressure (3mks)

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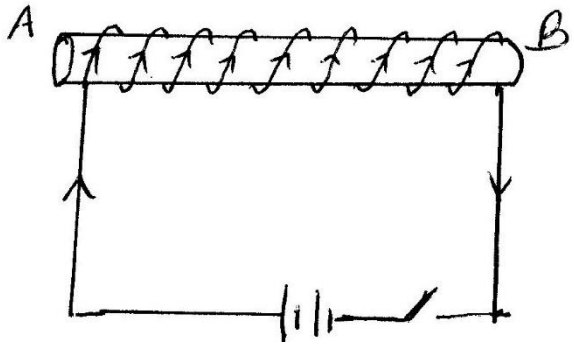
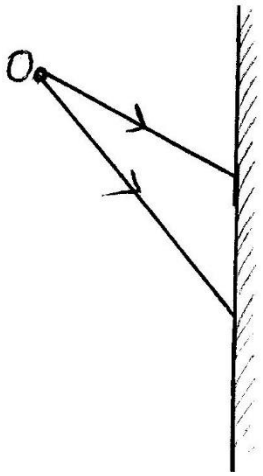
1. In a form 2 class the students used the method shown in figure to make a magnet.



a) Name the method used (1mk)
b) State the polarity at ends A and B. (2mks)
A –
B –

2. The figure 2 below shows an object O placed infront of a mirror plane M. Two rays from the object to the mirror are shown.



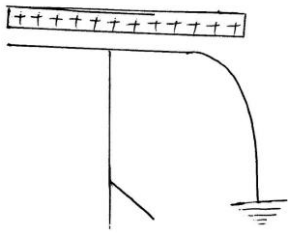
Locate the image position for the object O by used of suitable rays. (2mks)

3. Given that the wavelength of a certain electromagnetic wave is 7500cm, determine its frequency. (Take speed of light in a vacuum as 3.0×10^8 m/s) (2mks)

4. A hair drier is rated 2500w, 240v. Determine its current, (2mks)

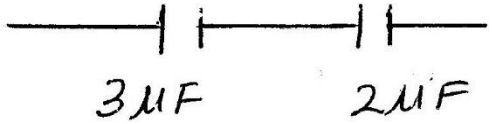
5. State any defect if a simple cell and explain how it is corrected. (2mks)

6. a) To diagram in Figure 3 shows as electroscope being charged by indication method.



Indicate the direction of flow of electrons during earthing. (1mk)

6. b) Determine the table capacitance of the arrangement below. (2mks)



7. Indicate on figure 5 below the direction of force when a wire carrying current is in a magnetic field, (1mk)

8. Green light has a frequency of 6.0 x 10^{14} HZ. Find the energy it emits.
   (Plank'sconstant is 6.63 x 10^{-34} JS).
9. State one (1) property of cathode rays. (1mk)
10. The following nuclear reaction is part of radioactive series.

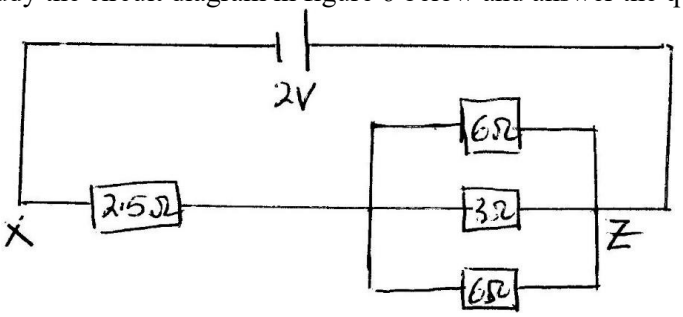
$$^{210}_{82}A \xrightarrow{\beta} {}^{210}_{x}B \xrightarrow{\gamma} {}^{210}_{84}C \xrightarrow{S} {}^{y}_{82}D$$

Determine the numbers represented by x and y. (2mks)

11. P-type and n-type semi-conductors are made from a process known as —doping" what is meant by doping. (1mk)
12. The minimum frequency of light that will cause photoelectric emission from potassium surface is 5.37 x 10 ^{14}HZ. When the surface is irradiated using a certain source, photoelectrons are emitted with a speed of 7.9 x 10^{5}m/s. Calculate the work function of potassium. (Take h = 6.63 x 10-^{34}J/s) (3mks)

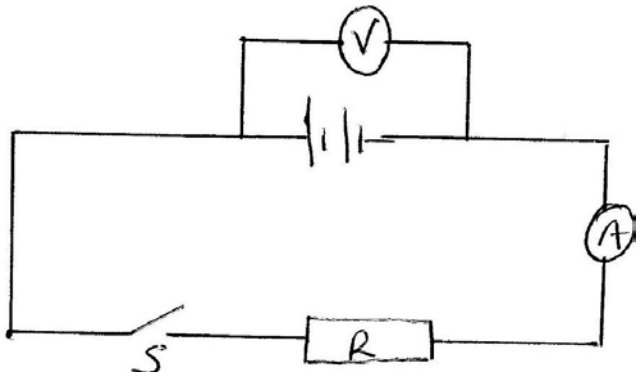
SECTION B (55 MARKS)

13. a) State Ohm's law. (1mk)
    b) Study the circuit diagram in figure 6 below and answer the question,



Determine the current through the 3Ω resistor. (3mks)

c) It was noted that for the circuit diagram below in figure 7 below, when s was opened the voltmeter gave a reading of 12v, but when switch s was closed, the voltmeter reading drops to 10v.

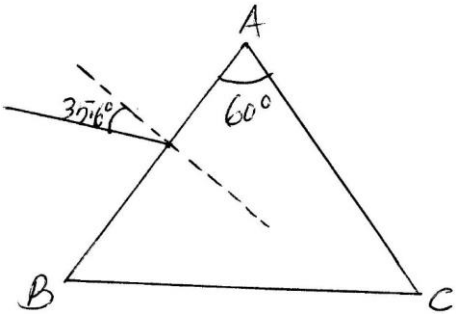


i) Give an explanation for the difference on the voltmeter when the switch is open and when the switch is closed, (2mks)
ii) What is the emf of the battery (1mk)
iii) If the ammeter gave a ready of 0.8 A when 5 is closed, determine the value of R. (2mks)
iv) What is the internal resistance of the accumulator? (2mks)

14. a) Define refraction of light. (1mk)
b) Give one reason for the cause of refraction of light (1mk)

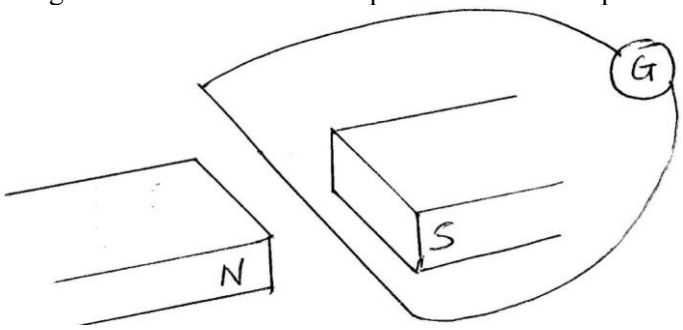
c) The refractive index of glass is $^{3}/_{2}$ and that of water is $^{4}/_{3}$. Calculate the refractive index of glass with respect to water. (3mks)

d) The figure below shows a ray of light incident at an angle of 35.6^{o} at point D on the first face of a glass prism ABC. The refractive index of the prism is 1,6.



i) Determine the angle of refraction at point D (3mks)
ii) Determine the critical angle of the glass prism. (2mks)

15. a) State Lenz's law of electromagnetic induction. (1mk)
b) The figure 9 below shows a wire placed between the pores of two permanent magnets.

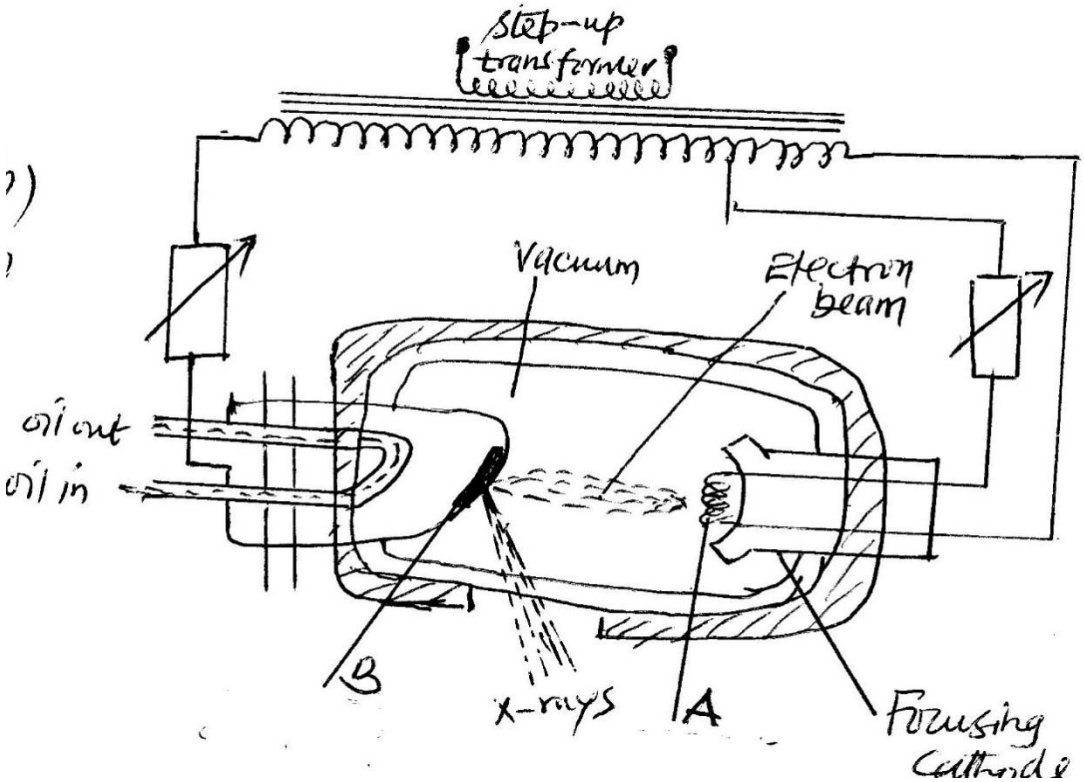


i) State and explain what is observed when the wire is moved up and down. (2mks)
ii) Suggest two (2) ways of altering the magnitude of the effect you've stated in (i) above. (2mks)

c) A transformer has 10,000 turns on its secondary coil and 100 turns on primary coil. An alternating current of 5.0 A flows in the primary circuit when it is connected to a 12 v a.c. Supply.
i) Calculate the power input to the transformer. (3mks)
ii) Calculate the voltage across the secondary coil. (2mks)

d) A heater rated 2kw used for 30 minutes everyday for 30 days. Calculate the cost of the electricity consumed in the 30 days given that it's charged at Ksh. 7.00 per unit. (3mks)

16. a) Name two(2) properties of common to both x-rays and gamma rays. (2mks)
b) The figure 10 shows an x –ray tube



i) Name the parts labelled A and B.
(2mks)

ii) State the functions each of the parts you have and in (i). (2mks)

iii) In the x-ray tube, the voltage between the cathode and anode is more than 50,000v. Give a reason for this. (1mk)

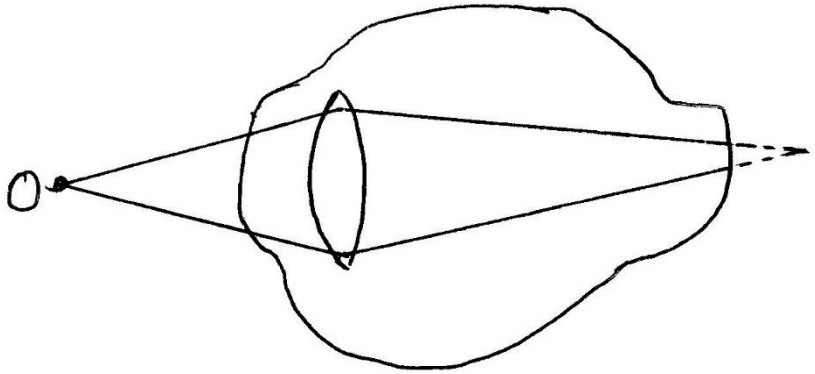
c) An X-ray tube operates with a potential difference of 150kv between the cathode and the anode. Only 0.5% of the kinetic energy of each electron is converted into x-rays. (Take electronic charge e = 1.6 x 10^{-19} C) Determine the maximum

i) Kinetic energy of each electron (3mks)

ii) Energy of the x-rays. (2mks)

17. a) State what is meant by the term accommodation as applied to the human eye. (1mk)

b) The Figure 11 below shows how a new object O is focused in a defective eye.

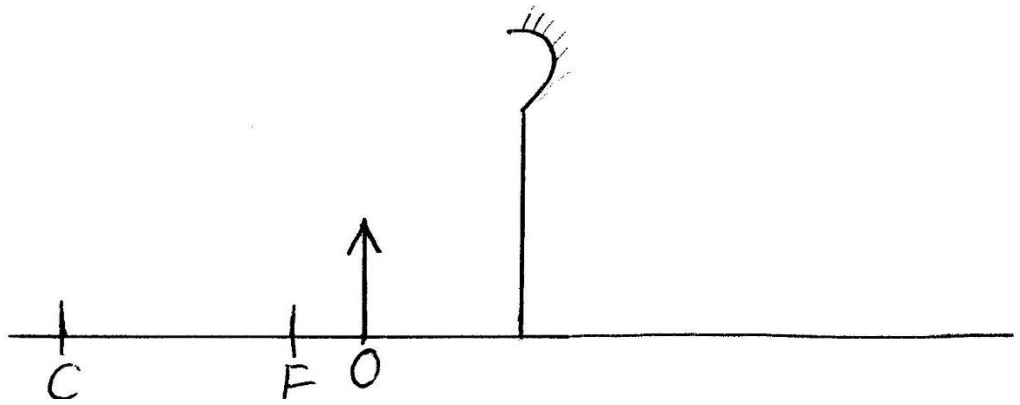


i) What problem does the observer face when viewing an object at the near point (1mk)

ii) Name the type of lens used to correct the defect. (1mk)

c) An object of height 10cm stands before a diverging lens of focal length 30cm and at a distance of 20 cm from the lens. Determine the image distance. (3mks)

d) An object O stands on the principal axis of a concave mirror as shown below in figure 12.



i) By drawing suitable rays show the positon of the image. (2mks)

ii) State one (1) characteristic of the image formed. (4mks)

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CONFIDENTIAL

Question 1

- An ammeter 0-1 A
- Voltmeter
- A wire mounted on a mm scale labelled X (SWG 32)
- A switch
- A jockey
- 3 new size D dry cells
- 3 new holders
- 7 connecting wires, three with crocodile clips on both ends
- A convex lens of focal length 20cm.
- Lens holder
- Metre rule
- A white screen
- A candle

Question 2

- One metre rule and a half metre rule
- Two complete stands
- Three pieces of thread 1cm, 30 cm and 30 cm.
- One optical pin
- One helical spring
- 200g mass
- A cellotape (10cm)
- Stop watch

MURANG'A SOUTH
PHYSICS
PAPER 3
JULY/AUGUST, 2018
232/3
PRACTICAL

QUESTION 1A

You are provided with the following.

- A wire mounted on mm scale labelled x.
- An Ammeter
- A Voltmeter
- A Switch
- 3 new size D dry cells.
- 3 cell holders
- Jockey
- Seven connecting wires, three with crocodile clips on both ends.

Proceed as follows

a) Connect the circuit as shown in figure I below.

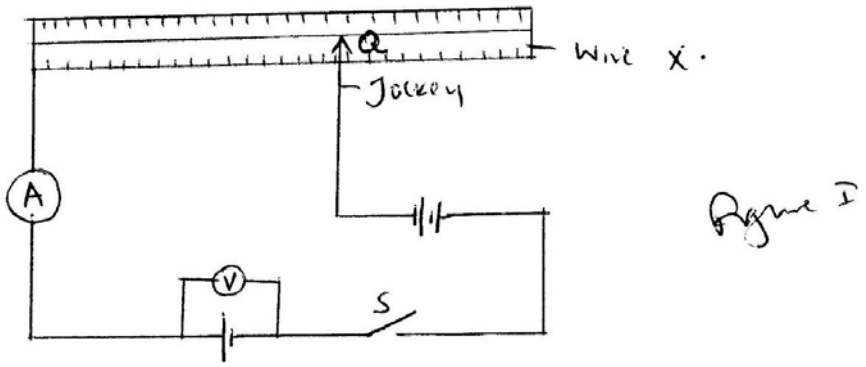


Figure 1

b) Adjust the contact Q so that the reading on the voltmeter is 1.3v, note the reading of the current and record in the table I below. (3mks)

pd Volts (V)	1.3	1.2	1.1	1.0	0.9	0.8	0.7
Current I (A)							

c) Repeat the procedure in (b) above for the values of voltage given in the table and record the corresponding values of the current.
d) Plot a graph of voltage V(y-axis) against current I(x-axis) in the grid provided. (5mks)
e) Determine the gradient of the graph. (3mks)
f) From the graph determine the values of
   i. The emf E of the cell. (1mk)
   ii. The internal resistance r of the cell. (2mks)

PART 1B

You are provided with the following.

- A lens and a lens holder.
- A candle
- A screen
- A metre rule.

Proceed as follows.

a) Set up the apparatus as shown below in figure 2

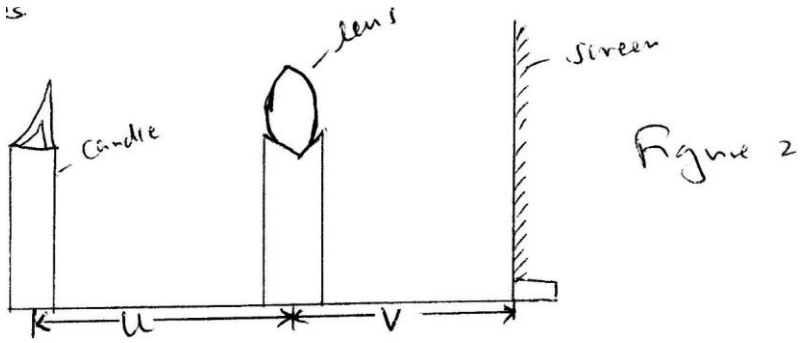


Figure 2

b) Starting with U=30cm, adjust the position of the screen to obtain a sharp image of the candle. Record the values of V in table 2.
c) Repeat the procedure in (b) above for U=40cm. Complete the table. (3mks)

U cm	V cm	m = v/u
30		
40		

d) Given that the focal length of the lens satisfies the equation $f = \frac{V}{1+m}$ determine the average value of focal length f. (3mks)

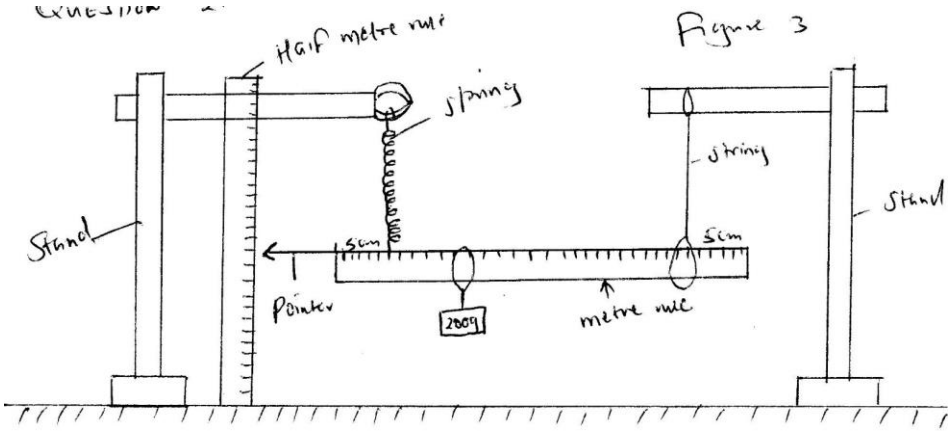
QUESTION 2.

You are provided with the following.

- A meter rule and a half meter rule.
- Three pieces of thread 1m, 30cm and 30cm.
- One helical spring.
- 200g mass.
- A cello tape.

Proceed as follows.

a) Set up the apparatus as shown in figure 3.



b)

i) Fix the optical pin using the cello tape at one end of the meter rule to act as a pointer.
ii) Suspend one end of the meter rule with a thread at 5cm mark from the end.
iii) Suspend the other end of the meter rule with spring also 5cm from the other end so that the meter rule is horizontal.
iv) Hold the half meter rule vertical on the bench so that it is near the end with a pointer as shown in the figure above.

c)

i) Read the pointer position L_0 =__ cm. (1mk)
ii) Hang on the horizontal meter rule the 200g mass at length L = 10cm from the spring.
iii) Record the extension e of the spring in the table 3 below.
iv) Displace the mass slightly downwards and release it to oscillate vertically, time for 20 oscillations.
v) Record in the table 3 the time for 20 oscillations.
vi) Repeat steps (ii), (iii), (iv) and (v) for other positions L on the mass. (8mks)

Length L(cm)	10	20	30	40	50
Extension e(cm)					
Time for 20 oscillations					
Periodic time T (s)					
T^2 (S^2)					

d) Plot a graph of extension (e) against T^2 on the grid provided. (5mks)

e) Calculate the slope s of the graph. (3mks)

f) Given that

$$e = \frac{PT^2}{4\pi^2} + C$$

Determine the value of P. (2mks)

19. a) State a condition which should be attained by a body in a viscous fluid to have terminal velocity. (1 mark)

ii)A block of metal having a mass of 30kg requires a horizontal force of 100N to move it with uniform velocity along a horizontal surface. Calculate the co-efficient of friction. (3 marks

b)i) State Charles' law. (1 mark)

ii) Give **three** reasons why gas laws do not hold at low temperatures. (3 marks)

c) Distinguish between elastic and inelastic collisions. (1 mark)

KIGUMO JOINT TRIAL EXAMS
PHYSICS
PAPER 2
JULY/AUGUST, 2018
232/2

SECTION (25 MARKS)
Answer all questions in this section in the spaces provided

1) **Figure 1** shows objects A and B placed in front of a mirror M.

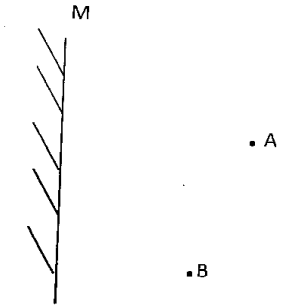


Figure 1

Show the position of their images A^1 and B^1. (2 marks)

2) **Figure 2**shows a negative point charge near a positively charged rod. Draw on the figure, the resulting electric field pattern. (2 marks)

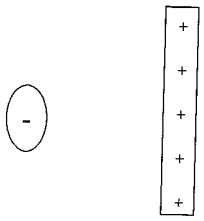


Figure 2

3) Calculate the magnification produced by a convex lens of focal length 10cm used in a simple microscope given that the image distance is 40cm. (3 marks)

4) The chart below shows an arrangement of different parts of the electromagnetic spectrum.

P	Q	R	Ultra violet	S	Gamma rays

Name the radiation represented by letter Q and state one use of the radiation. (2 marks)

5) Explain why the filament of an electric lamp is made of tungsten. (1 mark)

6) **Figure 3** shows wave fronts in a ripple tank approaching a shallow region in the tank.

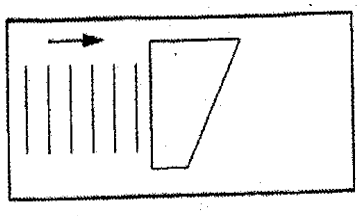


Figure 3

Complete the diagram to show the wave fronts as they pass over the shallow region and after leaving the region. (2 marks)

7) **Figure 4** shows two magnets A and B brought from a point above a table towards a steel pin.

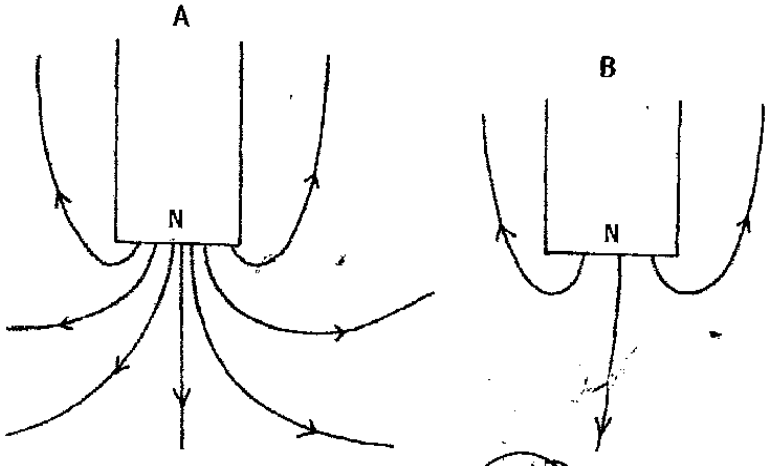


Figure 4

State with reason which magnet will attract the pin at a larger height above the table. (2 marks).

8) State briefly what happens to the depletion layer when a diode is forward biased. (1 mark)

9) A soldier standing 600m from a wall blows a whistle. How long does it take for the echo to reach him? (Speed of sound in air =330m/s) (2 marks)

10) Determine the critical angle for a ray of light passing from glass into water (refractive indices of glass and water are 1.5 &1.33 respectively). (3 marks)

11)**Figure 5** shows a current carrying conductor placed between two strong magnets.

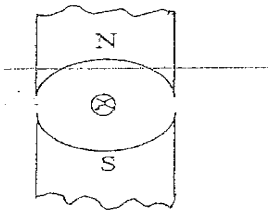


Figure 5

Indicate the direction of the magnetic field and the force on the conductor (2 marks)

12) In**Figure 6** complete the diagrams to show the path of the X-ray beam when it enters an electric field. (1 mark)

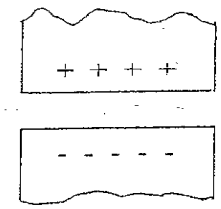


Figure 6

13) Light of frequency 6.5×10^{14}Hz is radiated on a metal whose threshold frequency is 2.0×10^{14} Hz. Determinethe kinetic energy of the emitted electrons. (2 marks)
(Planck's constant $=6.63 \times 10^{-34}$Js.)

SECTION B (55 MARKS)

Answer all questions in this section in the spaces provided

14. a)A house has the following appliances

Appliance	Power rating W	Time used in hours per day
Cooker	4000	1
TV set	150	3
Electric kettle	2000	0.5
Radio	300	6

i) Determine the appropriate fuse which would be required for the cooker and the radio respectively. The 240V mains available fuses are rated 40A, 35A, 20A, 13A, 3A &1A. (2marks)

ii) Calculate the total cost of electricity paid in a month of 30 days given that all the appliances are used as shown above and 1KWh costs ksh1.85. (3 marks)

iii) State with reason the fuse suitable for the mains switch. (2marks)

b) Study **Figure 7** and use it to answer the questions below it.

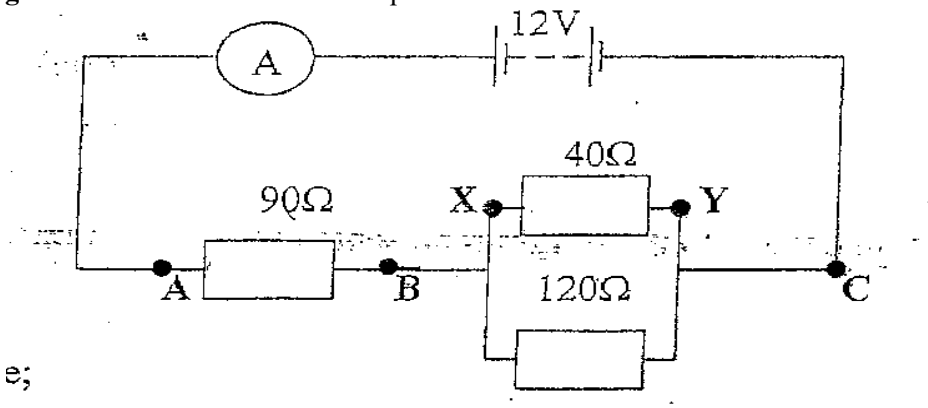


Figure 7

Determine the:

i) Current flowing through the ammeter. (3marks)

ii) Potential difference between X and Y (2marks)

c) State two factors that affect electrical resistance of a conductor. (2marks)

15) a) Distinguish between transverse and longitudinal waves (1mark)

b) Water waves are observed as they pass a fixed point at a rate of 30 crests per minute. A particular wave crest takes 2s to travel between two fixed points 6m apart. Determine for the wave the:

i) frequency (2marks)

ii) wavelength (2marks)

c) **Figure 8** shows a displacement –position graph of a slinky spring as it is continuously vibrated at one end.

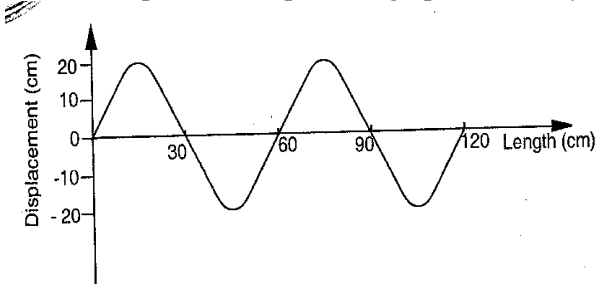


Figure 8

i) Name the type of wave generated. (1mark)

ii) Determine the:

I) amplitude of the wave (1mark)

II) wavelength of the wave (1mark)

iv) On the same diagram draw a wave showing the wave when the frequency is doubled. (1mark)

16) **Figure 9** shows the features of an x-ray tube.

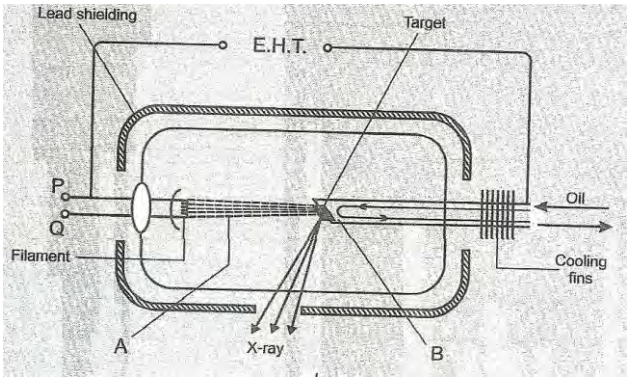


Figure 9

i) Name the parts labeled A and B (1mark)

ii) Explain how a change in the potential across PQ changes the intensity of the x rays produced in the tube. (1mark)

iii) During the operation of the x ray tube, the target become very hot .Explain how this heat is caused. (1mark)

iv) What property of lead makes it suitable for use a shielding material? (1mark)

b) X- rays are used for detecting cracks inside metal beams.
i) State the type of the X rays used for purpose above. (1mark)
ii) Give a reason for your answer in (b)(i) above (1mark)

c) In a certain X- ray tube electrons are accelerated by p.d of 12 kV. Assuming all energy goes to produce X-rays, determine the frequency of the X-rays produced
(Planck's constant $=6.63\times10^{-34}$Js. Charge of an electron$=1.6\times10^{-19}$C) (2marks)

d) **Figure 10** shows the waveform of a voltage displayed on the screen of a C.R.O.
The Y-gain was 5V/cm and time base control was 10ms/cm.

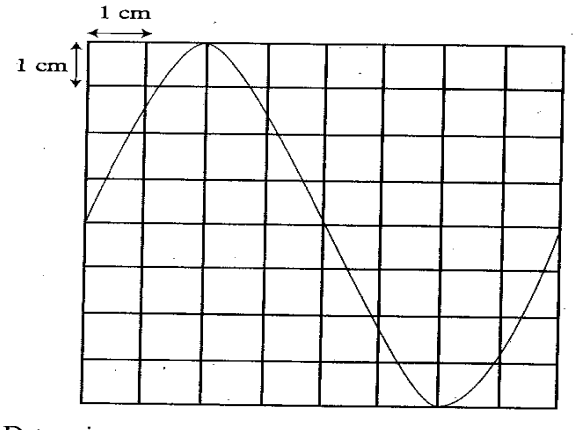


Figure 10

Determine the:

i) peak to peak voltage of the Y- input (1mark)

ii) period of the signal (2marks)

iii) frequency of the signal. (2marks)

17) **Figure11** shows a simple electric generator.

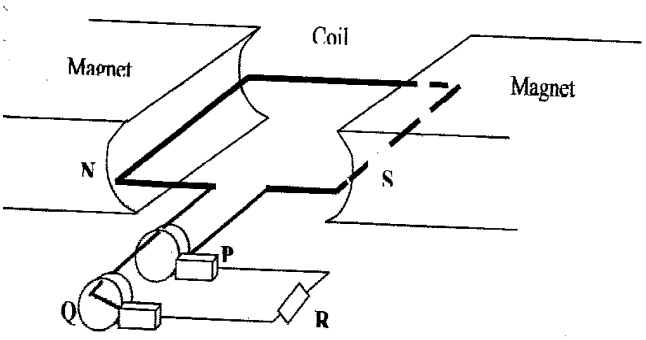


Figure 11

a) i) Name the parts labeled P and Q (2marks)
ii) State two ways of increasing the magnitude of the induced current in this type of generator. (2marks)

b) The primary coil of a transformer has 1200 turns and the secondary coil has 60 turns .The transformer is connected to a 240v a.c source. Determine the:
i) Output voltage (2marks)
ii) Output current when the primary coil has a current of 0.5A.Assume there are no energy losses. (2marks)

c) **Figure 12** shows a magnet being moved towards a stationary solenoid. It is observed that a current flows through the circuit in a direction Q to P.

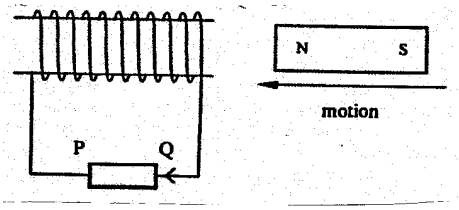


Figure 12

Explain why the current flows from Q to P (1 mark)

18)a) The table below gives values for the activity of a sample of an isotope at different times. The background radiation is 4 counts per minute.

Time (min)	0	10	20	30	40	50	60	70	80
Count rate per minute(Activity)	96	78	62	54	45	39	34	31	29
Corrected Activity									

i) Complete the table above. (1mark)
ii) Plot a graph of corrected activity against time. (4marks)
iii) Use the graph to determine the half life of the sample (1mark)

b) **Figure 13** shows a diffusion cloud chamber for detecting radioactivity.

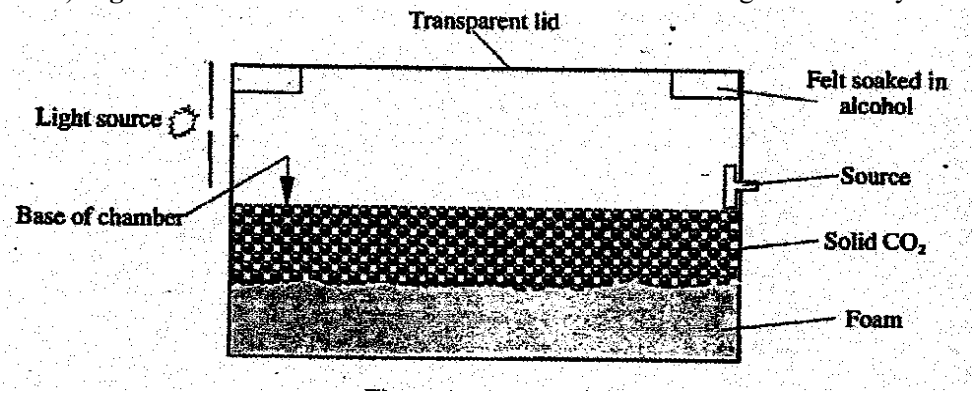


Figure 13

When radiation from the source enters the chamber, some white traces are observed. Explain how these traces are formed and state how the radiation is identified. (4 marks)

KIGUMO JOINT TRIAL EXAMS
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232/3
CONFIDENTIAL

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QUESTION ONE

Each student should have

- ✓ Two new D size dry cells
- ✓ Nichrome wire mounted on metre rule
- ✓ Ammeter (0-3.0A)
- ✓ Cell holder
- ✓ Voltmeter (0-5)V
- ✓ 8 connecting wires (4 with crocodile clips)
- ✓ Switch
- ✓ Metre rule

QUESTION TWO

Each candidate to have

- ✓ Glass block
- ✓ Soft board
- ✓ Plain paper
- ✓ Four optical pins
- ✓ Four thumb pins
- ✓ Protractor
- ✓ Ruler

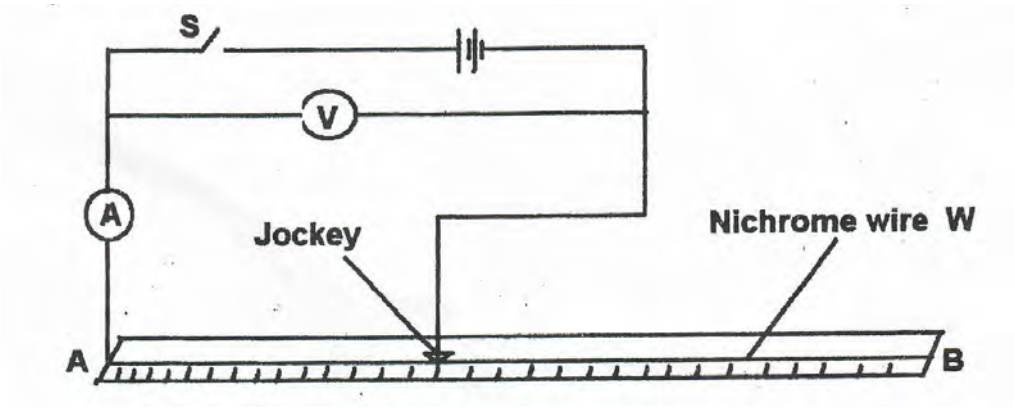
KIGUMO JOINT TRIAL EXAMS
PHYSICS
PAPER 3
JULY/AUGUST, 2018
232/3
PRACTICAL

QUESTION 1

1. You are provided with the following
   - ✓ Two cells of 1.5V each
   - ✓ Nichrome wire mounted on a metre rule
   - ✓ An ammeter (0-1.5A) or (0-2.5A)
   - ✓ A cell holder
   - ✓ A voltmeter (0-5)v
   - ✓ 8 Connecting wires (4 with crocodile clips)
   - ✓ A switch
   - ✓ A metre rule

Proceed as follows

a) Connect the circuit as shown below



b) Connect the jockey at B
   i) Close the switch and measure both the current I and p.d. V across the wire AB
   Current (1mark)
   Voltage (1mark)
   ii) Measure the e.m.f of the cell E= 3.0V (1mark)

c) Reduce the length AB by tapping the Jockey at 100cm, 60cm, 50cm, 40cm, 30cm, and 20cm. In each case record current 1 and p.d

d) Enter the values as shown below in the chart (6mks)

Length (AB)cm	**100**	**70**	**60**	**50**	**40**	**30**	**20**
Current I(A)	**0.12**	**0.18**	**0.20**	**0.22**	**0.24**	**0.26**	**0.32**
p.d. V (v)	**2.4**	**2.2**	**2.1**	**1.9**	**1.8**	**1.6**	**1.5**
E – V(V)	**0.6**	**0.8**	**0.9**	**1.1**	**1.2**	**1.4**	**1.5**

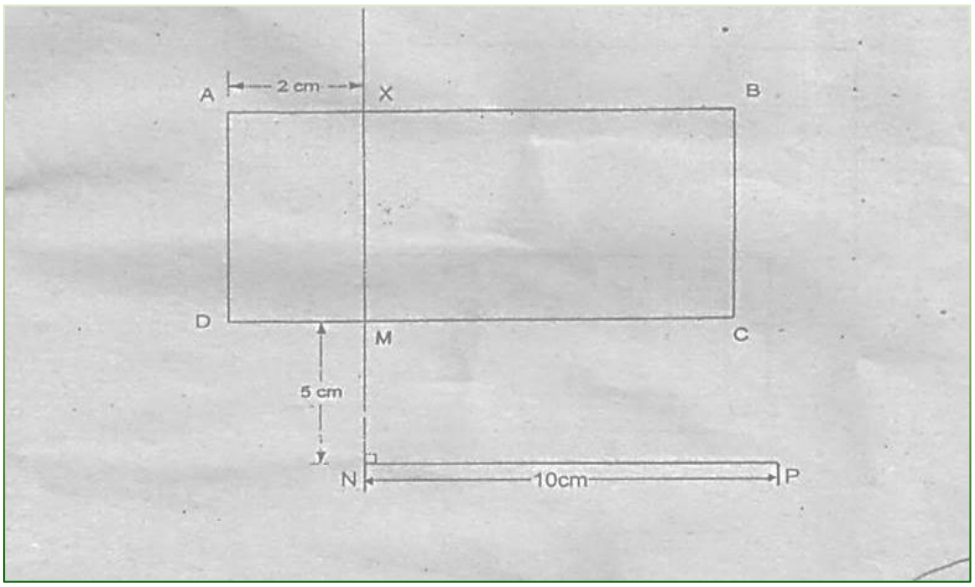
e) (i) plot a graph of (E-V) against current I (5mks)
   (ii) Determine the gradient of the graph (3mks)
   (iii) Given the equation, E=V+Ir determine the internal resistance of each cell. (3mks)

QUESTION 2

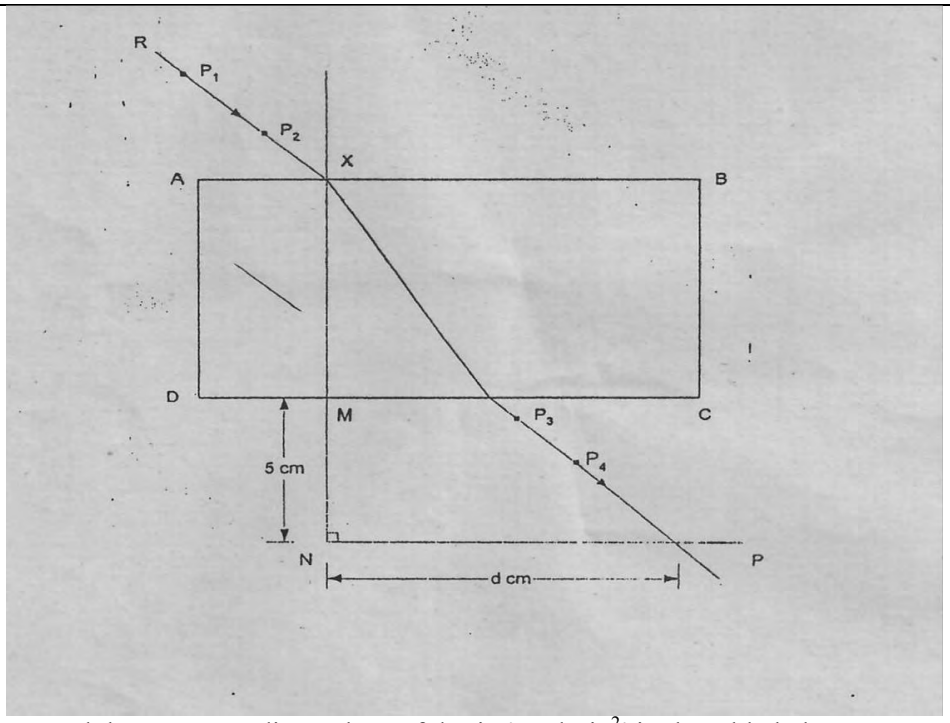
2. You are provided with the following apparatus
   - ✓ A glass block
   - ✓ Soft board
   - ✓ Plain paper

- ✓ Four optical pins
- ✓ Four thumb pins
- ✓ A protractor
- ✓ A ruler

i. Fix the plain paper on the soft board using the four thumb pins
ii. Place the glass block on the plain paper (that is fixed on the soft board). Let the glass block rest on the paper from the broader face.
iii. Trace the glass block using a pencil.
iv. Remove the glass block.
Mark point X one of the longer side of the traced glass block as shown in the diagram below.
Point X should be 2cm from edge A.



v. Construct a normal at X, to emerge through line DC. Let this normal meet line DC at point M.
vi. Mark point N along the emergent normal, 5cm from M.
vii. Construct a line NP to meet the normal at N at 90^0. Line NP is 10cm.
viii. Using a protractor, construct an incident ray RX at an angle of incidence **i** $=10^0$. Fix two point P_1 and P_2along RX
ix. Replace the glass block to the traced figure.
x. View the path of the incident ray RX through the glass block from the face DC. Using other two pins P3 and P4, fix them to seem to align themselves with images of P_1 and P_2
xi. Remove the glass block and draw the emergent ray through P_3 and P_4
xii. Measure the distance of the emergent ray from point N along line NP as shown in the diagram below.



xiii. Record the corresponding values of d, Sin **i** and Sin^2**i** in the table below.

xiv. Repeat the procedure for other values of **i** (8 marks)

Angle of incidence i^0						
Distance d (cm)						
Sin i						
Sin^2i						

(xv) (i) On the grid provided, plot the graph of Sin^2i (vertical axis) against d (5mks)

(ii) Calculate the gradient of the graph (3marks)

(iii) What is the equation of the graph? (2marks)

c) Give the value of d when $i=80^0$ (2marks)

BUURI CLUSTER EXAMS
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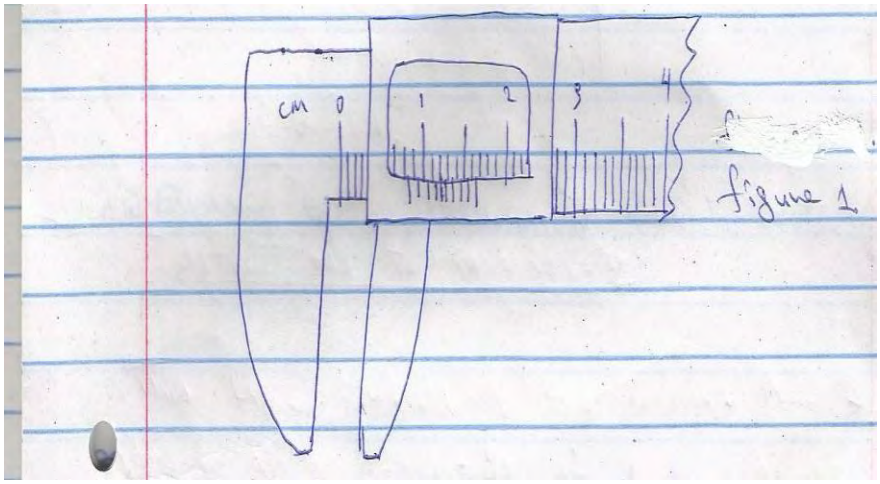
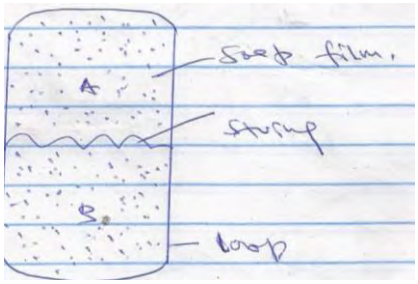
SECTION A: (25MKS)

1. The vernier calipers shown below has a zero error of + 0.02cm.



State the actual reading on the instrument. (2mks)

2. State Brownian motion (1mk)
3. Figure 2 below shows a wire loop with a string that has been dipped into soap solution.

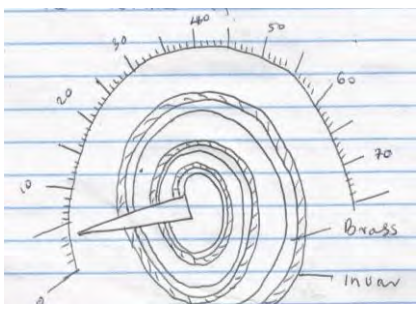


i) The soap film is pierced with a hot pin at B. Sketch a similar diagram to show the observed effect. (1mk)

ii) Explain the observation in (i) above. (1mk)

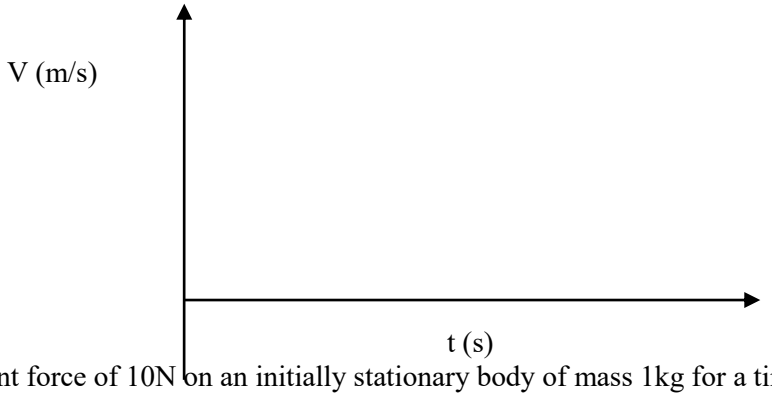
4. Hard water of density 1.02g/cm^3 is being pumped into a tank through a pipe of uniform cross – section area of 6.284cm2 at a speed of 6m/s. Determine volume flux in S.I units. (3mks)

5.

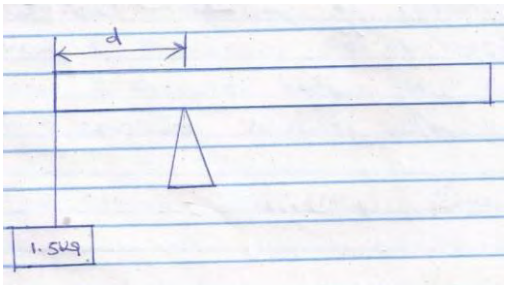


The figure 3 above is a bimetallic thermometer explain how it can be used to measure temperature. (2mks)

6. On the axes below, sketch a graph of velocity (v) against time (t) for uniformly accelerated motion given that when t = 0 V is greater than zero. (1mk)



7. A resultant force of 10N on an initially stationary body of mass 1kg for a time of 1 second. How far will it make. (3mks)
8. State two functions on which the sensitivity of a clinical thermometer depends on. (2mks)
9. Give the reason why one feels warmer in woolen clothing than in nylon clothing. (1mk)
10. A student wanted to have a warm bath at 60^0C. He had 5.0kg of water in a basin at 80^0C. What mass of cold water at 30^0C must he cold to the hot water to have his bath of choice? (Neglect heat loss and take specific heat capacity of water as 4200Jkg^{-1}K^{-1}) (3mks)
11. The figure 4 below shows a uniform woolen plank of length 2M and weight 5N. The plank is balanced at a distance (d) from one and by a mass of 1.5kg

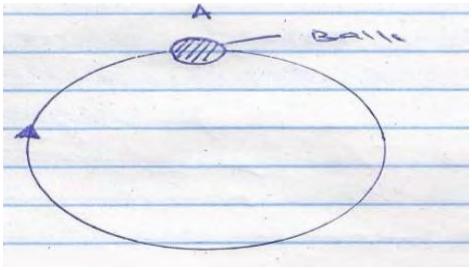


Determine the distance d. (3mks)
12. Define the term absolute zero as used in gas laws. (1mk)
13. State one way of increasing stability of a body. (1mk)

SECTION B: (55 MARKS)

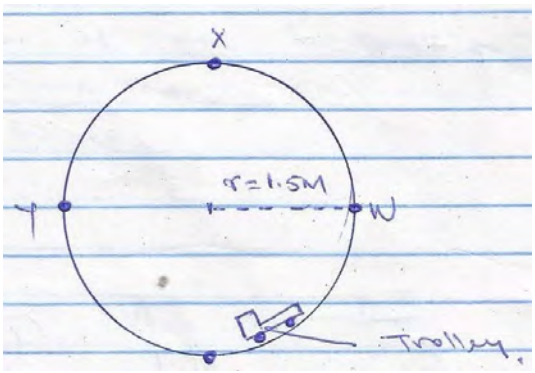
14. a) State Newton's third law of motion. (1mk)
    b) Distinguish between elastic and inelastic collision. (2mks)
    c) A mini bus of mass 2000kg travelling at a constant velocity of 36km/hr collides with a stationary car of mass 1000kg. The impact takes 2 seconds before the two move together at a constant velocity for 20 seconds. Calculate.
        i) The common velocity (2mks)
        ii) The distance moved after impact. (2mks)
        iii) The change in Kinetic energy. (2mks)

15. a) i) The following diagram shows a ball whirled in a clockwise directionalong a vertical plane. Sketch the path followed by the the ball if the string breaks when the ball is at position A. (1mk)



ii) A body having a uniform motion in a circular path is always accelerating. Explain (2mks)

b) Figure 6. Below shows a trolley moving on a circular rail in a vertical plane. The mass of the trolley is 200g and the radius of the nail is 1.5m.

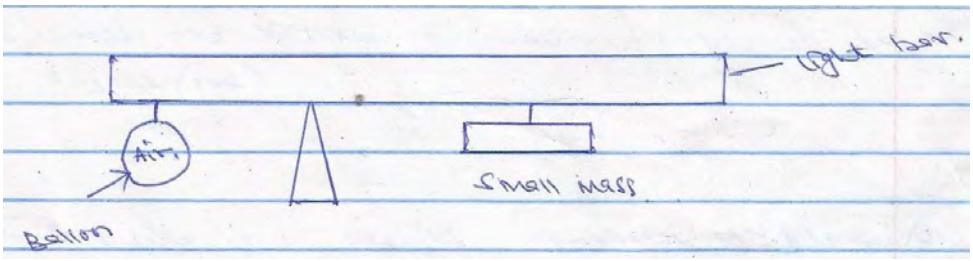


i) Determine the minimum velocity at which the trolley posses point X. (3mks)

ii) If the trolley moves with a velocity of a 4ms^{-1} as it passes point X, find its angular velocity at this point. (2mks)

iii) Find the force exerted on the rail at point Z. (3mks)

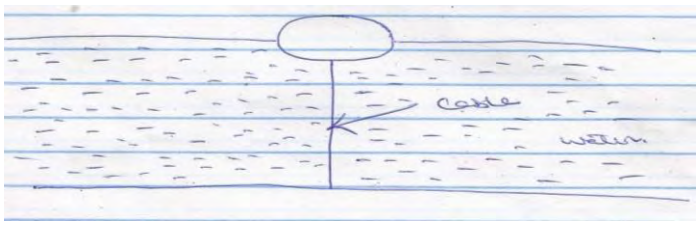
16. a) The figure 7 below shows a system in equilibrium at room temperature. The system is taken outside where the temperature is 200^{o}C higher for sometimes.



Explain why it tips to the right when it is taken outside the room. (1mk)

b) i) State the law of floatation. (1mk)

ii) Fig 8 below shows a floating object of volume 40,000cm3 and mass 10g. It is held as shown in water of density 1.25g/cm3 by a light cable at the bottom so that ¾ of the volume of the object is below the water surface (Assume the upthrust due to air is negligible).



I) Calculate the volume of the object under water. (2mks)

II) State the volume of water displaced by the object (1mk)

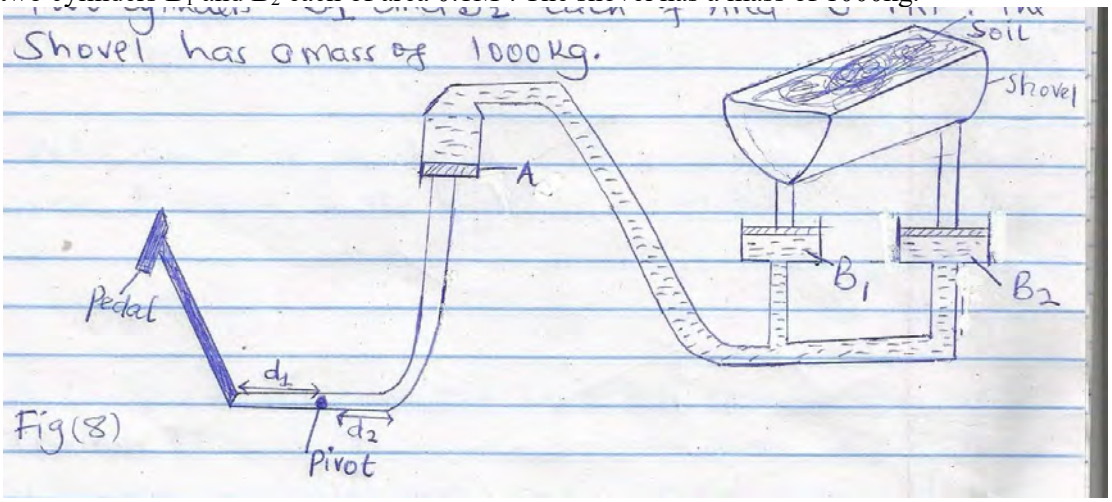
III) Calculate the weight of water displaced. (2mks)

iii) Determine the tension in the cable. (3mks)

iv) Calculate the density of the object. (2mks)

17. a) In a pulley system the head is lifted with a velocity of 4m/s when the effort moves with a velocity of 8m/s. Determine the velocity ratio of the pulley system. (1mk)

b) Figure 9 shows hydraulic system of an earth mover lifting mass of soil. The shovel is operated by two cylinders B_1 and B_2 each of area $0.1M^2$. The shovel has a mass of 1000kg.



i) The driver applies a force of 80N on the pedal with a lever arm of length d_1 = 40cm. Calculate the force produced on the piston of master cylinder A if its lever arm d_2 is of length 4cm. (2mks)

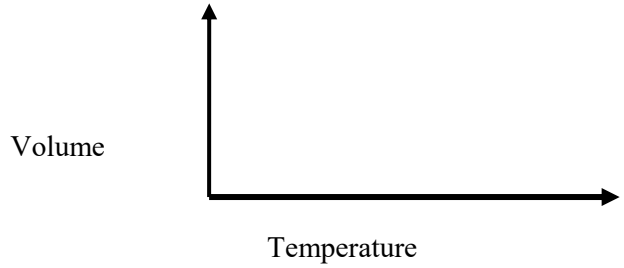
ii) If the area of A is $0.0005M^2$ determine the pressure on A. (2mks)

iii) Calculate the maximum weight of the soil that can be lifted. (2mks)

iv) Why would it be dangerous if small bubble of air were trapped in the hydraulic fluid? (1mk)

c) A tin closed with an air tight lied contains air at a pressure of 1.0×10^5Pa and a temperature of 12^0. The tin is heated in water bath until the lid opens. If the temperature at which the lid opens is 88^0, determine the pressure attained by the gas. (3mks)

18. i) Water is heated from -4^0 until it boils. Sketch on the axis provided a graph show the variation of volume with temperature. (2mks)



ii) State three effects of anomalous water expansion. (3mks)

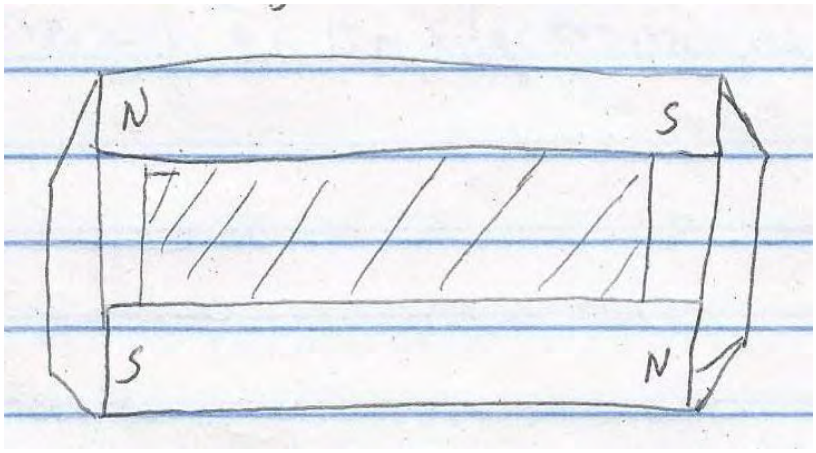
iii) Suggest why several layers of paper provide effective insulation for hot take away forced. (2mks)

iv) State any three factors affecting thermal conductivity. (3mks)

BUURI CLUSTER EXAMS
PHYSICS
PAPER 2
JULY/AUGUST, 2018
232/2

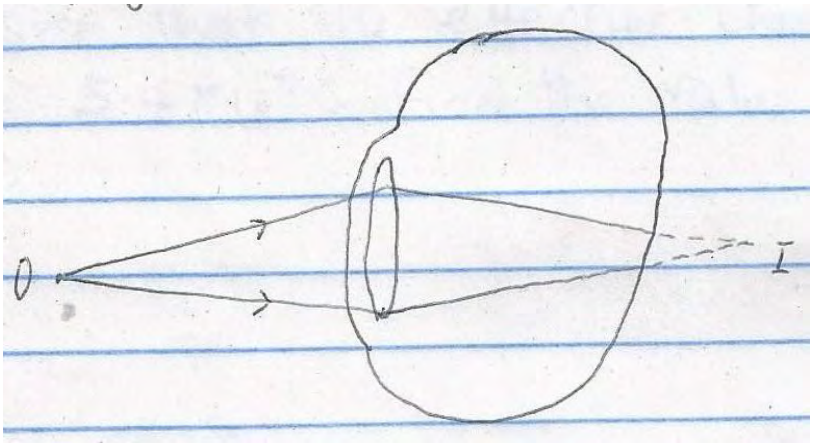
SECTION A: (25MKS)

1. Five images are formed when two mirrors are inclined at an angle between them. Determine the angle of inclination. (2mks)
2. Explain why theatre halls are cautioned with soft materials. (2mks)
3. Magnets are stored in pairs with unlike poles adjacent, and with keepers at the ends with a non magnetic material between.



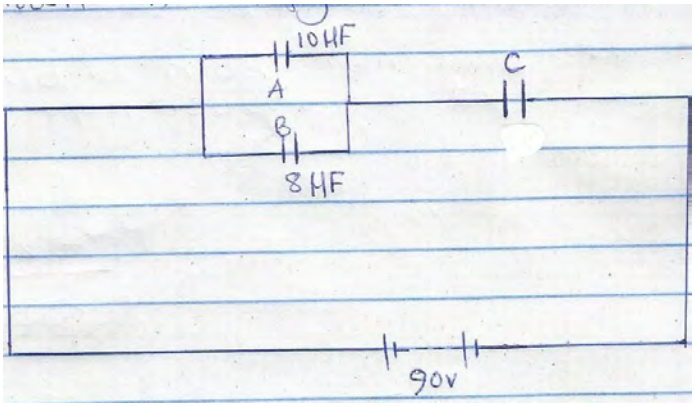
a) What is the purpose of
   a) The non – magnetic material (1mk)
   b) The keepers (1mk)

4. Give one advantage of using dry cell over an accumulator. (1mk)
5. An electromagnet is made by winding insulated copper wire on an iron core. State two changes that could be made to reduce the strength of the electromagnet. (2mks)
6. What is meant by a virtual image? (1mk)
7. Draw a circuit to show a formal biased pin function connected to a battery. (1mk)
8. Explain the fact that radiant heat from the sun penetrates a glass sheet while radiant heat from burning wood is cut off by the glass sheet. (2mks)
9. What is the use of a low voltage source in a cathode ray tube? (1mk)
10. The figure below shows an eye defect.



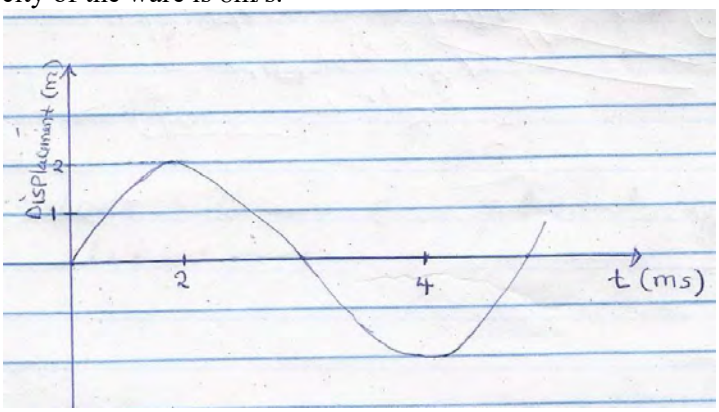
Draw another diagram to show how the defect is corrected.

11. Three capacitors A, B and C are connected as shown in the figure below.

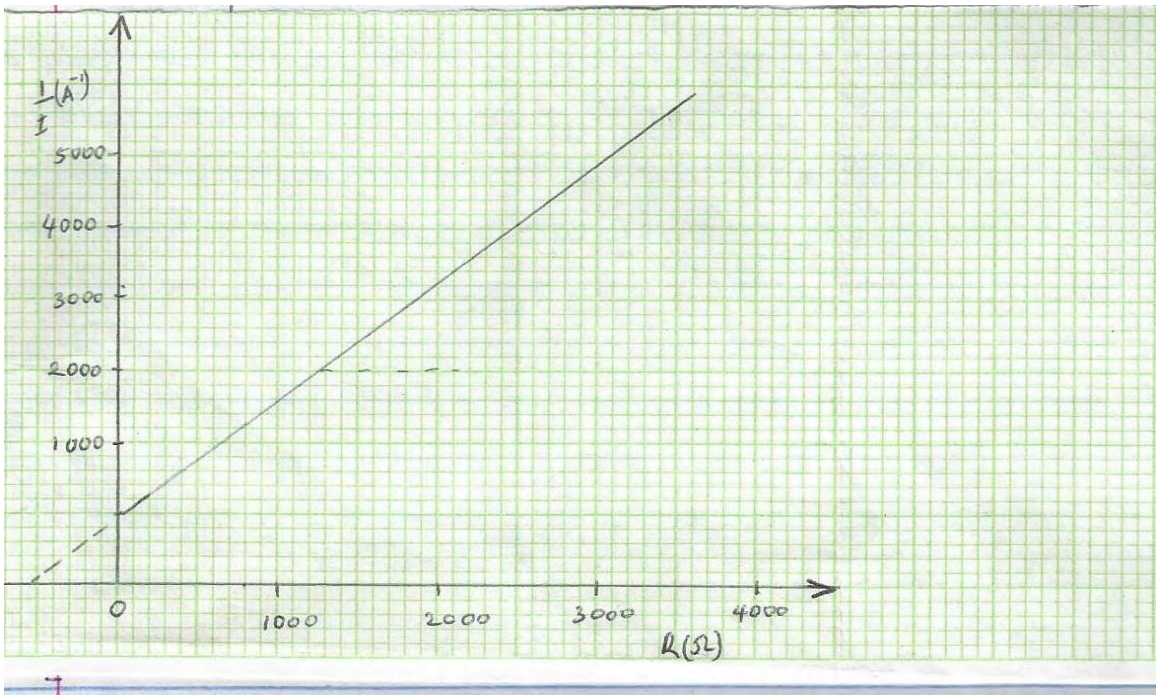


Given that the effective charge for the system is 5.4×10^{-4}C. Find the value of the capacitance for C. (3mks)

12. The figure above is an illustration of a ware pattern. Calculate the frequency of the wave given that the velocity of the ware is 8m/s. (2mks)



13. In an experiment to determine the E.m.f of a cell the student obtained the graph below.



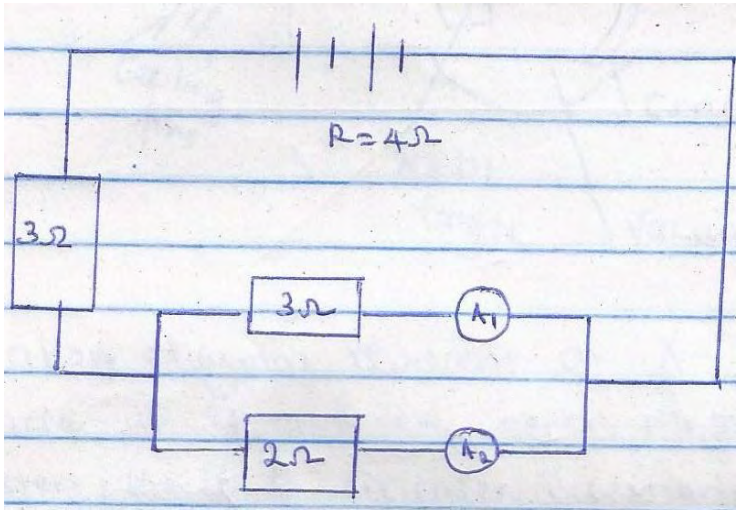
Calculate the E.m.f (3mks)

14. How does resistance of a filament affect heating of an element? (1mk)

SECTION B: (55 marks)

15. a) Define electromotive force of a cell. (1mk)

b) Study the circuit below and answer questions (i) and (ii) that follow.



Given that the total current in the circuit is 12A, determine.

i) The E.m.f of the battery (3mks)

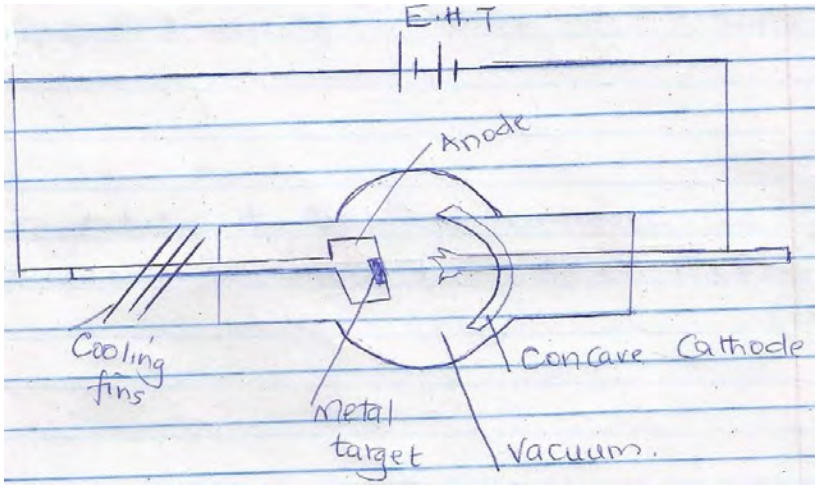
ii) The ammeter readings A_1 and A_2 (3mks)

c) An electric heater is made of a wire of resistance 100 ohms and connected to a 240V mains supply. Determine the:-

i) Power rating of the heater. (3mks)

ii) Current flowing in the circuit. (2mks)

16.



The above diagram represents an X – ray tube. The anode is made up of a thick copper metal which is embedded tungsten; use it to answer questions that follow.

a) i) Why is it necessary to maintain a vacuum inside the tube. (1mk)

ii) Why is anode made of a thick copper metal? (1mk)

iii) What effect will increase in p.d between the anode and the filament have on the X – ray produced. (1mk)

b) i) Why are cooling fins necessary? (1mk)

ii) State any two uses of x-rays in medicine. (2mks)

c) In X-ray tube the voltage between the cathode and the anode is more than 50kv. Explain. (1mk)

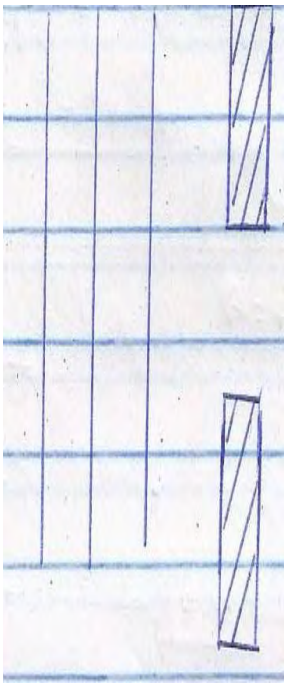
d) An X-ray tube operates with a potential difference of 250kV between the cathode and the anode. Only 0.5% of the Kinetic energy of each electron is Converted into x-rays. (Take electron charge, e = 1.6×10^{-19}C)

i) Kinetic energy of each electron. (2mks)

ii) Energy of the X-rays. (2mks)

17. a) Define diffraction as applied in waves. (1mk)

b) The diagram below shows wave fronts approaching an opening.



i) Sketch the wave-front after passing the opening, on the same diagram. (1mk)

ii) State what would be observed on the pattern after passing the Opening if:

i) The gap was made smaller. (1mk)

ii) The wavelength was made larger. (1mk)

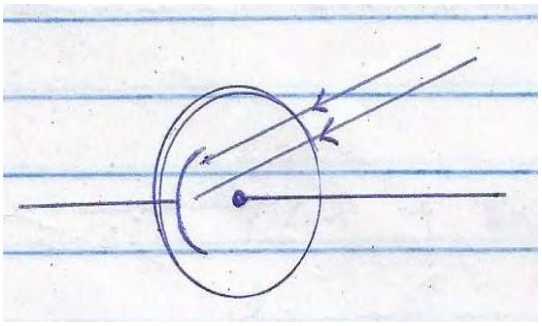
c) When a metre rule was placed in a ripple tank, it was noted that the distance between 15 successive dark lines (crests) was 30cm. The frequency of the vibrator was 20HZ. Determine:

i) One wave length of the waves in the ripple tank. (2mks)

ii) The periodic time of the wave. (2mks)

iii) The velocity of the waves over the water surface. (3mks)

18. a) The figure below shows a photo cell.



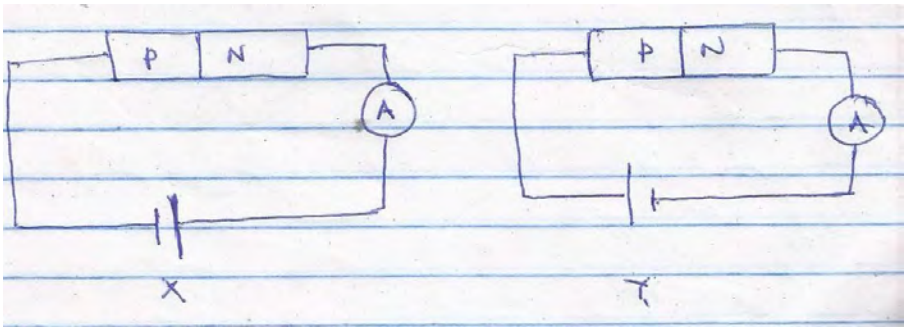
i) Label the cathode and anode. (1mk)

ii) How are electrons produced in the cell? (2mks)

iii) On the diagram, show the direction of the convent. (1mk)

iv) Calculate the photon energy in ultraviolet radiation whose frequency is 8.60×10^{14}HZ (planks constant $h = 6.63 \times 10^{-34}$Js) (3mks)

v) The figure below shows two ways of biasing a P–N junction.



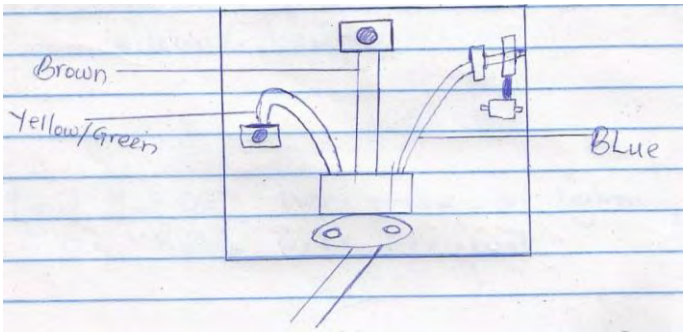
State in which of the circuits will current flow. Explain (2mks)

vi) A radioactive isotope of copper decays to form an isotope of zinc as shown below.

$$^{69}_{29}Cu \longrightarrow {}^{69}_{30}Zn + \text{radiation}$$

Name the radiation emitted and state one of its characteristics. (2mks)

19. a) The figure below shows a connection of the three pin plug.



i) Identify two mistakes in this wiring. (2mks)

ii) What would happen if this plug was connected to the mains of the socket? (1mk)

iii) State two reasons why the earth pin is normally longer than the other two pins. (2mks)

b) A house had five rooms with 240V, 75W bulbs. If the bulbs are switched on from 7:00pm to midnight.

i) Calculate the power consumed per day in kilowatt – hour. (3mks)

ii) Find the cost per week for lighting these rooms at Kshs. 6.70 per unit. (2mks)

BUURI CLUSTER EXAMS
PHYSICS
PAPER 3
JULY/AUGUST, 2018
232/3
CONFIDENTIAL

Question one

- ✓ Candle
- ✓ Lens and lens holder
- ✓ White screen
- ✓ Metre rule

Question Two

- ✓ 1 metre rule
- ✓ 1 weight w (100g mass labeled w)
- ✓ 3 pieces of cotton thread
- ✓ One 100ml beaker with holes and a piece of thread
- ✓ Two glass marbles (diameter 1.5cm)
- ✓ Micrometer screw gauge
- ✓ One voltmeter (0 – 3V)
- ✓ A resistor (R = 2k ohms) Labeled (R = 2k ohms)
- ✓ One dry cell and a cell holder
- ✓ Six connecting wires atleast
- ✓ 3 with crocodile clips on both ends.
- ✓ Resister R can be made by connecting two 1000 ohms resistors in series.

BUURI CLUSTER EXAMS
PHYSICS
PAPER 3
JULY/AUGUST, 2018
232/3
PRACTICAL

1. You are provided with the following:
   - ✓ A candle
   - ✓ A lens and lens holder
   - ✓ A screen
   - ✓ A metre rule

   Procedure

a) Set up the apparatus as shown in figure 1. Ensure that the candle flame and lens are approximately the same height above the bench.

b) Set the position of the lens so that it is 50cm from the candle (u = 50cm). Adjust the screen position until a sharp image of the candle flame is obtained.

c) Measure the distance V between the lens and the screen record the value of V in table 1.

d) Repeat the procedure in (b) and (c) above for the values of u in table 1, complete the table.(9mks)

e)

Object distance U (cm)	50	45	40	35	30	25	20
Image distance V (cm)							
v/u							

f) i) Plot a graph of $v_{/u}$ (y – axis) against V. (5mks)

ii) Determine the slope S of the graph. (3mks)

iii) Given the equation of the graph as

$UV = K (u + V)$

Where K is a constant determine K (3mks)

Adjust the position of the beaker to set the system at equilibrium as shown in figure 2.

Record the distance of the beaker from P d_1 ……cm. (1mk)

c) Add one more marble to the beaker, adjust the beaker position to set the system at equilibrium and record the distance d_2 …….cm. (1mk)

d) Determine the force F the weight of one marble given that

$$F = 10 - 10$$
$$d_2 \quad d$$

(3mks)

e) Calculate the mass M of a marble given that

$M = \frac{f}{g}$ where of = 10N/kg (7mks)

g) The volume of the marble is given by equation (2mks)

$V = \frac{11D^3}{3}$

Find V

h) Determine P given that

$P = \frac{M}{V}$ (3mks)

QUESTION 2

You are provided with the following

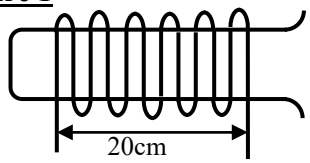
- ➢ A voltmeter
- ➢ A milliameter
- ➢ A resistor (R 2k)
- ➢ One dry cell and a cell holder
- ➢ 6 connecting wires at least 2 with crocodile clip on one end.

KISII CLUSTER TRIAL EXAM
PHYSICS
PAPER 1
JULY/AUGUST, 2018
232/1

SECTION A (25 MARKS)
Answer all the questions in this section in the spaces provided.
(Take g=10N/kg or 10m/s^2)

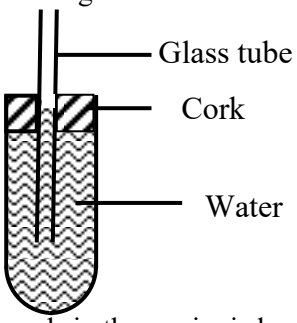
1. The figure1 below shows a wire wound on a test tube. The windings just touch each other. If the total number of complete loops was found to be 15, and the distance covered by the windings on the test tube is 20cm; find the radius of the wire. (2marks)

Figure 1



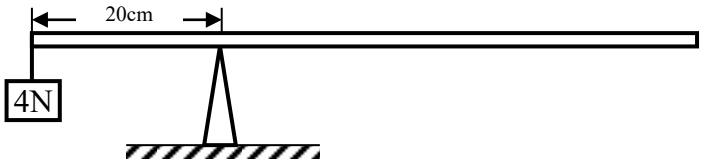
2. A paratrooper flexes his legs when he lands. Explain (1mark)
3. A needle may float on clean water but sinks when a detergent is added. Explain. (1 mark)
4. 50g of ice at -10^{0}c is melted to water at 0^{0}c.Given that the latent heat of fusion of water=336000J/Kg and the specific heat capacity of ice=2100J/KgK; Determine the amount of heat required. (3 marks)
5. Water flows in a pipe of diameter 7cm at a speed of 5m/s. The water then gets to the perforated end which has 20 holes of diameter 0.7cm each.Determine the speed of water jets. (3 marks)
6. For an enclosed system with a liquid, a force is applied at one point.
   a) Briefly explain how force is transmitted to other parts of the system. (2 marks)
   b) State one application of such a system. (1 marks)
7. A 150g mass tied on a string is whirled in a vertical circle of radius 30cm with a uniform speed. At the lowest position the tension in the string is 9.5N.Calculate the velocity of the mass. (3 marks)
8. A spring of elastic constant K has its length increased from 4.00m when unloaded to 4.25m when loaded with a 75N weight. Assuming that the elastic limit is not exceeded, determine the value of K. (2 marks)
9. The figure 2 below shows a glass tube fitted on to a boiling tube filled with water. State and explain what is observed when the boiling tube is heated. (2marks)

Figure 2



10. A bus that carries goods in the carrier is less stable than one that carries goods in the boot. Explain why this is so. (1 mark)
11. A rod consists of glass on one part and copper on the other. The rod is wrapped with a piece of paper and then a flame passed below it. It is observed that the paper on the side with glass is charred while that on the side of copper is not. Explain this observation. (1 mark)
12. The figure 3 below shows a uniform 50cm rod. It is balanced horizontally by a load of 4N on one end. Calculate the weight of the rod. (2marks)

fig. 3

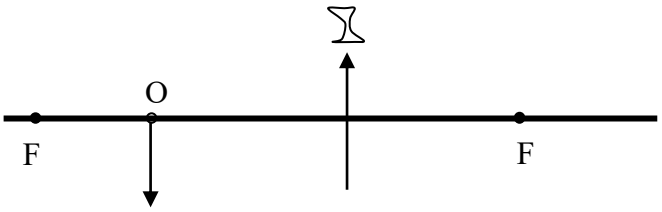


KISII CLUSTER TRIAL EXAM
PHYSICS
PAPER 2
JULY/AUGUST, 2018
232/2

SECTION A (25 MARKS)
***Answer all the questions in the spaces provided*.**

1. State two factors that affect the capacitance of a parallel plate capacitor. (2marks)
2. The figure1. Shows an object,O placed in front of a concave lens.
   By drawing appropriate rays, locate the image formed. (3marks)

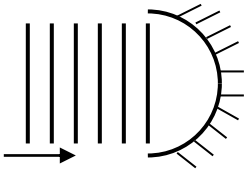
Fig .1



3. Kenya power sells electricity at ksh. 10 per unit. What is the cost of using an electric heater rated 1500w for a total of 30 hours. (3marks)
4. You are provided with resistors of 2.0Ω, 4.0Ω and 6.0Ω.Draw a circuit diagram to show how the three resistors can be connected together to give an effective resistance of 3Ω. (2marks)

5. Figure 2 shows wave fronts approaching a concave surface

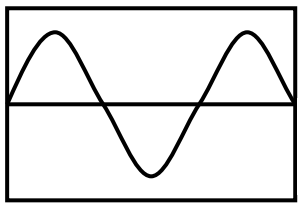
Fig. 2



Complete the diagram to show the wave fronts after striking the surface (2marks)

6. Figure 3. Shows the pattern produced by an a.c voltage on a cathode ray oscilloscope screen.

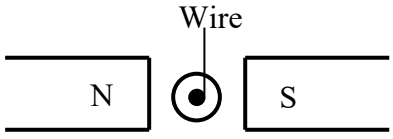
Fig .3



On the same diagram sketch the pattern produced by the same voltage when the time base is switched off. (1mark)

7. State one difference between electromagnetic and mechanical waves. (1mark)
8. A wire carrying current is placed in the direction shown is placed in a magnetic field.
   Indicate on the diagram the direction of the force. (1mark)

Fig . 4



9. When ultraviolet radiation is directed into a clean zinc plate connected to the cap of a negatively charged leaf electroscope, the leaf falls. Explain this observation. (2marks)
10. An electric bulb is rated 75w, 240v, determine the resistance of the bulb. (3marks)

Using the graph determine

i) Planks constant. (3marks)

ii) Work function of the metal (3marks)

16.

a. State ohms law (1mark)

b. A battery of Emf E drives a current of 0.25A when connected to a 5.5Ω resistor. When the 5.5Ω resistor is replaced with 2.5Ω resistor the current flowing becomes 0.5A.Find the emf, E and the internal resistance, r, of the battery. (4marks)

c) A capacitor of capacitance 6μF capacitor is charged using a 6v d.c source. It is then connected across a 12μF capacitor. Find :-

i) Final voltage (2marks)

ii) Charge stored in each capacitor (2marks)

17.

a) State Snell's law (1mark)

b) A ray of light travelling from water to glass makes an angle of incident of 30^0. Find the angle of refraction in the glass. Refractive index of water $=^4/_3$. Refractive index of glass $=^3/_2$ (3marks)

c) State the necessary and sufficient conditions for total internal reflection to occur. (2marks)

d) You are provided with a glass block, a soft board, white sheet of paper and three optical pins. With the help of a diagram explain how you would use these apparatus to determine the refractive index of the glass block using real and apparent depth method. (4marks)

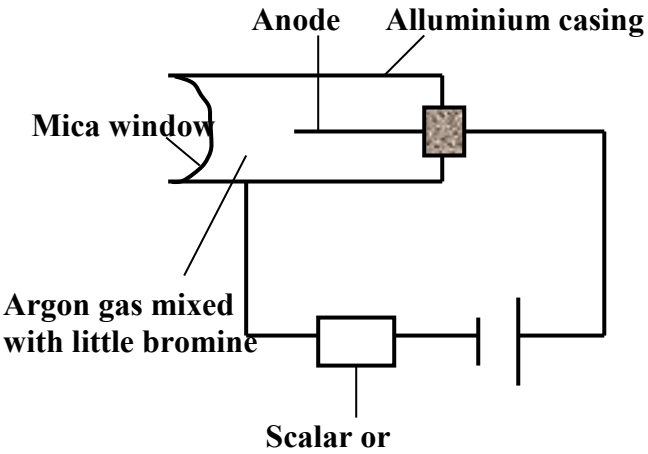
18. a) $^{226}_{88}Ra$ decays into $^{222}_{86}Rn$ by emission of an alpha particle. Write a nuclear equation for the decay (2marks)

b)

i) What do you understand by the term half-life of a radioactive substance. (1mark)

ii) A G.M tube registers an initial count rate of 3200 counts for a certain substance and 100 counts 30 hours later. What is the half-life of this substance. (3marks)

c) The figure below shows a G.M tube.



i) What is the purpose of the mica window? (1mark)

ii) What is the purpose of the bromine (1mark)

iii) Briefly explain how it works. (2marks)

KISII CLUSTER TRIAL EXAM
PHYSICS
PAPER 3
JULY/AUGUST, 2018
232/3
CONFIDENTIAL

Question 1

Each candidate is to be provided with;
- A metre rule
- One 50g mass and one 100g mass
- Three pieces of sewing thread each about 50cm
- Some water in a beaker
- Paraffin in 100ml beaker
- Complete retort stand
- A cardboard with a crosswire
- A white screen
- A 10cm convex lens
- A candle

Question 2
- 2 dry cells
- Voltmeter
- Switch
- Ammeter
- Resistance wire mounted on a millimetre scale
- Six connecting wires
- Micrometre screw gauge (to be shared)
- Rectangular glass block
- Soft board
- Two plain papers
- Four optical pins
- 4 thumb pins

KISII CLUSTER TRIAL EXAM
PHYSICS
PAPER 3
JULY/AUGUST, 2018
232/3

Question 1
PART A

You are provided with the following.
- A resistance wire PQ mounted on a mm scale.
- An ammeter.
- A voltmeter.
- A switch K.
- Two new dry cells and cell holder.
- Seven connecting wires at least two with crocodile clips.

KANGEMA SCHOOLS CLUSTER TRIAL EXAM
PHYSICS
PAPER 1
JULY/AUGUST, 2018
232/1

SECTION A (25 marks)

Answer ALL the questions in the spaces provided.

1. A drug manufacturer gives the mass of an active ingredient in a tablet as 800mg. Express this quantity in kilogramme and in standard form. (1 mark)

2. State **two** measurements that you would take in an experiment to determine the upthrust experienced by an object which is immersed in a fluid. (2 marks)

3. A can with a hole on the side is filled with a liquid to a certain height. The liquid jets out as shown in figure 1(a). A second identical can is filled with water to the same height and a block of wood floated on the water as shown in figure 1(b)

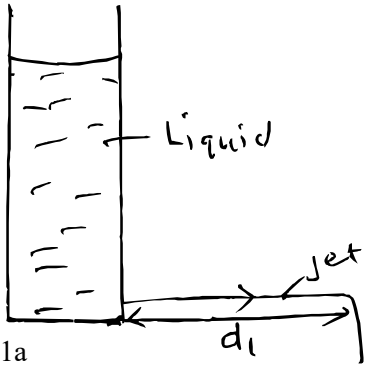


Fig 1a

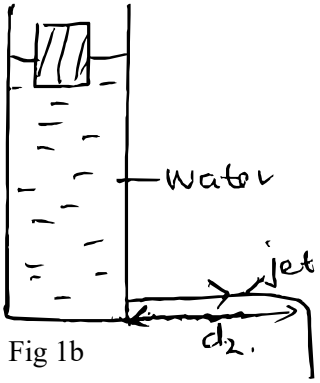


Fig 1b

It is observed that d_1 is greater than d_2.

(i) State a reason for the above observation. (1 mark)

(ii) State two adjustments that can be made in the above experiment to make the two jets d_1 and d_2 equal. (2 marks)

4. Two identical tubes P and Q held horizontally contain air and water respectively. A small quantity of coloured gas is introduced at one end of A while a small quantity of coloured water is introduced at one end of B. State with a reason the tube in which the colour will reach the other end faster. (2 marks)

5. Figure 2 shows a glass flask fitted with a narrow tube dipped into a beaker containing water at room temperature.

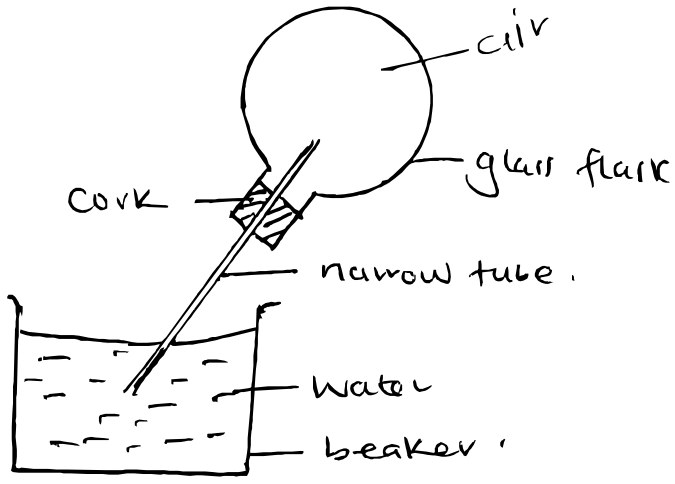


Fig 2

Explaine what is observed when ice-cold water is poured on the flask. (2 marks)

6. Figure 3 shows two identical balloons A and B. The balloons were filled with equal amounts of the same type of gas. The balloons are suspended at distances S_1 and S_2 from a metal cube filled with boiling water and placed on an insulating material.

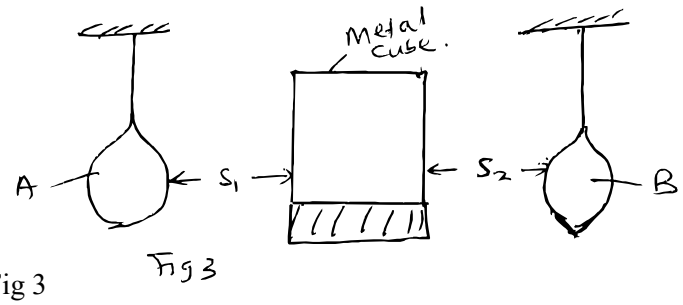


Fig 3

Fig 3

The face of the cube towards B is dull and the face towards A is shiny. The rate of change of temperature in A is observed to be lower than that in B.

i) Explain this observation. (1 mark)

ii) State one adjustment that can be made on the distances S_1 and S_2 so that the rate of change of temperature in both balloons is the same. (1 mark)

7. Figure 4 shows a metallic uniform metre rule of weight 5N with two weights of 0.9N and 0.6N suspended from its sides.

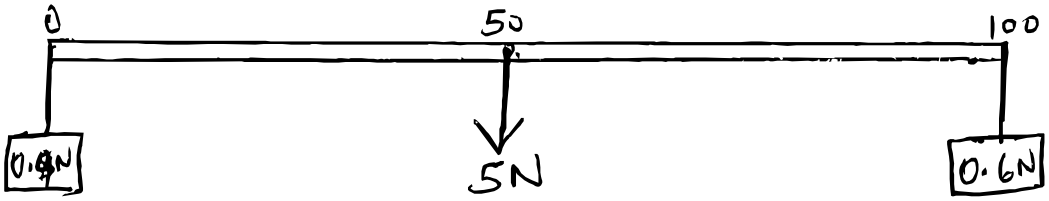


Fig 4

Determine how far from the 0.9N weight a pivot should be placed in order to balance the metre race.

(3 marks)

8. Figure 5 show a bi-metallic strip with a wooden handle suspended horizontally using a think thread.

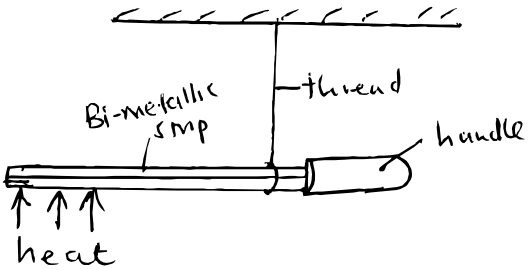


Fig 5

The strip is heated at the point shown. Explain what is observed. (2 marks)

9. The graphs in figure 6 represent the relation between extension, e and force, F loaded on two springs A and B.

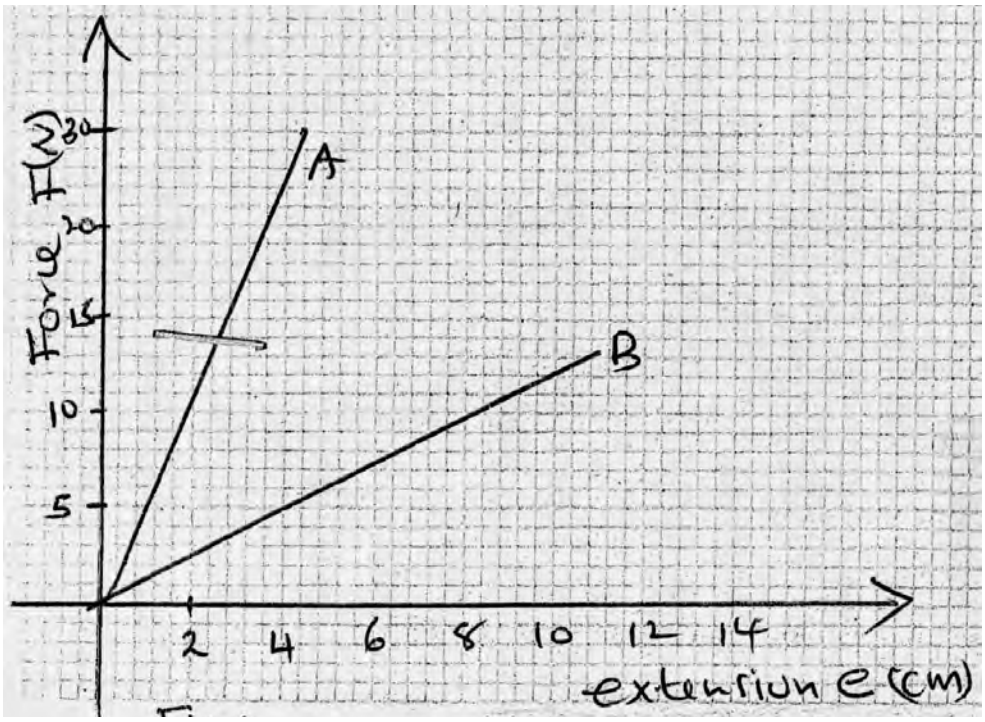


Fig 6

Given that the two springs are made of the same material, state one reason why the graphs are different. (1 mark)

10. An aeroplane is moving horizontally through still air at a uniform speed. If the speed of the aeroplane is doubled, explain why would be observed. (2 marks)

11. A ball bearing falling through glycerine attains terminal velocity after a short time. State the reason why it attains terminal velocity. (1 mark)

12. A balloon filled with a light gas is observed to rise in air upto a height of 2.5km before floating.

i) Explain why the balloon rises. (1 mark)

ii) Explain why the balloon floats at 2.5km above the ground. (1 mark)

13.a) State one reason why water is not a suitable thermometric liquid . (1 mark)

b) State one factor that determines the conductivity of heat in a copper wire of length 30.0cm (1 mark)

SECTION B: 55 marks

14. Figure 7 shows a block of mass 50.0kg being pulled up a slope by a force F at a constant speed. The friction between the block and plane if 40.0N.

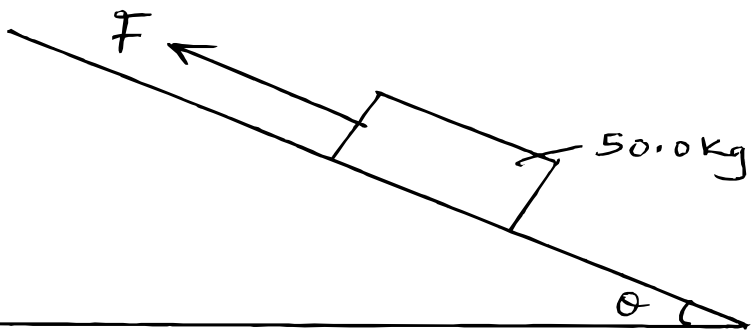


Fig 7

a) i) On the same figure **name** and **indicates** the other forces acting on the block. (3 marks)

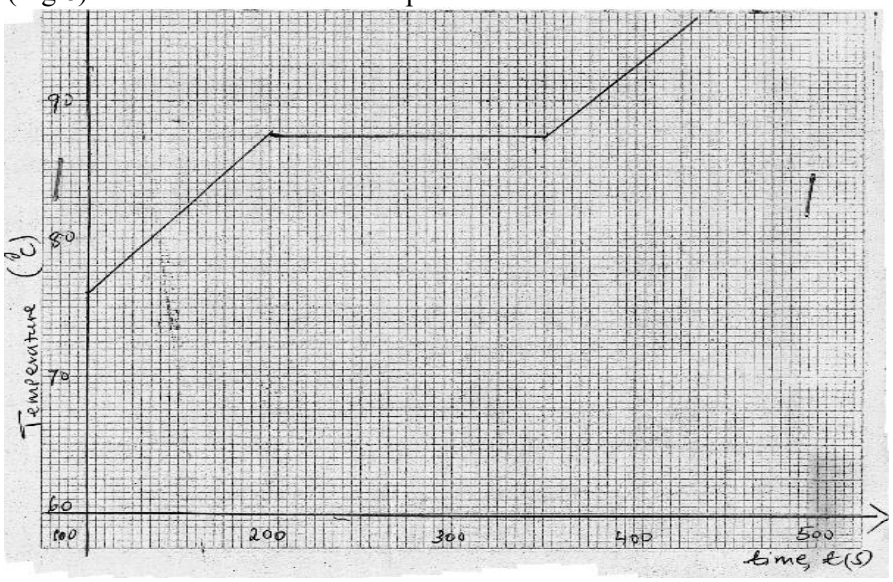
ii) State how each of the forces named in (i) above is affected when the angle θ is reduced. (3 marks)

b) If the value of force F applied on the block is 120N, and the block moves through a distance of 8.0m along the plane, determine

i) the acceleration of the block (3 marks)

ii) the work done by the force F. (2 marks)

15. A solid of mass 500g was heated in a container by an electric heater rated 800W for some time. The graph below (Fig 8) shows the variation of temperature of the solid with time.



a) From the above graph, determine;

i) the melting point of the solid. (1 mark)

ii) the quantity of heat supplied by the heater from the time the solid starts melting to the time it has all melted. (3 marks)

b) What is meant by specific latent heat of vapourisation? (1 mark)

c) In an experiment to determine the specific latent heat of vapourisation of water, steam at 100°C was passed into water contained in a well lagged copper calorimeter. The following measurement were made.

Mass of calorimeter	= 50g
Initial mass of water	= 70g
Initial temperature of water	= 5°C
Final mass of calorimeter + water + condensed steam	= 123g
Final temperature of mixture	=30°C
Specific heat capacity of water	=4200Jkgk^{-1}
Specific heat capacity of copper	= 390Jkgk^{-1}

i) Determine the

I) mass of condensed steam (1 mark)

II) Heat gained by the calorimeter and water. (2 marks)

ii) Given that L is the specific latent heat of vapourisation of steam;

I. Write an expression for heat given out by steam. (1 mark)

II. Determine the value of L. (2 marks)

16.a) State two ways in which the centripetal force on a body of mass M can be increased. (2 marks)

b) Figure 9 shows an object of mass 200g at the end of a string 120cm long being whirled round a vertical circle in the direction shown.

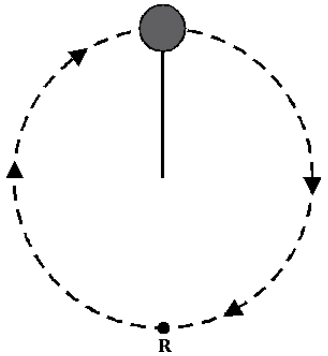


Fig 9

i) State two forces acting on the object at any instant as it continues to move in the vertical circle. (2 marks)

ii) Indicate with an arrow on the figure the direction of ;

I) Centripetal force. (1 mark)

II) Velocity at the position shown (1 mark)

iii) State the reason why the object is accelerating while its speed remains constant. (1 mark)

iv) Given that the angular velocity of the body is 5 rad s^{-1}, find the tension of the string at point R, the lowest point. (3 marks)

v) Determine the minimum velocity required to maintain the above body in a vertical circle. (2 marks)

17.a) State Archimedes' principle (1 mark)

b) Figure 10 shows a cork floating on water and held to the bottom of the beaker by a thread.

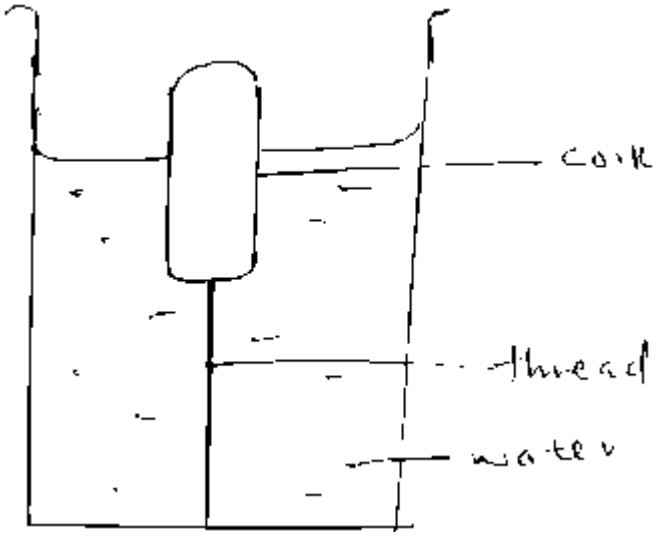


Fig 10

i) Name the forces acting on the cork. (3 marks)

ii) Describe how each of the forces mentioned in (i) above changes when water is added into the beaker until it fills up. (3 marks)

c) A rectangular wooden block floats in two liquids A and B shown below.

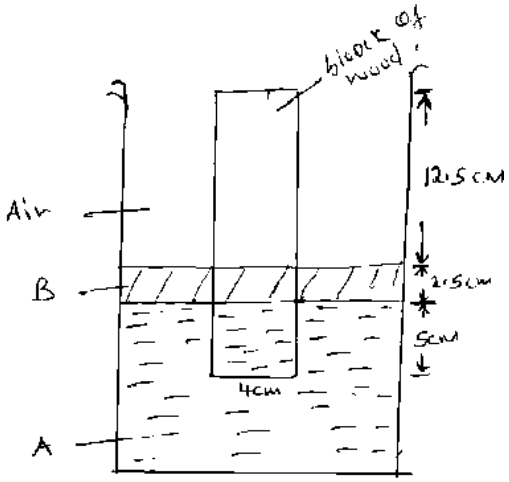


Fig 11

Given that the density of liquid A is 1.5g/cm³ and that of B is 0.8g/cm³ and that the dimensions of the wooden block.

i) upthrust experienced by the block. (3 marks)

ii) the weight of the block. (1 mark)

iii) density of the block (2 marks)

18. (a) State the law that relates the volume of a gas to the temperature of the gas . (1 mark)

(b) Figure 12 shows an experiment set-up that may be used to investigate one of the laws. The glass tube containing dry air has a uniform bore and it is graduated in millimetres.

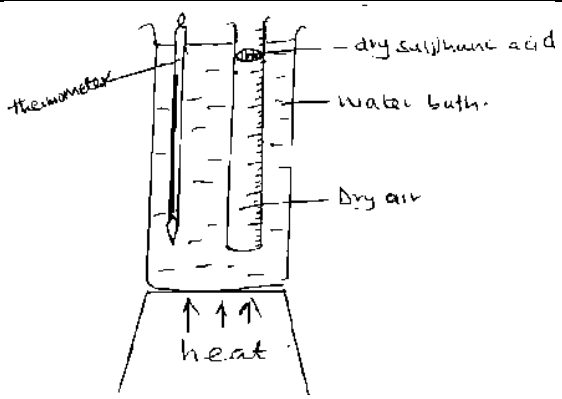


Fig 12

i) Describe how the experiment is carried out to verify the law. (4 marks)

c) A thick glass tube has 20cm³ of dry air trapped in it by a 12cm long column of mercury as shown in figure 13 below.

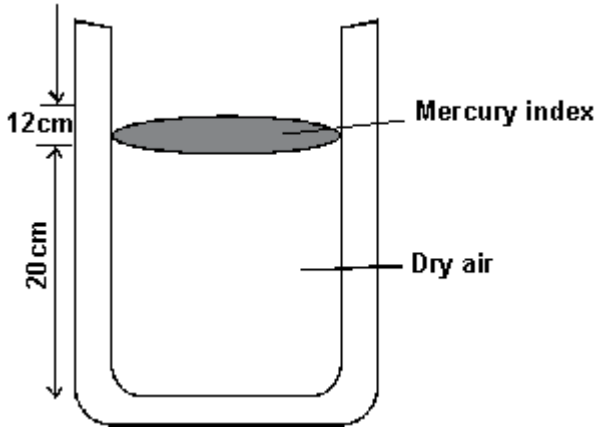


Fig 13

Calculate the new volume of the trapped air if the tube were held horizontally.
(Atmospheric pressure = 74.5cmHg and density of mercury = 13600kgm^{-3}.) (3 marks)

KANGEMA SCHOOLS CLUSTER TRIAL EXAM
PHYSICS
PAPER 2
JULY/AUGUST, 2018
232/2

SECTION A (25 marks)

Answer ALL questions in this paper

1. The diagram below shows two parallel mirrors M_1 and M_2, and a ray of light incident on one mirror as shown below. Trace the ray of light when it strikes the mirrors. (2 marks)

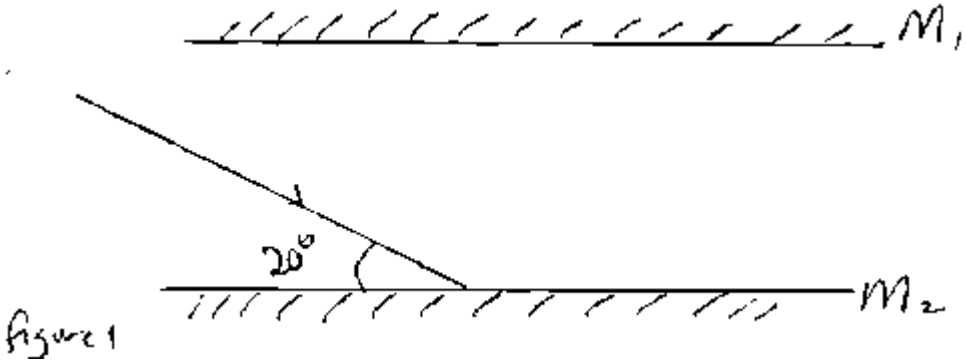


figure 1

2. You are provided with a charged electroscope, an insulator and conductor. Describe how you would use these apparatus to distinguish the insulator from conductor. (2 marks)

3. State the reason for topping up a lead-acid accumulator with distilled water. (1 mark)

4. Fig 2 below shows a soft iron bar PQ placed in a coil near a freely suspended magnet.

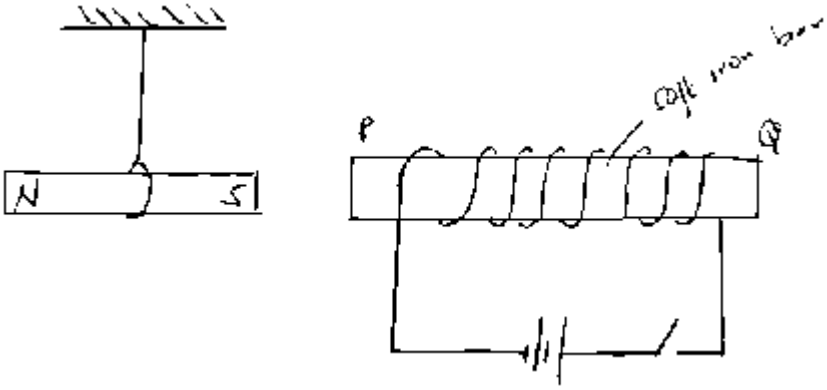


Fig 2

Explain what is observed when the switch is closed. (2 marks)

5. The equation below represents a nuclear reaction in which two deuterium nuclei fuse to form Helium and X.

$$ {}^{2}_{1}H + {}^{2}_{1}H \longrightarrow {}^{3}_{2}He + {}^{a}_{b}X $$

a) Determine the values of a and b (1 mark)

b) Identify X (1 mark)

6. a) In the production of x-rays, state how the penetration power can be increased. (1 mark)

b) Differentiate between thermionic emission and photoelectric emission. (1 mark)

7. The figure 3 below shows a section of a flexible wire carrying current perpendicularly out of the paper.

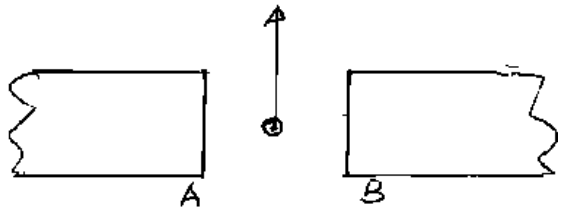


Fig 3

The wire moves in the direction shown as current pass through it.

i) Name the polarities of the magnets A and B. (1 mark)

ii) Explain the behaviour of the flexible wire. (1 mark)

8. Figure 4 below shows two rays of light incident normally on face PQ of a glass prism, whose critical angle is 42°.

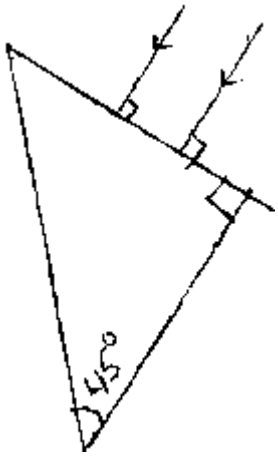


Fig 4

Complete the diagram to show the paths of the two rays as they pass through the prism. (2 marks)

9. A ship in an ocean sends out ultra sound whose echo is received after 3 seconds. If the wavelength of the ultra sound in water is 7.5 cm, and frequency of the transmitter is 20KHZ, determine the depth of the ocean. (3 marks)

10. Draw a circuit diagram to show a p-n junction diode in the reverse bias mode. (1 mark)

11. Fig 5 below shows the trace of a signal on the C.R.O. Given that the time base setting is 100ms/div, determine the frequency of the signal. (2 marks)

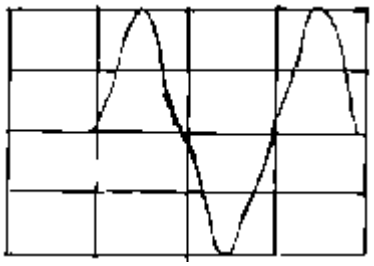


Fig 5

12. The figure 6 below shows the image of an object formed by reflection in a concave mirror. C is the centre of curvature of the mirror.

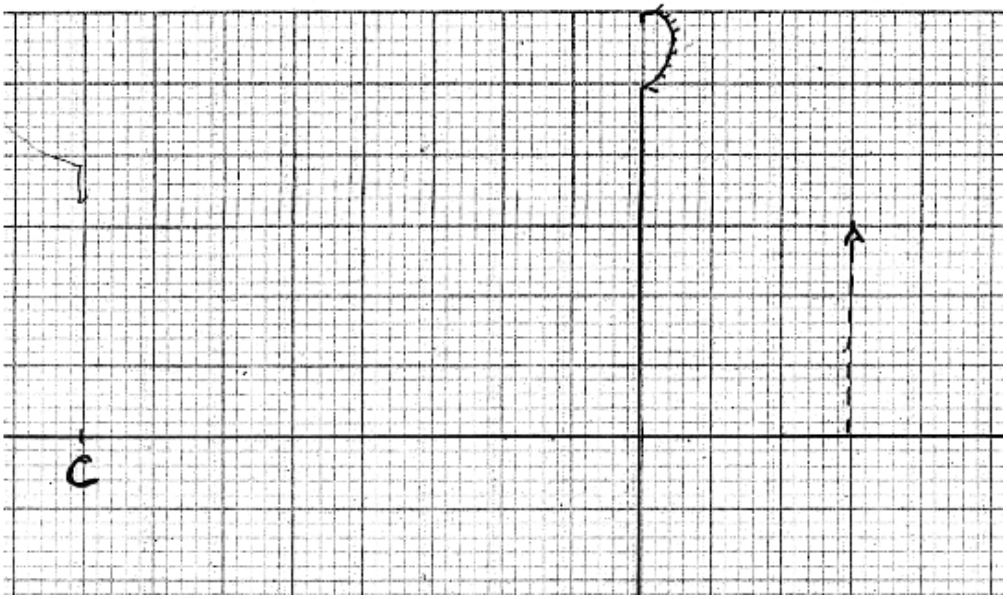
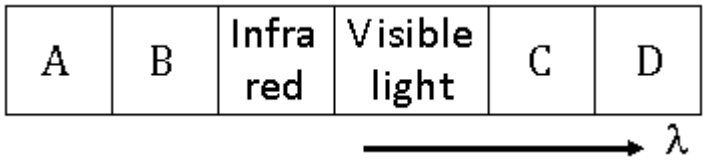


Fig 6

Use ray diagram to locate the object. (2 marks)

13. The table below shows part of the electromagnetic wave spectrum in order of **decreasing** wavelength.



i) How are wave C produced. (1 mark)
ii) State one use of the wave D. (1 mark)

SECTION B (55 marks)

14.a) The figure 7 shows a displacement-time graph for a progressive wave.

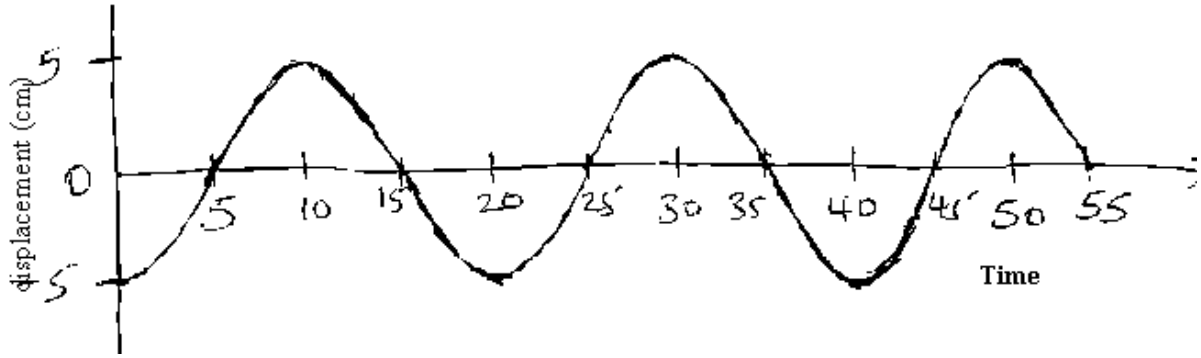


Fig 7

i) State the amplitude of the wave. (1 mark)
ii) Determine the frequency of the wave. (3 marks)
iii) Given that the velocity of the wave is $20ms^{-1}$, determine its wavelength. (3 marks)

b) Figure 8 shows two identical dippers A and B vibrating in water in phase with each other. The dippers have the same constant frequency and amplitude. The waves produced are observed along line MN.

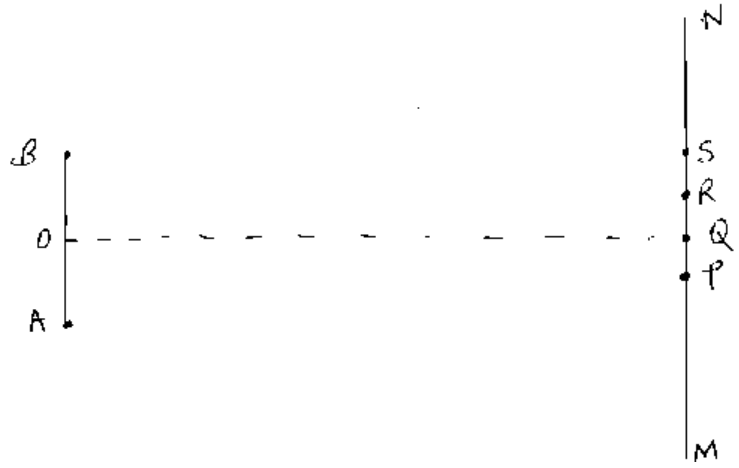


Fig 8

It is observed that the amplitudes are maximum at points Q and S, and minimum at points P and R.

i) Explain why the amplitude is maximum at Q. (1 mark)
ii) State why a mplitude is minimum at R. (1 mark)
iii) State what would happen if the two dippers had different frequencies. (1 mark)

15 .a) State one application of photoelectric effect. (1 mark)

b) The figure 9 below shows an arrangement used to investigate photo electric effects.

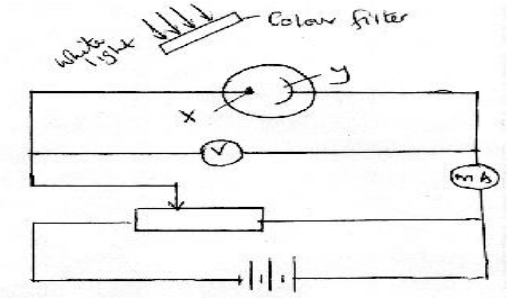


Fig 9

i)Name the parts X and Y (2 marks)

ii) State two measurable quantities in this setup. (2 marks)

iii) State how the intensity of light affects the photo current. (1 mark)

c) i) Define the term doping. (1 mark)

ii) The figure 10 below shows two circuits close to each other.

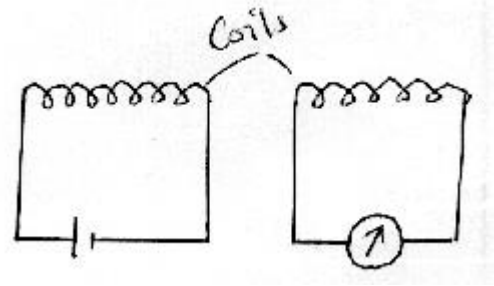


Fig 10

When the switch is closed, the galvanometer shows a reading then returns to zero. When the switch is open, the galvanometer shows a reading in the opposite direction and then returns to zero. Explain these observations. (3 marks)

d) A transformer is connected to a 12.0V, 30.0W lamp form the 240V main. If the transformer is 75% efficient. Determine the mains current (3 marks)

13. (a) (i) Using a suitable diagram show how a convex lens may be used as a simple microscope. (3 marks)

ii) Using your diagram in a(i) above, determine the magnification of your lens. (2 marks)

b) i)An object is placed 14.0cm in front of a convex lens of focal length 6.0cm. On the grid provided, draw a ray diagram to locate the image. (Use a scale 1cm rep 2cm.) (3 marks)

ii) Determine the image distance. (1 mark)

c) Figure 11 shows a human eye with a certain defect.

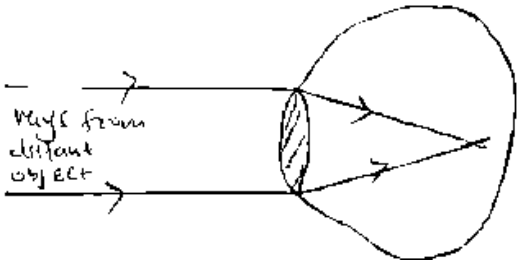


Fig 11

i)Name the defect. (1 mark)

ii)On the same diagram, sketch the appropriate lens to correct the defect and sketch rays to show the effect of the lens. (1 mark)

17.a) State Ohm law.

(1 mark)

b) Figure 12 shows the electric wiring of an electric iron box.

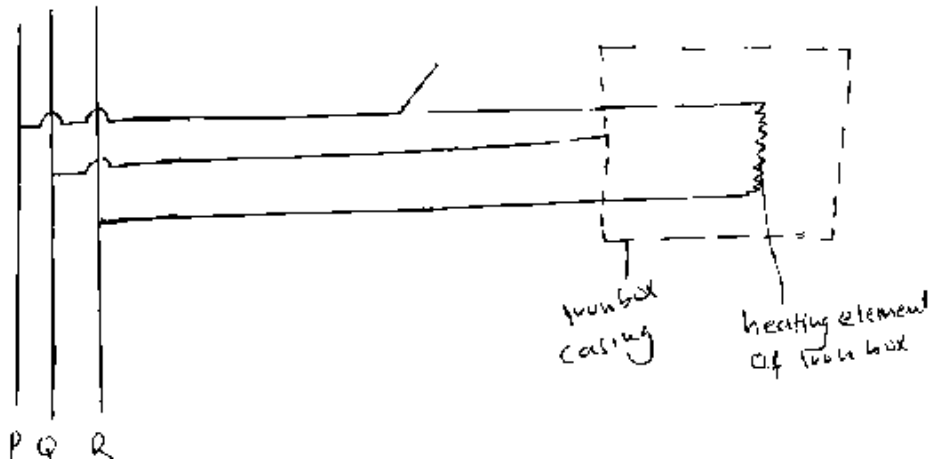


Fig 12

Identify wires P and R (2 marks)

b) The heating element of the iron box in (a) above is made of a wire of resistance 28.8Ω and is connected to a 240V mains supply. Determine

i)the power rating of the iron box. (3 marks)

ii) the current flowing in the circuit. (2 marks)

iii) the cost of using the iron box for half an hour for 30 days if cost per unit is Kshs 12.50. (3 marks)

18. X-rays are used for detecting flaws in metal cylinders.

a) State with a reason the type of x-rays used. (2 marks)

b) Figure 13 shows the features of an x-ray tube.

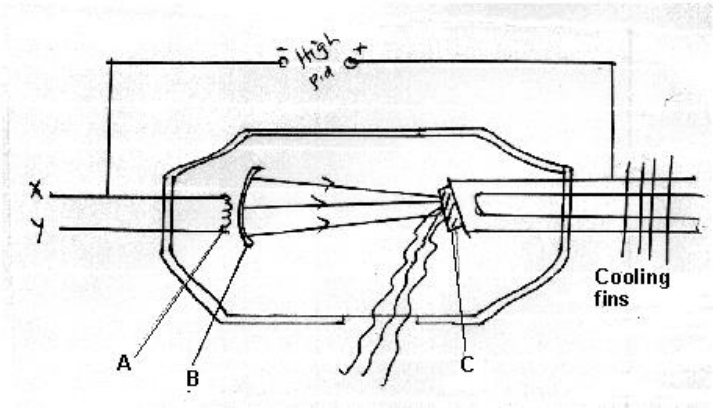


Fig 13

i)Name the parts labelled A and C. (2 marks)

ii) State the function of the part labelled B. (1 mark)

iii) Explain the effect of increasing the p.d. between X and Y. (2 marks)

c) In a certain X-ray tube, an accelerating p.d. of 10KV is used. If all the energy of the emitted electrons hitting the target goes to produce x-rays, determine the frequency of the x-rays produced. (Plank's constant h=6.63 × 10^{-34}Js and the change of an electron e = 1.6 × 10^{-19}C) (3 marks)

KAKAMEGA NORTH SUBCOUNTY JOINT EXAMINATIONS
232/1
PHYSICS
PAPER 1

SECTION A (25marks)

Answer all the Questions in this section

1. Figure 1 below shows a section of a vernier caliper.

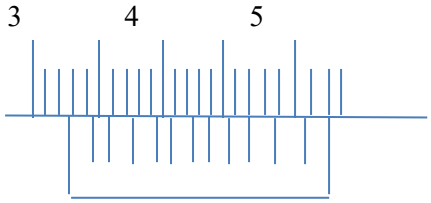


Figure 1

If the vernier calipers has a zero error of +0.02 what is the actual reading of the vernier caliper. (2mks)

2. A body is projected vertically upward from the top of a building. It lands at the base of the building. Sketch the velocity time graph of the motion. (2mks)
3. When floating in a liquid of relative density 0.8 a rod displaces $90cm^3$; what volume will it displace when it floats in a liquid of relative density 1.2? (3mks)
4. Two identical pick-ups A and B are loaded such that their center of gravity is as shown in the figure below.

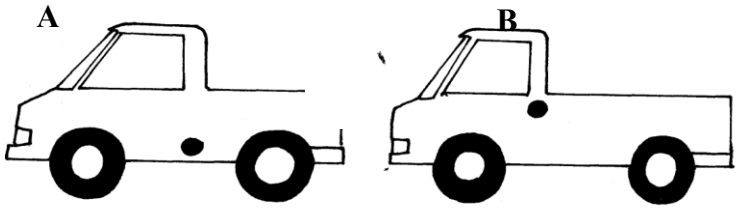


Figure 2.

Explain which one of the pick-ups is more stable. (2mks)

5. Oil accidentally spilt on an ocean and spread into a monolayer film of area $2.0x10^{12}cm^2$. The oil was found to consist of molecules of thickness $5x10^{-9}m$ each. Calculate the volume of oil that splint (3mks)
6. Give a reason why mercury is preferred as a barometric liquid. (2mks)
7. A drawing pin was observed to float on the surface of pure water. When a few drops of soap solution were added to the water the pin sank. Explain this observation. (2mks)
8. A ball of mass 2kg is whirled at the end of a string in a horizontal circular path at a Constant Speed of $5ms^{-1}$. if the string is 2.0m long calculate the tension in the string. (3mks)

Figure 3 shows a set of pulley used to lift a load of 500N

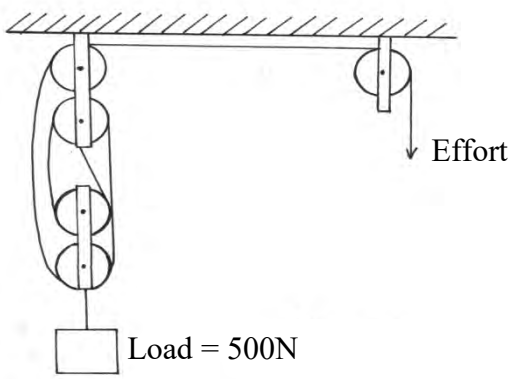


Figure 3

Use the information above to answer questions 9 and 10

9. What is the velocity ratio of the pulley system? (1mk)
10. If the efficiency of the machine is 80%, find the effort required to just lift the load. (2mks)
11. Water flows steadily through a pipe whose diameter is 2cm with a speed of 4.5m/s. The pipe widens at some point to 3.0cm in diameter. What is the speed of water flow at this point? (3mks)

SECTION B (55marks)

Answer all questions in this section

12. A fair ground ride trolley of mass 120Kg carrying two passengers of average mass 40Kg was released at point ***P*** of a frictionless curved surface ***S***. upon reaching the horizontal, it collided with a stationery trolley of mass 140Kg carrying three passengers of average mass 60Kg. if the two trolleys moved together with a common velocity along the horizontal for 1.2 seconds before coming to rest, determine:

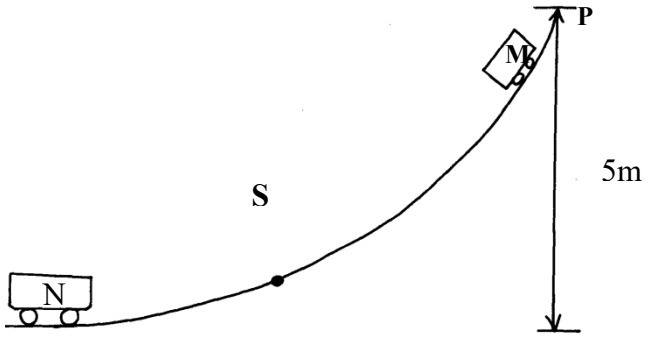


Figure 5

(a) The gravitational potential energy of the trolley at point ***P*** (2mks)
(b) The velocity of trolley ***M*** just before it collides with trolley ***N*** (3mks)
(c) The common velocity of the two trolleys after collision. (3mks)
(d) The impulse (2mks)

13 (a) State Boyle's law. (1mk)

(b) The figure 6 below shows a simple set up for pressure law apparatus.

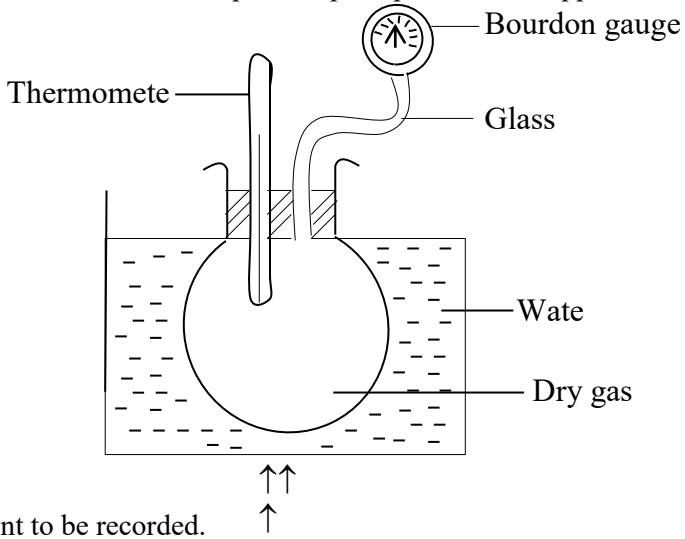
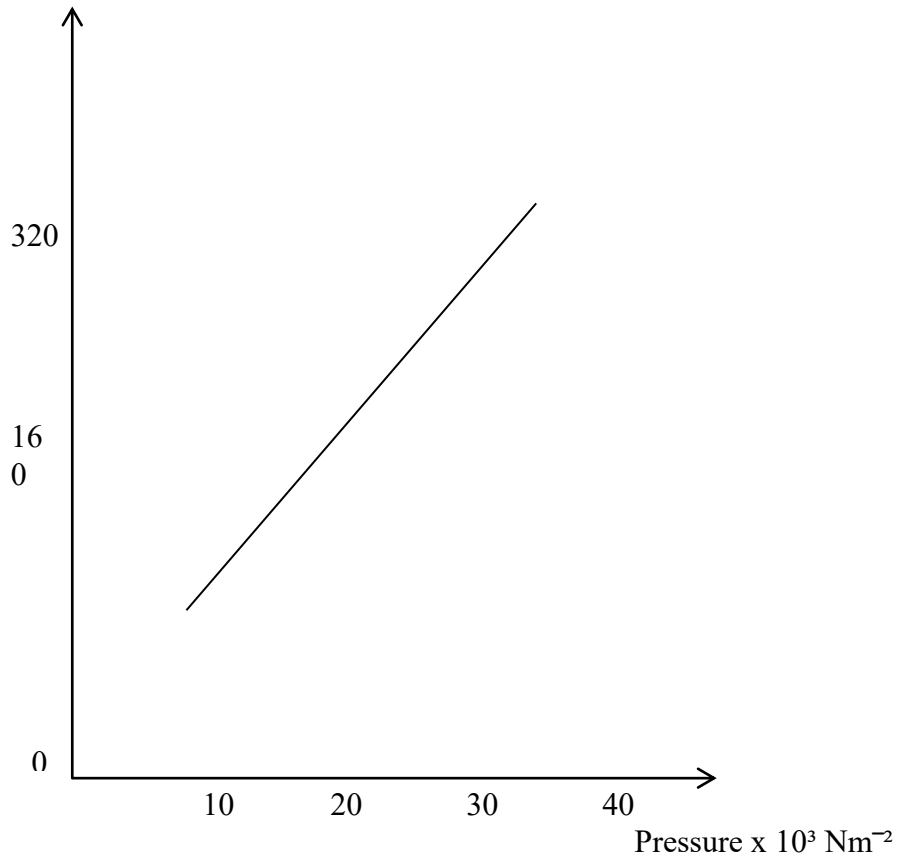


Figure 6

(i) State measurement to be recorded. (2mks)

(ii) The graph in the figure **below** shows the relationship between temperature and pressure for a fixed mass of an ideal gas at constant volume.



(ii) Given that the relationship between temperature T and pressure P is of the form.TK + C = P where K and C are constants, determine from the graph the values of K and C. (3mks)

(c) A sample of the gas has a pressure of 1.0 x 10^5Pa when its temperature is 10^{o}C. What will be its pressure when its temperature is raised to 100^{o}C and its volume doubled (3mks)

14. (a) Define specific latent heat of fusion of a substance (1mk)

(b) Water of mass 400g at a temperature of 60^{o}C is put in a well lagged copper calorimeter of mass 160g. A piece of ice at 0^{o}C and mass 40g is placed in the calorimeter and the mixture stirred gently until all the ice melts. The final temperature, T, of the mixture is then measured. (*Specific latent heat of fusion of ice = 334000J/kg, specific heat capacity of water = 4200J/kgK specific heat capacity of copper = 400J/kgK*)

Determine:

(i) The heat absorbed by the ice during melting. (2mks)

(ii) Total heat gained by the ice (*Give your answer in terms of T*) (2mks)

(iii) Heat lost by the water. (1mk)

(iv) Heat lost by the calorimeter. (1mk)

(iv) The final temperature T of the mixture (2mks)

Angular velocity (ω) ($rads^{-1}$)	2.0	3.0	4.0	5.0	6.0
Tension (**T) (N)**	0.04	0.34	0.76	1.30	1.96

(i) Plot the graph of **T** against ω^2 (5mks)

(ii) From the graph determine the mass **m** of the body given that $\underline{T + C} = \omega^2$, ***where*** **C** is Constant **mr** (3mks)

c) i) State the principle of conservation of energy. (1mk)

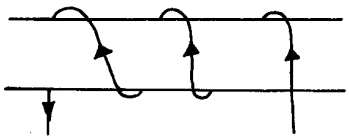
ii) A ball of mass 1.5kg falls freely from a height 20m and rebounds to a vertical height of 6m. Determine time the ball takes to reach the ground. (2mks)

iii) Account for the loss in kinetic energy on impact. (1mk)

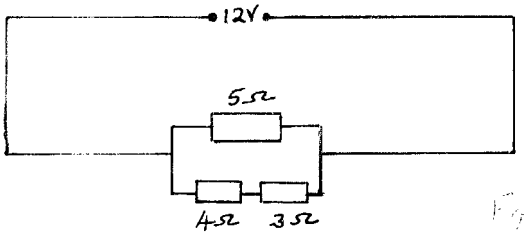
KAKAMEGA NORTH SUBCOUNTY JOINT EXAMINATIONS
232/2
PHYSICS
PAPER 2

SECTION A (25 Marks**)**
Answer all the questions in this section in the spaces provided below each question

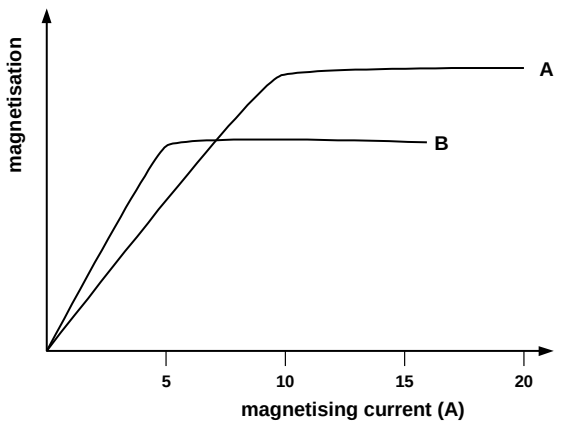
1. Sketch the magnetic field for a conductor shown in the figure below. (2mks)



2. State ***one*** similarity and ***one*** difference between a camera and a human eye. (2mks)
3. State ***one*** factor which does not change as water waves move from shallow to deep end. (1mk)
4. A girl standing 200m from the foot of a high wall claps her hands and the echo reaches her 1.16 seconds later. Calculate the velocity of sound in air using this observation. (3mks)
5. With the aid of a diagram, explain why convex mirror is preferred for use in supermarkets for surveillance to plane mirrors. (2mks)
6. Figure 1. is a circuit diagram of three resistors connected to a 12V battery.



Determine the potential difference across the 3Ω resistor. (3mks)
7. State the energy transformation that takes place in a hydroelectric power station. (2mks)
8. Name ***one*** type of electromagnetic radiation that ionizes air. (1mk)
9. When the moon comes between the sun and the earth in a straight line, an eclipse occurs. Name the eclipse. (1mk)
10. Explain how polarization affects the working of a simple cell. (2mks)
11. Why is concave mirror used as a saloon mirror? (2mks)
12. Write ***one*** difference between a virtual and a real image. (1mk)
13. Figure 2 shows a graph of magnetisation against magnetising current for two materials A and B.



State with a reason, the material which is more suitable for use in a transformer to concentrate the magnetic fields. (3mks)

SECTION B (55 MARKS)

Answer all the questions in this section

14. **(a)** Explain what is meant by the principle of superposition of two waves. (2mks)

(b) In an experiment to try to produce an observable interference pattern, two monochromatic light sources, S_1 and S_2, are placed in front of a screen, as shown in Fig.1.

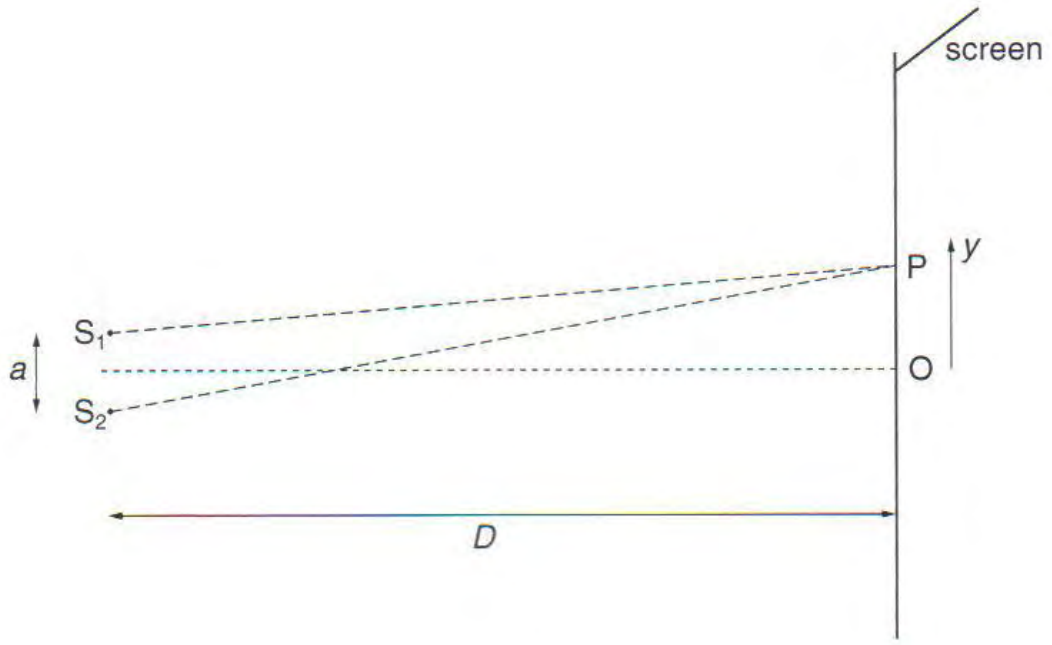


Fig. 1

(i) In order to produce a clear interference pattern on the screen, the light sources must be *coherent*. State what is meant by *coherent.* (1mk)

(ii) In Fig 1, the central point O is a point of maximum intensity. Point P is the position of **minimum** intensity nearest to O. State, in terms of the wavelength λ, the magnitude of the path difference S_1P and S_2P. (2mks)

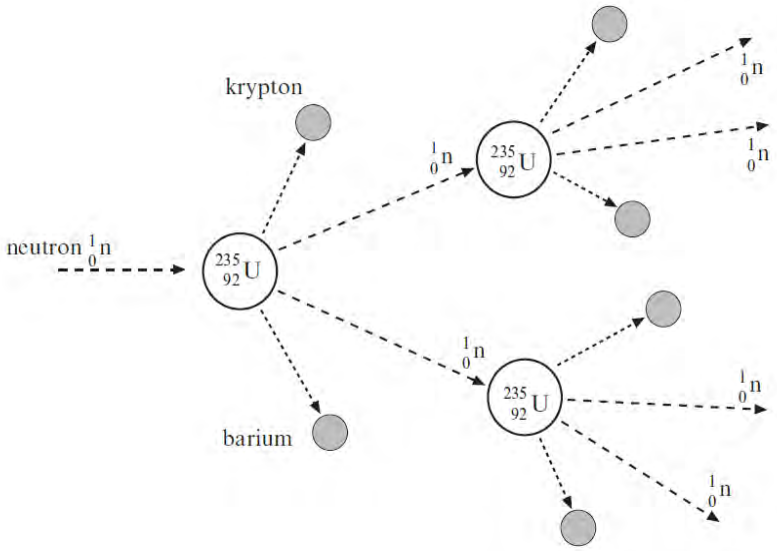
15. An X-ray tube is operated at 120Kv with a beam current of 0.5mA. Assuming its efficiency is 1%, calculate:

(i) The number of electrons hitting the target each second (3mks)
(ii) The X-ray energy emitted each second (2mks)
(iii) The heat energy dissipated (2mks)
(iv) The minimum wavelength of the emitted X-radiation. (2mks)

16. In an experiment to determine the range of beta particles in aluminium, different thickness of aluminium sheets were interposed between a small beta source and the window of a Geiger tube 20mm apart.

Thickness/mm	0	0.45	0.90	1.35	1.80	5.40	7.20
Count rate/s^{-1}	85.0	59.5	41.6	29.2	20.4	1.5	1.5

a) Plot a graph of count rate against thickness. (5mks)
b) Use your graph to determine the range of beta particles in aluminium. (2mks)
c) The diagram shows an uncontrolled nuclear fission reaction. When a **slow-moving** neutron strikes an atom of U, the atom splits. In this reaction two **fast moving** neutrons are produced together with the radioactive fission fragments of Ba (barium) and Kr (krypton).



i) What name is given to an uncontrolled fission reaction? (1mk)

ii) Complete the nuclear equation for this reaction. (2mks)

$$^{235}_{92}U + {}^1_0n \longrightarrow {}^{144}Ba + {}_{36}Kr + 2\,{}^1_0n$$

iii) .....

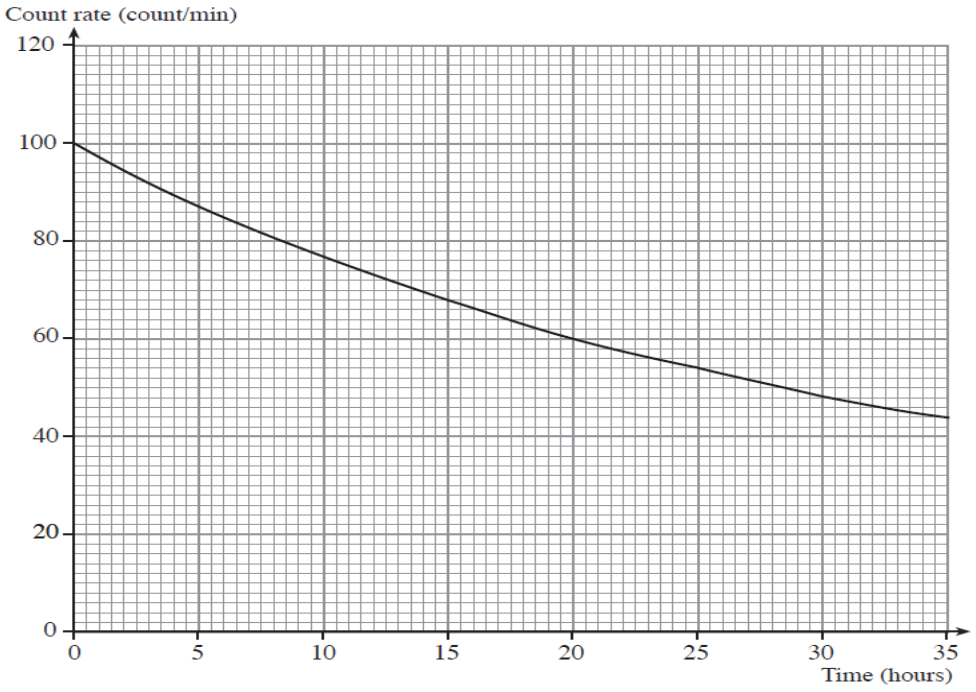
iv) In a nuclear reactor, the fission reaction is controlled using control rods of boron steel which readily absorb neutrons and a graphite moderator which improves the chances of uranium atoms splitting apart. State how the graphite moderator improves the possibility of fission of uranium. (1mk)

(i) Explain how the energy released from a nuclear reactor can be increased (2mks)

(ii) Outline the advantages of producing electricity from nuclear fusion rather than nuclear fission in the future. (2mks)

d) Explain what is meant by the half-life of a radioactive substance. (1mk)

The count rate changed in the way shown in the graph below:



Use the graph to find a value for the half-life of the radioactive source. (2mks)

17. A set of Christmas tree lights consists of 40 identical filament lamps connected in series across a supply of 240V.

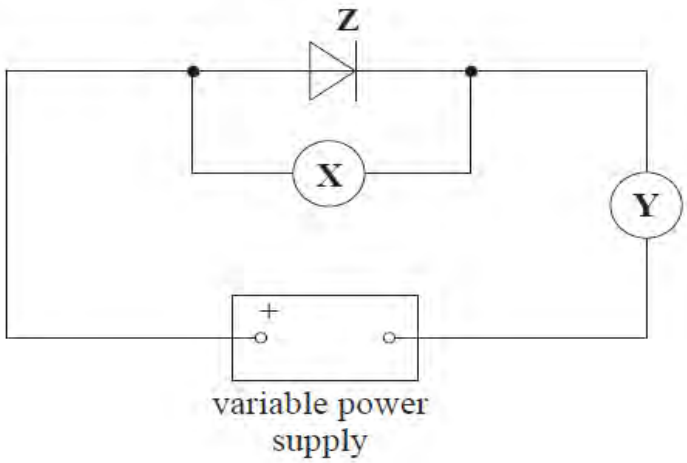
(a) Define *resistance.* (3mks)

(b) Each lamp when lit normally carries a current of 250mA. Calculate:

(i) The potential difference *V* across a lamp. (3mks)

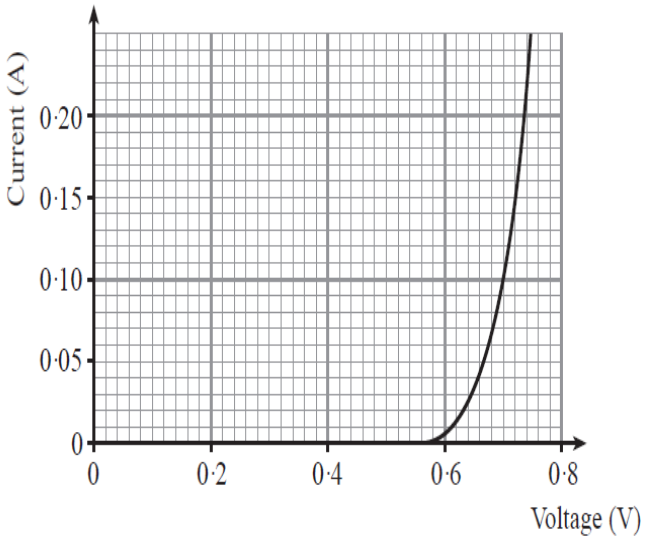
(ii) The resistance *R* of a lamp. (3mks)

(c) The circuit shown is used to investigate how the current changes with voltage for component Z.



(a) Name the component: (3mks)

(b) The results from the investigation are shown on the graph.



(i) Describe **carefully** how the current through **Z** changes as the voltage is increased from 0·0 to 0·7V**.** (2mks)

(ii) Write down in words an equation and use it to find the resistance of **Z** when the voltage is 0·7V. (2mks)

18. Fig.2.1 shows two capacitors, **A** of capacitance 2μF, and **B** of capacitance 4μF, connected in parallel. Fig. 2.2 shows them connected in series. A two-way switch **S** can connect the capacitors either to a d.c. supply, of e.m.f. 6V, or to a voltmeter.

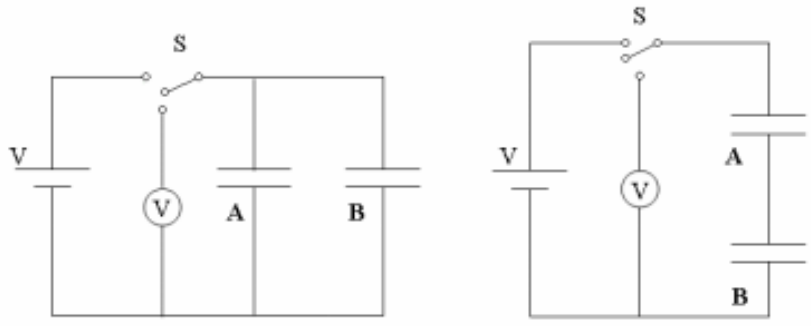


Fig. 2.1

(V required in both circles)

Fig. 2.2

(a) Calculate the total capacitance of the capacitors
- **(i)** When connected as in Fig. 2.1 (2mks)
- **(ii)** When connected as in Fig. 2.2 (2mks)

(b) The switch in the circuit shown in Fig. 2.1 is then connected to the battery. Calculate
- **(i)** The potential difference across capacitor (2mks)
- **(ii)** The total charge stored on the capacitors. (2mks)

(c) The switch in the circuit shown in Fig.2.2 is then connected to the battery. Calculate the total energy stored in the two capacitors. (2mks)

iii) Use the straight portion of the graph (B to C) to calculate the specific heat capacity of the aluminium given that the voltmeter read 22.00v and ammeter 10A throughout the course of the experiment. Show all the steps you use clearly. (3Marks)

c) Explain the two reasons why the value calculated in b) iii) will not be accurate. (2Marks)

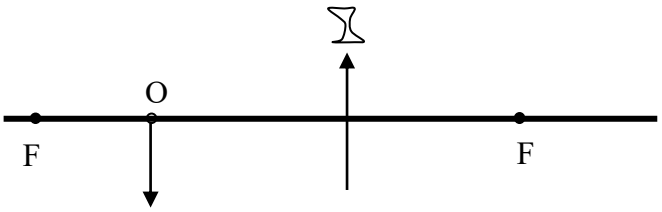
d) A temperature scale X has an ice point of 40^0 and a steam point of 240^0 .What is the temperature in ^{0}X when the celcius temperature is 50^0C. (3Marks)

M.C. CLUSTER OF SCHOOLS FORM 4 EVALUATION TEST – 2018
232/2
PHYSICS
PAPER 2
(THEORY)

SECTION A (25 MARKS)
Answer all the questions in the spaces provided.

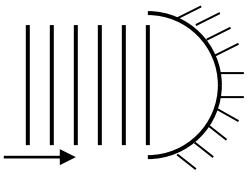
1. State two factors that affect the capacitance of a parallel plate capacitor. (2marks)
2. The figure1. Shows an object, O placed in front of a concave lens.
   By drawing appropriate rays, locate the image formed. (3marks)

Fig .1



3. Kenya power sells electricity at ksh. 10 per unit. What is the cost of using an electric heater rated 1500w for a total of 30 hours. (3marks)
4. You are provided with resistors of 2.0Ω, 4.0Ω and 6.0Ω.Draw a circuit diagram to show how the three resistors can be connected together to give an effective resistance of 3Ω. (2marks)
5. Figure 2 shows wave fronts approaching a concave surface

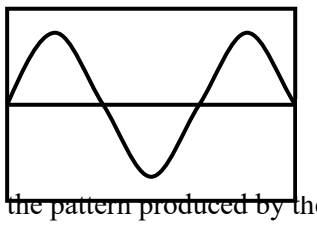
Fig. 2



Complete the diagram to show the wave fronts after striking the surface (2marks)

6. Figure 3. Shows the pattern produced by an a.c voltage on a cathode ray oscilloscope screen.

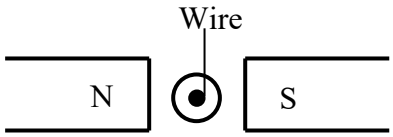
Fig .3



On the same diagram sketch the pattern produced by the same voltage when the time base is switched off. (1mark)

7. State one difference between electromagnetic and mechanical waves. (1mark)
8. A wire carrying current is placed in the direction shown is placed in a magnetic field.
   Indicate on the diagram the direction of the force. (1mark)

Fig . 4



9. When ultraviolet radiation is directed into a clean zinc plate connected to the cap of a negatively charged leaf electroscope, the leaf falls. Explain this observation. (2marks)

a. State ohms law. (1mark)

b. A battery of Emf E drives a current of 0.25A when connected to a 5.5Ω resistor. When the 5.5Ω resistor is replaced with 2.5Ω resistor the current flowing becomes 0.5A. Find the emf, E and the internal resistance, r, of the battery. (4marks)

c) A capacitor of capacitance 6μF capacitor is charged using a 6v d.c source. It is then connected across a 12μF capacitor. Find:-

i) Final voltage (2marks)

ii) Charge stored in each capacitor (2marks)

17.

a) State Snell's law. (1mark)

b) A ray of light travelling from water to glass makes an angle of incident of 30^0. Find the angle of refraction in the glass. Refractive index of water $= {}^4/_3$. Refractive index of glass $= {}^3/_2$ (3marks)

c) State the necessary and sufficient conditions for total internal reflection to occur. (2marks)

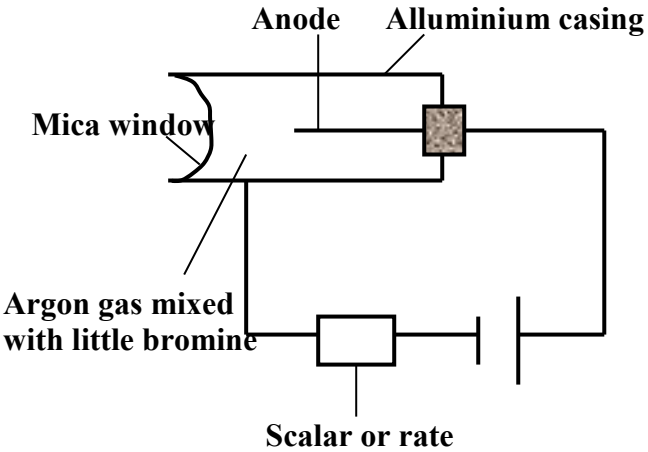
d) You are provided with a glass block, a soft board, white sheet of paper and three optical pins. With the help of a diagram explain how you would use these apparatus to determine the refractive index of the glass block using real and apparent depth method. (4marks)

18. a) 226Ra decays into 222Rn by emission of an alpha particle. Write a nuclear equation 8886 for the decay (2marks)

b) i) What do you understand by the term half-life of a radioactive substance? (1mark)

c) ii) A G.M tube registers an initial count rate of 3200 counts for a certain substance and 100 counts 30 hours later. What is the half-life of this substance? (3marks)

d) The figure below shows a G.M tube.



i) What is the purpose of the mica window? (1mark)

ii) What is the purpose of the bromine? (1mark)

iii) Briefly explain how it works. (2marks)

M.C. CLUSTER OF SCHOOLS FORM 4 EVALUATION TEST – 2018
232/3
PHYSICS
PAPER 3
(PRACTICAL)

Question 1

You are provided with the following:-
- Vernier callipers
- Micrometer screw gauge
- Masses; 10g, 20g, 50g and 100g
- A helical spring
- Metre rule or half metre rule

Proceed as follows

(a) Determine the number of complete turns of the helical spring.
N = _____ (1 Mark)

(b) Measure the external diameter of the spring using the vernier callipers
= _____ m (1 Mark)

(c) Use the micrometer screw gauge to determine the diameter of the wire of the spring.
d = _____ m (1 Mark)

(d) Determine the value of m (2 Marks)
$N = \frac{0.4D}{dm}$

(e) Suspend the helical spring vertically alongside the clamped half metre rule as shown in figure 1 below. Determine the length L_0, of the spring before loading it.

L_0 = _____ cm

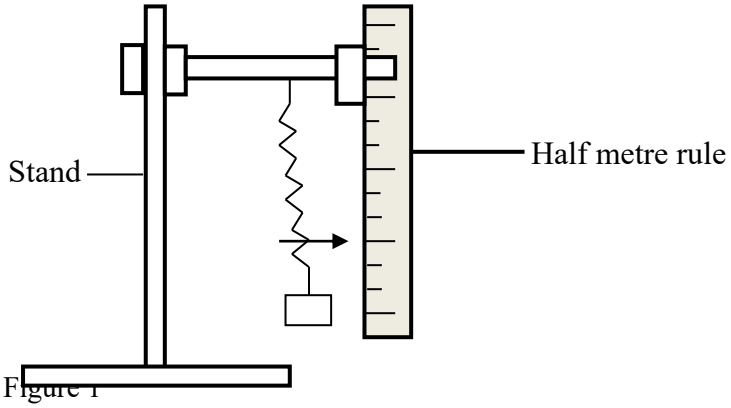


Figure 1

(f) Load the spring with a mass of 20g and determine the new reading on the metre rule. (L) Record this in the table below.

Calculate the extension e = L – L_0 due to the mass of 20g and record the value in the table given below. Repeat step f for other masses and complete the table.

Mass (g)	0	10	20	30	40	50	60	70	80	90	100
Weight (N)											
Reading (L) (cm)											
Extension e (cm)											
$\frac{1}{e}$ (cm^{-1})											

(6 Marks)

(g) Plot a graph of weight (N) against $\frac{1}{e}$ (cm^{-1}) (4 Marks)

(h) Determine the slope (s) of the graph at a mass of 45g (2 Marks)

(i) Given that $m = \frac{-255T}{(S+60)^2}$
Determine the value of T where (S) is the slope at 45g (3 Marks)

2. This question consists of two parts A and B attempt both parts.

PART A

You are provided with the following:

- 5 optical pins
- A glass block
- A plain paper
- A soft board
- 4 thumb pins

Proceed as follows:

(a) Fix the white piece of paper on softboard using the thumb pins provided. Place the glass slab on the white paper and draw the outline of the block on the paper. Remove the block and indicate the sides ABC and D as shown. On side BC determine the centres of side BC using your ruler and fix pin P_0 as shown. Looking from one side at the opposite end of the slab fix pin P_1, P_2 so that they are in with the image I of P_0. On the other side locate the same image using pins P_3 and P_4 as shown in figure 2. Remove the glass block and produce lines P_1, P_2 and P_3, P_4 to their points of intersection which is the position of the image I.

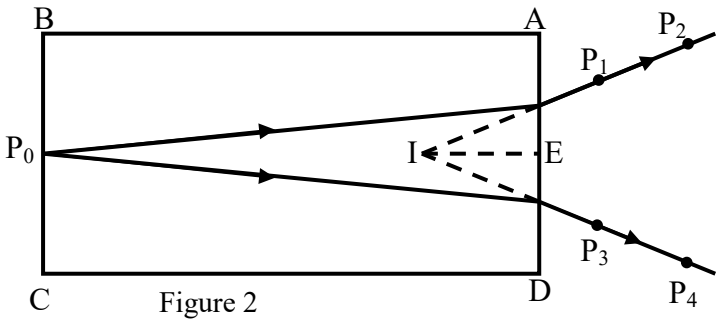


Figure 2

(b) (i) Using the half metre rule measure the lengths
EP0 = _____ cm (1 Mark)

EI = _____ cm (1 Mark)

(ii) Work out the ratio $n = \frac{EP_O}{EI}$ (2 d.p) (1 Mark)
(iii) What does n represent? (1 Mark)

PART B

You are provided with the following.

- A plain sheet of paper
- A soft board
- 4 optical pins
- 4 thumb pins
- A triangular pris

Proceed as follows

(a) (i) Firmly fix the plain sheet of paper on the softboard using the thumb pins and place the prism near the centre of the paper. Trace the outline of the prism using a pencil.
(ii) Remove the prism from the outline and label the vertices of the outline PQ and R.
On the side QR mark a point and draw a normal OZ at this point. Measure an angle of 200 from the normal and draw a line along this angle as shown in figure 3.

IGEMBE CENTRAL
232/1
PHYSICS
Paper 1

SECTION A (25 marks)
Answer ALL the questions in the spaces provided.

1. A rectangular container measures 2cm by 3cm by 5cm. What is the weight of mercury that will fill the container to the brim. (Take g = 10N/kg and density of mercury = 13600 kg/m³). (3 marks)

2. A vernier calliper has a zero error of -0.02cm. Draw the section of the calliper scale when used to take an actual measurement of 4.85cm. (2 marks)

3. Figure one below shows a beaker placed on a bench. A block of ice is placed in a beaker as shown below.

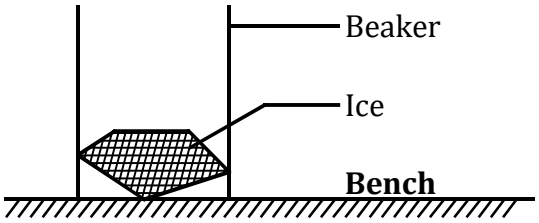


Fig 1

State and explain the change in the stability of a beaker when ice melts. (2 marks)

4. Figure 2 below shows horizontal copper wire tightly fixed on two stands. A mass P is suspended from the wire using a string that can freely slide.

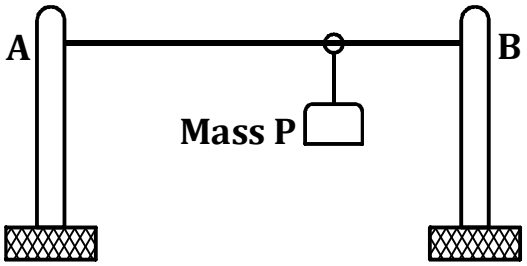


Fig 2

The copper wire is then heated for sometime. State and explain what happens to mass P. (2 marks)

5. Water flows through a pipe with different cross-section areas at a rate of 7.7×10^{-2} m³ / s. If the pipe has a diameter of 7mm, determine the velocity of water through the pipe at that particular section. (3 marks)

6. Apart from friction, name another factor that reduces efficiency in machine. (1 mark)

7. Two forces act on a trolley as shown below;

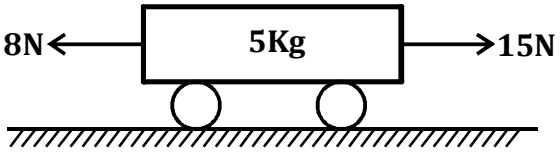
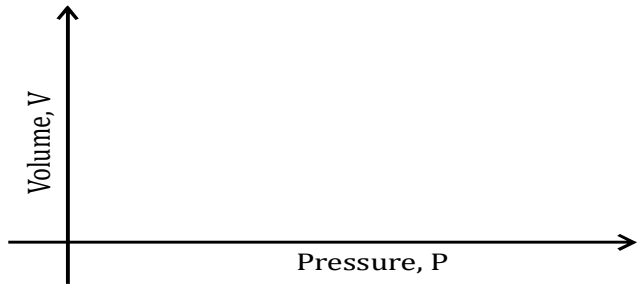


Fig 3

Find: the acceleration of the trolley. (3 marks)

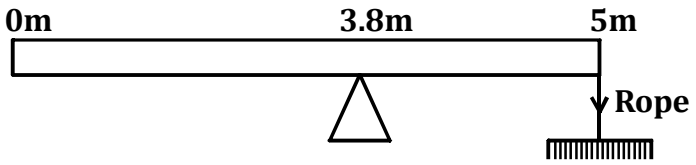
8. State the factors that affect the rate of flow of heat through a metal conductor. (2 marks)

9. Sketch a graph of volume of a fixed mass of a gas against pressure on the axes below. (1 mark)



10. A form three student heats 5kg of water to a temperature of 80°C. When he added X kg of water at 15°C, the mixture attains a temperature of 40°C. Determine the value of X.

11. A uniform rod of length of 5m and a mass of 6kg is pivoted at 3.8m mark. The rod is held horizontally by a vertical rope at 5m mark as shown in figure 3 below.



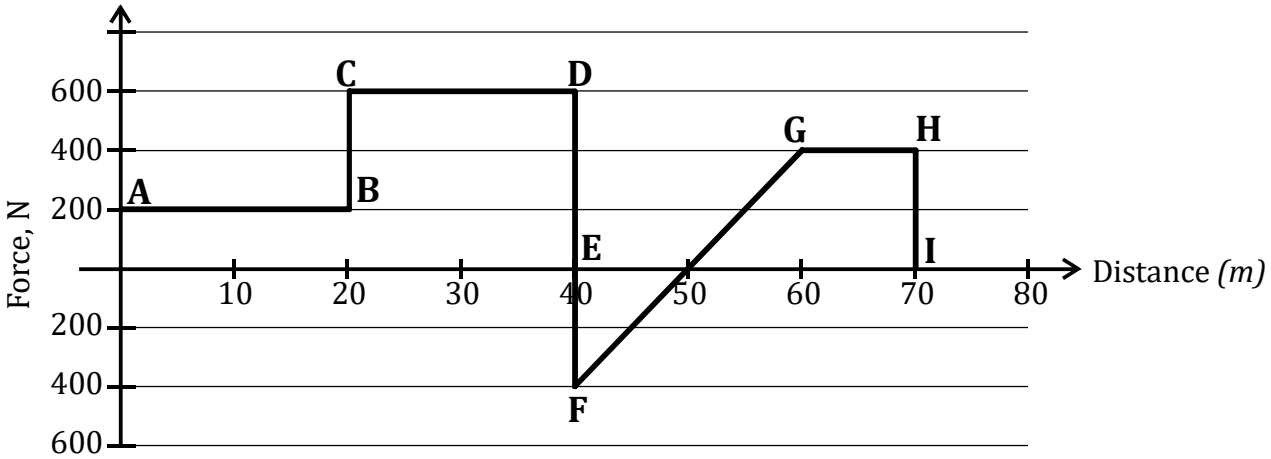
Calculate tension on the rope. (3 marks)

SECTION B: 55 marks)

12. a) i) State the law of conservation of energy. (1 mark)

ii) Explain why it is easier to use a thick screw driver than a thin one. (1 mark)

b) The figure below shows a force-distance graph for a car being towed on a horizontal ground.



i) Calculate the total work done. (4 marks)

ii) If the velocity just before reaching point D is 0.6m/s, calculate the power developed by the source providing the force at this point. (1 mark)

c) An electric pump can raise water from a low level reservoir to a high level reservoir at a rate of 3.6×10^5 kg/h. The vertical height that water is raised is 400m. If the rate of energy loss in form of heat is 200kw, calculate the efficiency of the pump. (4 marks)

13. a) State Newton's second law of motion. (1 mark)

b) Why is it easier to stop a saloon car than a bus moving at the same velocity. (2 marks)

c) A bullet of mass 20g moving at $200ms^{-1}$ hits and gets embedded in a wooden block of mass 450g that is suspended freely on a light inextensible string at a height of 5m above the ground. If the string breaks on impact, calculate:

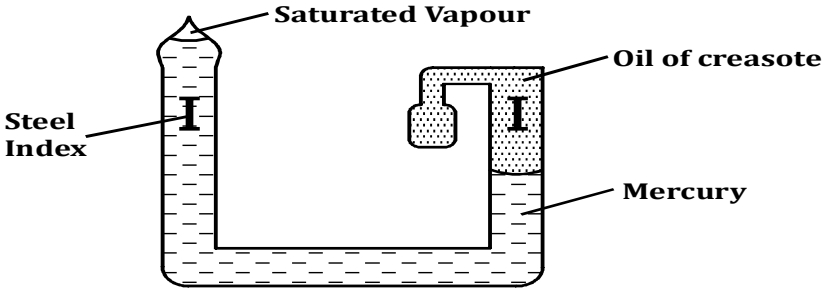
i) the velocity of the block immediately after impact. (3 marks)

ii) the time taken by the block to strike the ground. (2 marks)

iii) the horizontal range of the block. (2 marks)

14. a) State two properties of mercury that makes it a suitable thermometric liquid. (2 marks)

b) Figure below shows a six's maximum and minimum thermometer.



i) What is the thermometric liquid in the thermometer (1 mark)

ii) Give a reason why vapour in bulb B is saturated. (1 mark)

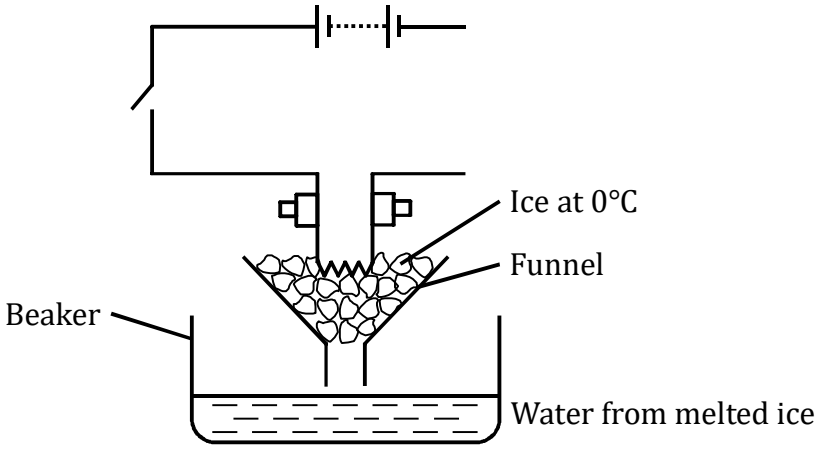
iii) Describe how the thermometer above works. (3 marks)

iv) At what points is reading of temperature taken from the thermometer. (1 mark)

v) What is used to reset the indices of the above thermometer after reading the temperature.

15. a) State one factor that affects freezing point of distilled water. (1 mark)

b) Figure below illustrates an experiment in which electrical energy is used to determine specific latent heat of fusion of ice.



i) Complete the circuit to show connection of essential circuit components. (3 marks)

ii) In the above experiment the following readings were obtained when heater was switched on for 10 minutes.
Voltage - 8.0V
Current - 2.25A
Temperature rise - 10°C
At the end of the experiment 400g of water at 0°C was collected in the beaker. Determine latent heat of fusing of ice. (3 marks)

iii) State any assumption made in (ii) above. (1 mark)

16. **a)**i) What is the importance of banking a road in corners? (1 mark)

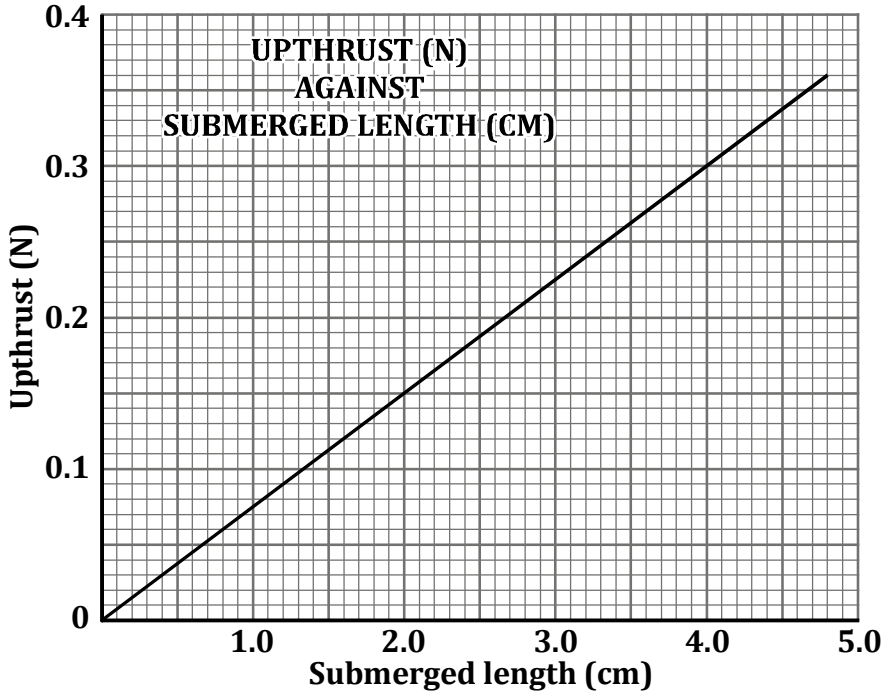
ii) Explain why wet clothes put in a drum which has holes at the bottom get dried faster when the drum of drying machine is rotated at high speed. (2 marks)

b) A turntable of a record player makes 60 revolutions per minute. Calculate.

i) Angular velocity in rads/second. (2 marks)

ii) The linear acceleration at a point 0.18M from the centre. (3 marks)

17.a) In an experiment to determine the density of a liquid, uniform metal cylinder of cross-section area 6.0cm² and length of 4.2cm was hang from a spring balance and lowered gradually into liquid. The graph below shows upthrust plotted against, lengths submerged.



From the graph, determine:

i) Value of upthrust when the cylinder is fully submerged. (1 mark)

ii) The density of the liquid in SI units. (5 marks)

b) A solid displaces 5.0cm³ of paraffin when floating and 20cm³ when fully immersed in it. Given that the density of paraffin is 0.8g/cm³, calculate the density of the solid. (3 marks)

IGEMBE CENTRAL
232/2
PHYSICS
Paper 2

SECTION A: (25 marks)
Answer all the questions in this sections in the spaces provided.

1. Figure 1 below shows two mirrors inclined at an angle of 80° to each other. A ray of light is incident on Mirror M_1 as shown below.

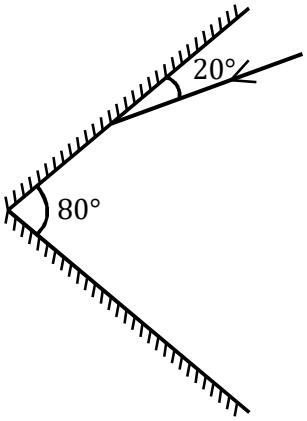


Fig 1

i) Complete the path of the ray as it emerges in M_2. (1 mark)
ii) Indicate the angle of reflection on each mirror. (2 marks)

2. Unmagnetised iron rod was clamped facing North-South direction and then hammered repeatedly When the rod was tested it became magnetised. Explain this observation. (2 marks)
3. a) A lake seems to be 20m shallower than its actual depth. If the refractive index of water is 1.33, determine the real depth of the lake. (3 marks)
   b) The critical angle of glass is 40°. Determine the refractive index of this glass. (3 marks)
4. a) State one difference between X-rays and Y-rays. (1 mark)
   b) State one reason why radiowaves signals are easier to receive than TV (television) signals in a place surrounded by hills. (1 mark)
5. A house has four 60W bulbs. The bulbs are switched on for three hours per day. Determine the cost of electricity used per week If the charges are Kshs 6.80 per unit. (3 marks)
6. State one property of a wave that does not change as it transverse different media. (1 mark)
7. An electric bulb is labelled 100W, 240V. What does this mean? (2 marks)
8. Define the term work function as used in photoelectric effect. (1 mark)
9. Explain why e.m.f of a dry cell drops if a large current is drawn for short time and then recovers if allowed to rest. (2 marks)
10. Explain how the following affects the magnitude of induced e.m.f in a conductor.
    i) Strength of magnetic field. (2 marks)
    ii) Number of turns of coil.
11. Define the term spherical aberration as used in physics. (1 mark)

SECTION B: (55 marks)

12. a) Define the term optical centre as applied in this lens. (1 mark)
b) You are provided with the following apparatus in an expeirment to the focal length of a lens.
- A lit candle
- A white screen
- A metre rule
- A biconvex lens
- A lens holder.

i) Draw a diagram to show how you would arrange the apparatus above to determine the focal length of the lens. (2 marks)

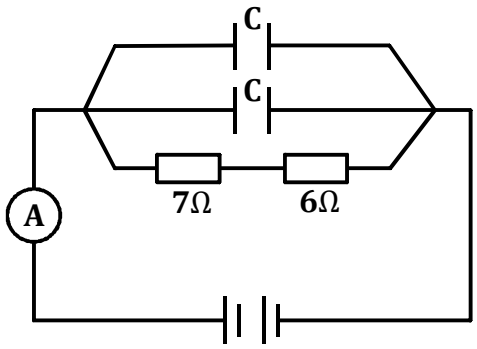
ii) Describe briefly the procedure you would use to determine focal length of lens using apparatus above. (2 marks)

iii) State the measurements that you would take. (2 marks)

iv) Explain the measurements in (ii) above would be used to determine the focal length. (2 marks)

13. In the circuit diagram shown in figure 2, each cell has an emf of 1.5V and internal resistance of 0.2Ω. The capacitance of each capacitor is 2.0μF.

Fig 2



When the switch is closed, determine the

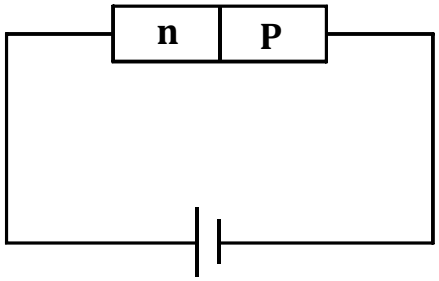
i) effective capacitance (2 marks)

ii) ammeter reading. (2 marks)

iii) charge on each capacitor. (3 marks)

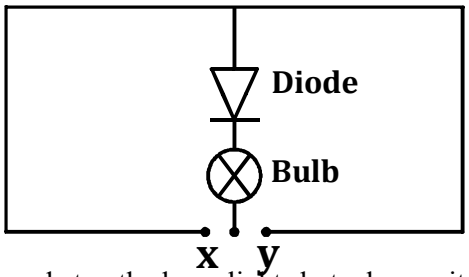
iv) Potential difference across the 6Ω resistor. (2 marks)

14. a) State the type of bias in the p-n junction diode below. (1 mark)



b) Sketch a diagram for full wave rectification using two diodes. (4 marks)

c) Study the figure 3 below and answer the questions that follow.



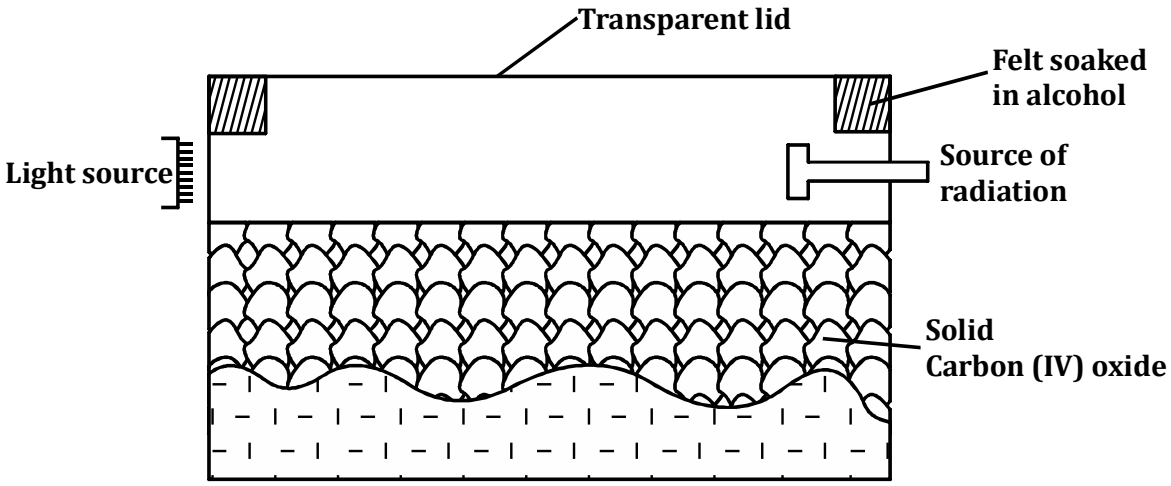
When switch is closed at x, the lamp lights but when switch is closed at Y, the lamp does not light. Explain this observation. (3 marks)

15. a) Define the term half life as used in radioactivity. (1 mark)

b) A radioactive element has a half life of 8 years. Determine the fraction of element remaining after 32 years. (2 marks)

c) Give a reason why it advisable to hold radioactive substance using forceps during experiments. (1 mark)

d) Figure 4 below shows radiation detector.



i) What is the name of the above detector. (1 mark)

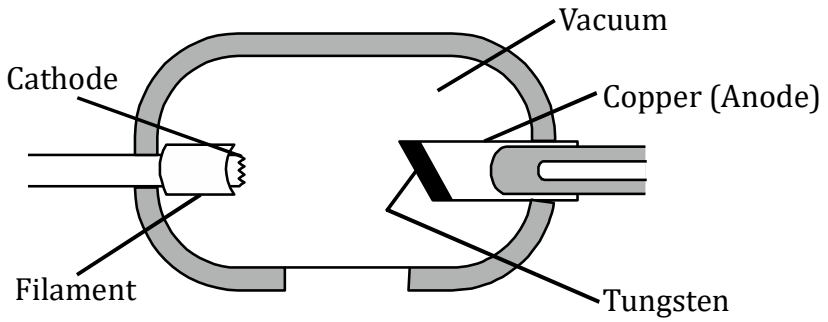
ii) State the functions of the following

Alcohol.....

Solid carbon (IV) oxide .....

iii) When radiation from source enters the chamber white traces are observed. Explain how the traces are formed and identified. (3 marks)

16. Figure five below is an x-ray tube. Study it and answer the questions that follow.



a) State one property of tungsten that makes it a suitable target. (1 mark)

b) Give a reason why the x-ray tube is evaluated. (1 mark)

c) Explain why anode is made of copper. (1 mark)

d) What is the effect of increasing the p.d. between anode and filament on the x-rays produced. (1 mark)

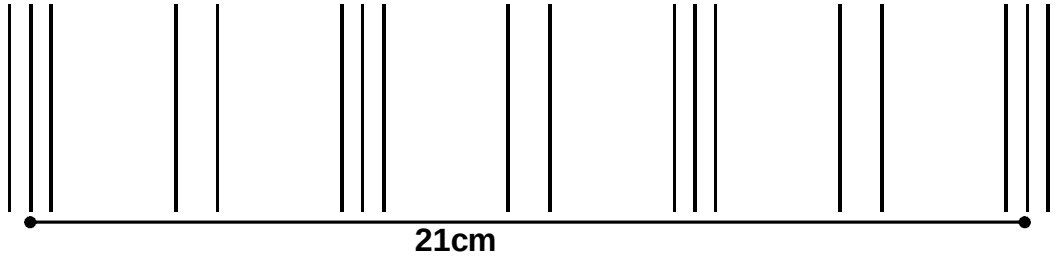
e) A potential of 50Kv was applied on the x-ray tube. Determine the velocity of the electrons as they strike the targe (3 marks)

f) State one use of the soft x-rays in hospital. (1 mark)

17. a) State the effect of temperature on the speed of a wave. (1 mark)

b) The diagram below shows a longitudinal wave pattern in figure 6.

Fig 6



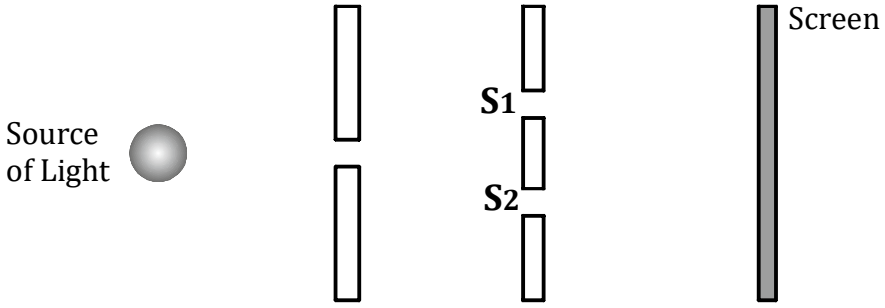
Given that the velocity of the wave is 340m/s, determine;

i) the wavelength of the given wave. (2 marks)

ii) frequency of the wave. (3 marks)

c) In an experiment to observe the inference of light waves a double shit is placed close to a monochromatic source of light as shown in figure 7 below.

Fig 7



i) state the function of the double slit. (1 mark)

ii) State what is observed on the screen (3 marks)

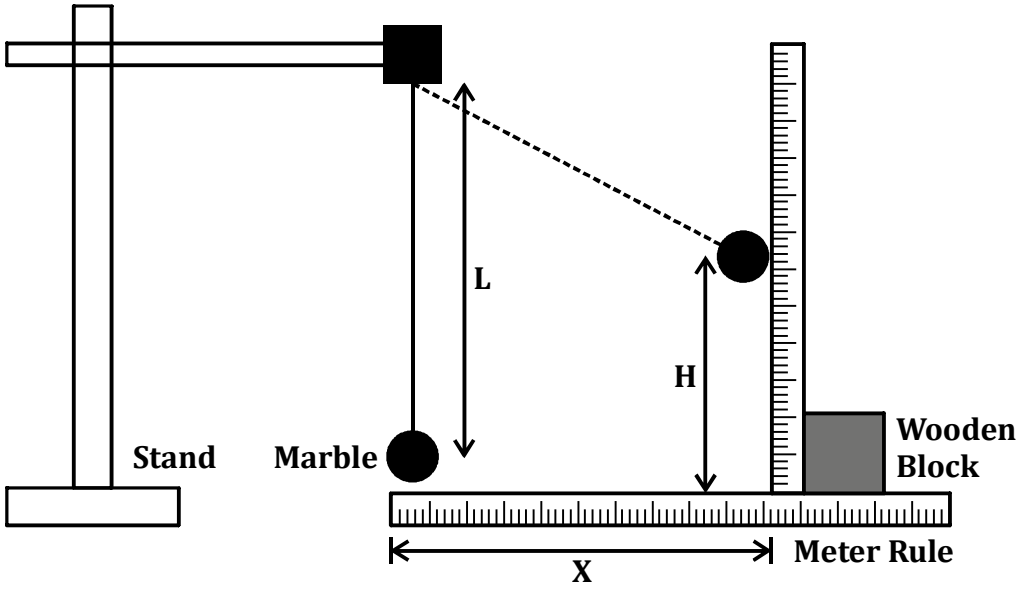
iii) state what is observed on the screen when the slit separation S_1S_2 is reduced.

IGEMBE CENTRAL
232/3
PHYSICS
Paper 3

1. You are provided with the following:
- A marble with a piece of thread attached.
- A complete stand
- A meter rule
- A stop watch
- A cellotape
- Half meter rule attached a wooden block.

Proceed as follows;

a) Fix the thread between two wooden blocks and faster the clamp.
b) Adjust the thread so that this length L = 50.0cm as shown in the diagram below.
c) Fix the meter rule horizontally to the bench using the cellotape provided.
d) Adjust the clamp such that the marble is next to the end of the water rule as shown below.



e) i) Displace the marble by a horizontal distance X=20cm and measure the corresponding vertical displacement H

H = ... cm (1 mark)

iii) Repeat the experiment to find. H for each of the following values of x given in the table below. Complete the table. (6 marks)

x(cm)	H(cm)	x^2 (cm^2)	x^2/H cm
20			
25			
30			
35			
40			
45			

iii) Plot the graph of x^2 / H (y-axis) against H. Draw the best line through the points. (5 marks)
iv) Determine the shape of the graph. (2 marks)

v) From the graph, find the value of x^2/H when H = 0. (1 mark)

f) Raise the clamp slightly without changing the length L so that the marble is free to swing. Displace the marble through a horizontal distance and let it swing freely.

i) Determine the period T, for one complete oscillation by timing 10 oscillations.
Time for 10 oscillations = ... seconds. (1 mark)
Period T = ... (1 mark)

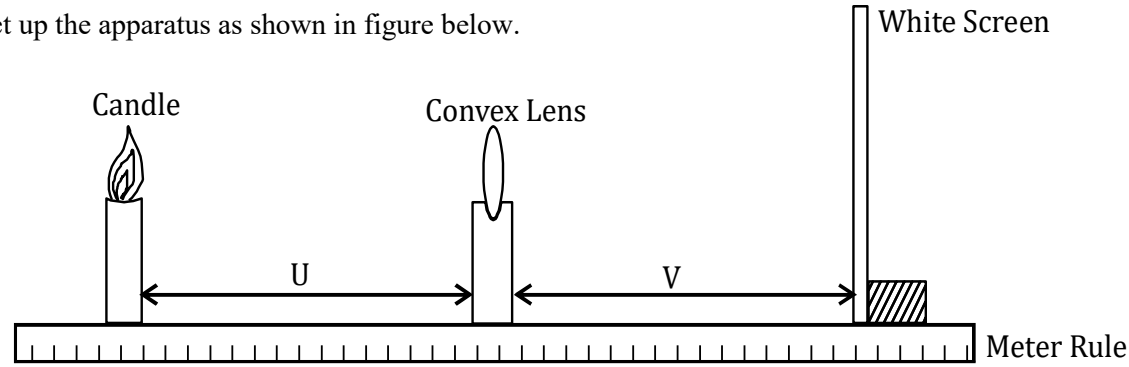
ii) Calculate the value of p given that.

$$T = 2\pi\sqrt{\frac{p}{g}}$$ use g = 9.8m/s². 3 marks)

QUESTION TWO. (Part A)

2. **i)** You are provided with the following apparatus.
- Biconvex lens
- Candle
- White screen
- Lens holder
- Meter rule.

a) Set up the apparatus as shown in figure below.



b) Place alighted candle at object distance, U=20cm. Move the screen towards or away from the lens until in sharp image of the candle flame is obtained on the screen. Measure the distance V and record the results in this table below. (5 marks)

c) Plot a graph of UV(cm^2) against U + V (cm) (5 marks)

Object distance U (cm)	Image distance V (cm)	u + v (cm)	UV (cm^2)
20			
30			
45			
60			
75			
90			

d) Determine the slope of the graph. (2 marks)

e) Determine the power of the lens used in the experiment. (2 marks)

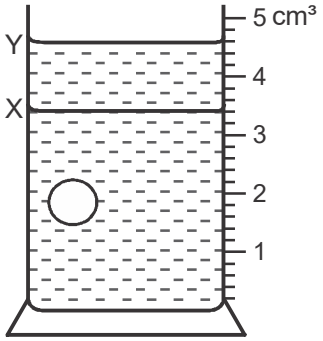
iii) Part B

You are provided with the following apparatus.
- 2 new dry cells.
- an ammeter.
- a voltmeter.
- a mounted wire labelled AB.
- cell holder.
- switch.
- connecting wires.

GRAPHICS
PHYSICS
232/1
PAPER 1 (THEORY)

SECTION A : (25 MARKS)

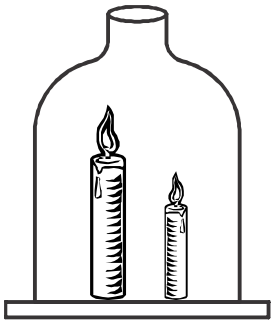
1. The figure below shows a measuring cylinder containing water initially at a level X. A spherical solid of mass 11g is immersed in the water and the level rises to Y.



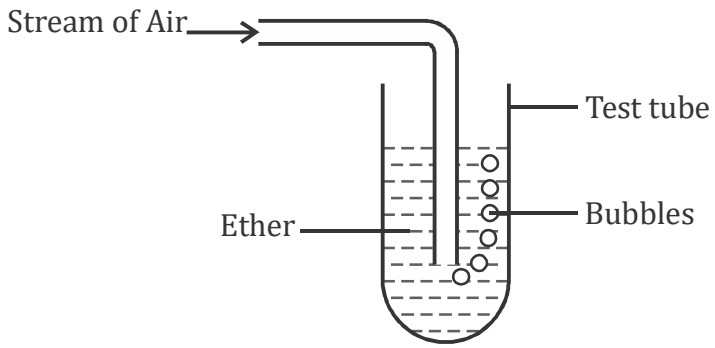
Determine the radius of the spherical ball. (2 marks)

2. A dropping dust particle in a still room does not trace a straight vertical path. Explain. (1 mark)

3. Two candles, a short and a long one were lit and then covered with a tall bell jar as shown below. State and explain which of the candles goes off first. (2 marks)



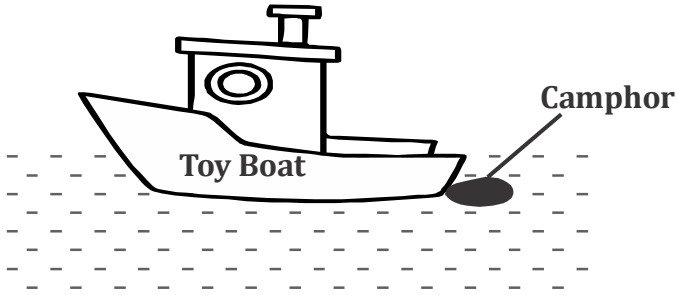
4. The set up below shows an experiment conducted by form three students.



Air was blown into the ether through the rubber tubing as shown below.
State and explain the observation made at the end of the experiment. (2 marks)

5. A small car travelling at a very high speed is likely to be dragged into a long truck travelling in the opposite direction also at a high speed. Explain. (2 marks)

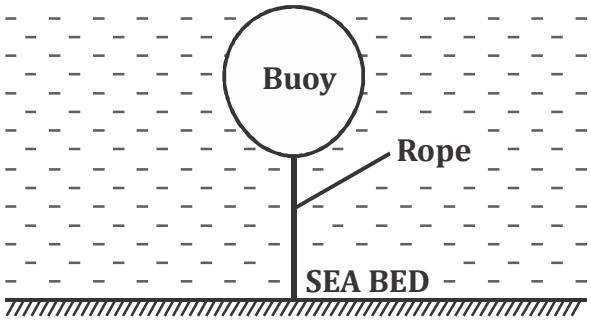
6. A toy boat was placed on the surface of water as shown below.



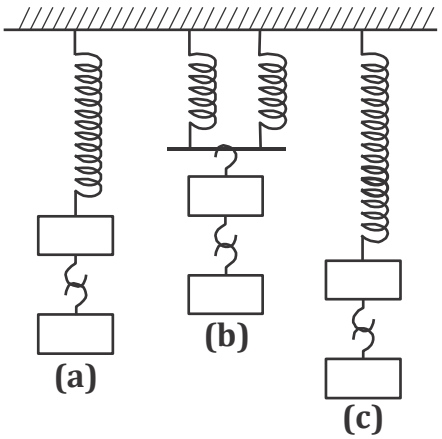
A piece of camphor was placed on one side of the boat as shown on the diagram. Show the direction of movement of the boat and explain. (2 marks)

7. Given that a container has a cross sectional area of A and contains a liquid of height, h, whose density is ρ. Show that the pressure due to the liquid column is given by hρg. (3 marks)

8. A spherical buoy of diameter 0.4m and mass 20kg is connected to rope tied to a sea bed so that $^3/_4$ of its volume is below the surface as shown in the figure below.
Assuming the weight of the rope is negligible, calculate the tension in it.
(Take density of sea water = 1030kg/m^3) (3 marks)



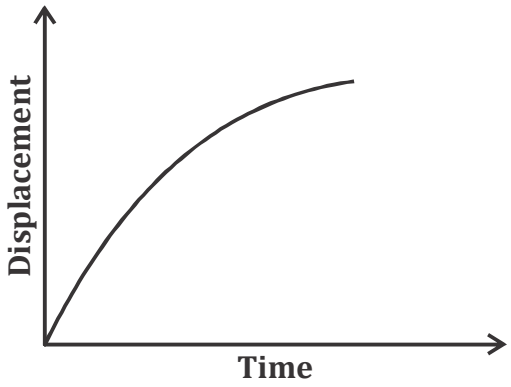
9. The figure below illustrates systems of identical springs. Equal masses are suspended on the springs to study the variation of extension with force. On the same axes, sketch the variation of extension with stretching force for each of the systems. (3 marks)



10. A body is projected vertically upwards from the top of a building with a velocity of 20m/s. Assuming that it lands at the base of the building, sketch the velocity time graph of the motion. (2 marks)

11. The helmet of a motorist contains a sponge on the inside. Explain how the sponge reduces the impact incase of an accident. (2 marks)

12. The figure below shows a sketch of a displacement-time graph.



Describe the motion displayed in the graph. (1 mark)

SECTION B : (55 MARKS)

Answer all the questions in this section in the spaces provided.

13. a) State any one form of energy. (1 mark)

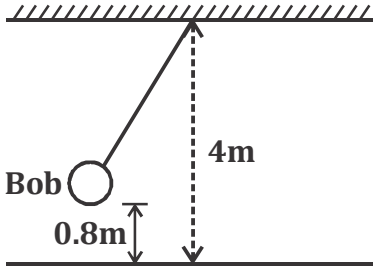
b) An electric crane lifts a load of 2500kg through a vertical distance of 5.0m in 10 seconds. Determine :

i) the work done (2 marks)

ii) the power developed by the crane (2 marks)

iii) the efficiency of the crane if it is operated by an electric motor rated 15.625KW. (2 marks)

c) A bob of mass 10kg is suspended using a string 4m long from a support and swung through a vertical height of 0.8m as shown below.



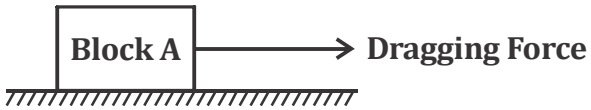
Determine :

i) The potential energy of the bob at its position shown. (2 marks)

ii) The speed of the bob when passing through the lowest point during the swing. (2 marks)

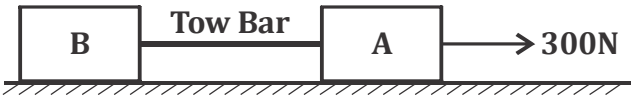
14. a) State the law of conservation of linear momentum. (1 mark)

b) A metal block A of mass 50kg requires a horizontal force of 100N to drag it with uniform velocity along a horizontal surface as shown in the figure below.



i) Calculate the coefficient of friction. (2 marks)

ii) Another block B of mass 60kg requires a force of 120N to drag it along the same surface. The two blocks A and B are now connected together with a tow bar and a dragging force of 300N applied to pull them along the same surface as shown below.



Determine :

I. the acceleration of the system (3 marks)

II. the tension of the tow-bar. (2 marks)

c) A fisherman in Sori beach wanted to jump out of his boat towards the off shore. Unfortunately he landed in water. Explain why he landed in water. (2 marks)

15. a) The moon goes round the earth at a constant speed. Explain why it is true to say the moon is accelerating. (1 mark)

b) A string of negligible mass has a bucket tied at the end. The string is 60cm long and the bucket has a mass of 45000mg. The bucket is swung horizontally making 6 revolutions per second.
Calculate :

i) the angular velocity (2 marks)

ii) the angular acceleration (3 marks)

iii) the tension on the string (2 marks)

iv) the linear velocity (2 marks)

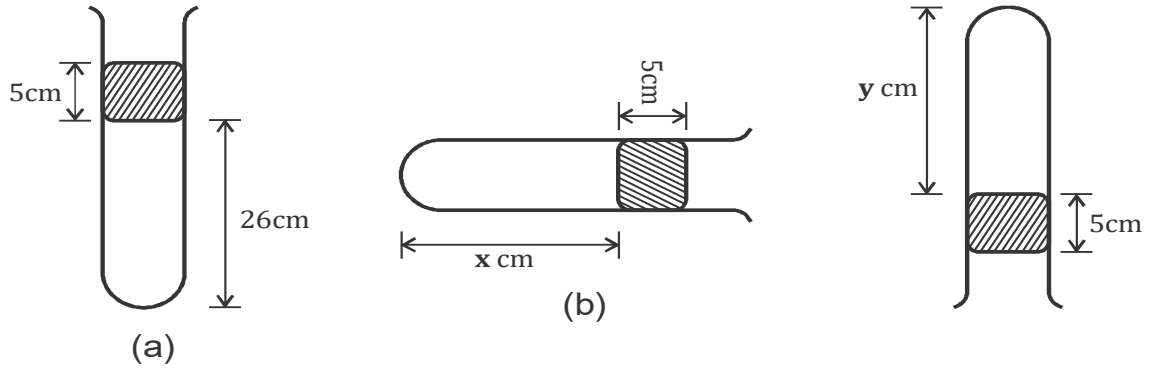
c) State a condition necessary for a body moving on a banked road not to skid. (1 mark)

16. a) i)State the pressure law of gases. (1 mark)

ii)Using the kinetic theory of gases, explain how rise in temperature of a gas causes a rise in pressure of the gas if volume is kept constant. (2 marks)

b) A certain mass of hydrogen gas occupies a volume of $1.6m^3$ at a pressure of 160Kpa and the temperature of 16°C. Determine its volume when the temperature is 0°C at a pressure of 160KPa. (3 marks)

c) A column of air 26cm is trapped by mercury thread 5cm long as shown in diagram (a) below. When the tube is layed horizontally as in (b) the air column is now xcm long. When inverted as shown in (c) the length of the column is ycm. Find the values of x and y. (Take atmospheric pressure to be 70cmHg) (4 marks)



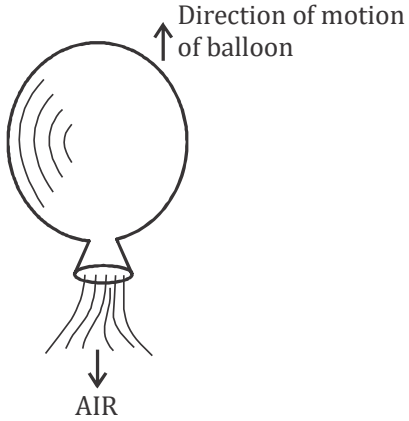
d) Explain what you understand by :

a) absolute zero temperature (1 mark)

b) ideal gas (1 mark)

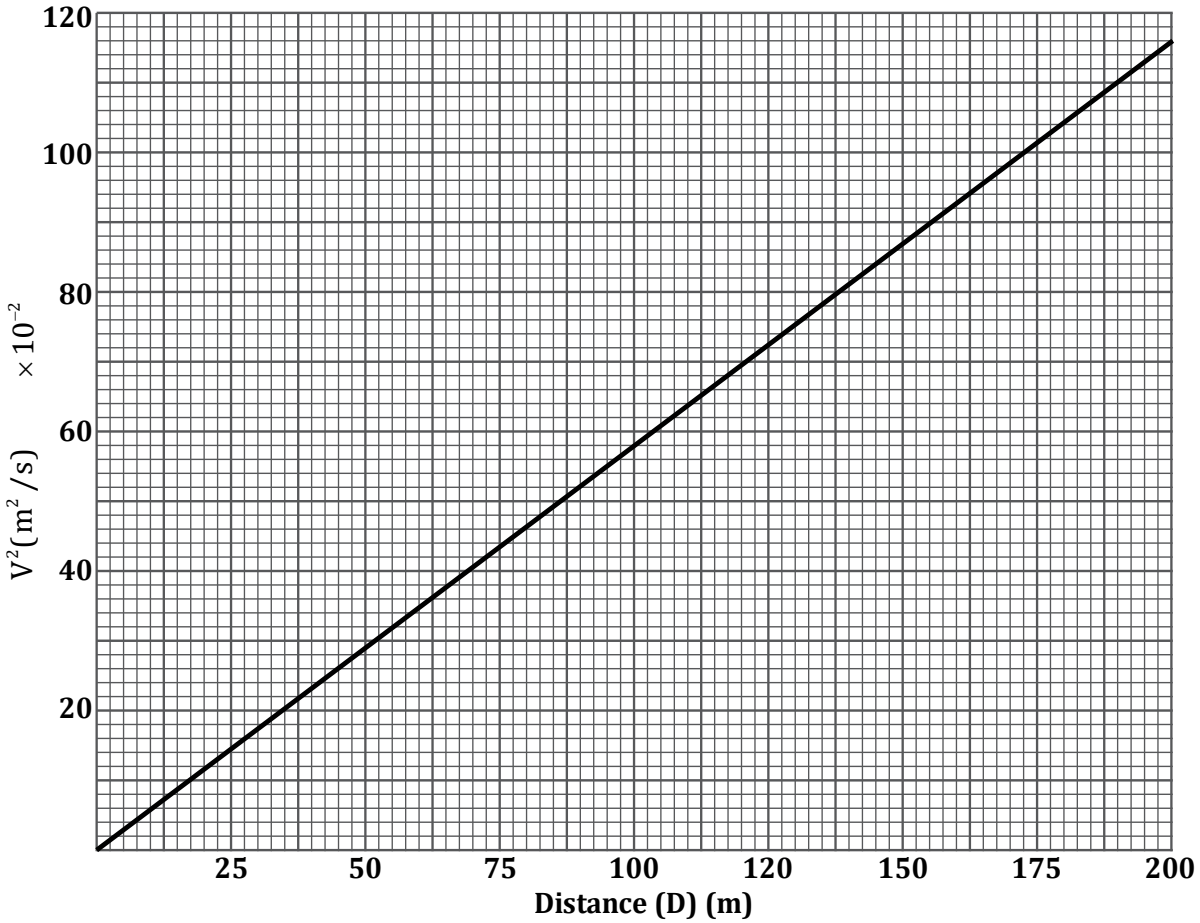
17. a) i) State Newton's second law of motion. (1 mark)

ii) An inflated balloon is observed to rise up when the air inside is suddenly let free to escape as shown in the figure below.



Explain the observation. (2 marks)

b) The graph below shows the variation of square velocity of a body against the distance on a horizontal surface.



From the graph,

i) determine the slope of the graph (3 marks)

ii) What does the slope of the graph represent given that $V^2 = 2aD$? (1 mark)

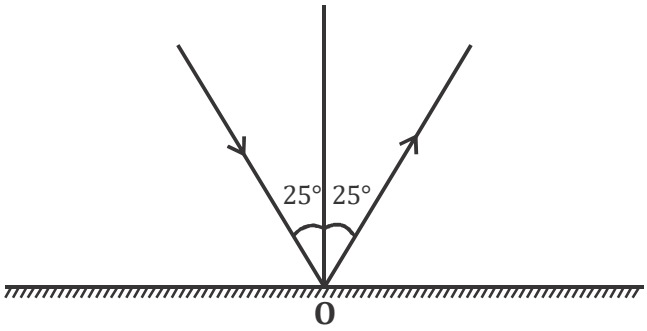
iii) Determine the velocity of a body at a distance 0.3m. (2 marks)

c) Define the terms momentum and impulse and state the relationship between them. (2 marks)

GRAPHICS
PHYSICS
PAPER 2

SECTION A : (25 MARKS)

1. The figure below shows a ray of light incident on a plane mirror.



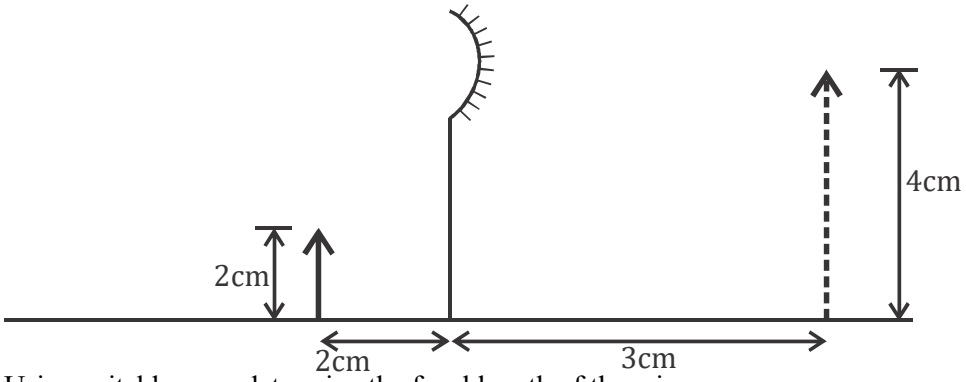
The mirror is rotated 10^{o} about O in the anticlockwise direction. Draw the new position of the mirror, the normal and the reflected ray. Through what angle has the reflected ray been rotated ?
(Show your working on the diagram) (3 marks)

2. A highly negatively charged rod is gradually brought close to the cap of a positively charged electroscope. It is observed that the leaf collapses initially then diverges. Explain the observations. (2 marks)

3. Polarisation is one of the defects of a dry cell. Name the depolariser used to correct this angle. (1 mark)

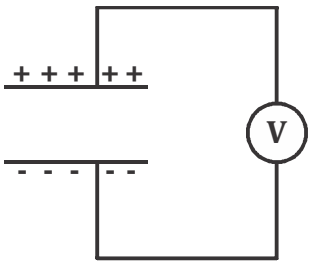
4. Describe the process of magnetisation of a magnetic material using the Domain theory. (3 marks)

5. The figure below shows an object O and its image I formed by a concave mirror.



Using suitable rays, determine the focal length of the mirror. (3 marks)

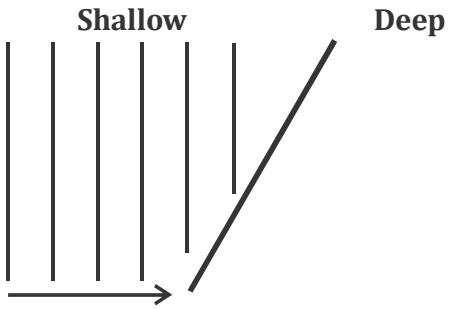
6. The figure below shows a voltmeter connected across two charged parallel plates.



When a thin sheet of mica is inserted between the plates, the voltmeter reading reduces. Explain this observation. (2 marks)

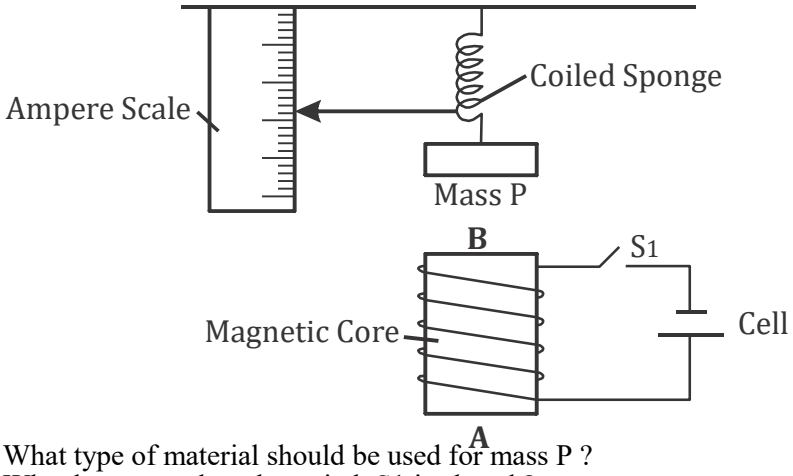
7. A dog stands between two cliffs and makes a loud sound. If it hears the first echo after 2.0s and the second after 2.5s, find the distance between the two cliffs. (speed of sound in air = 320m/s) (3 marks)

8. The figure below shows progressive waves coming from a shallow to a deep region.



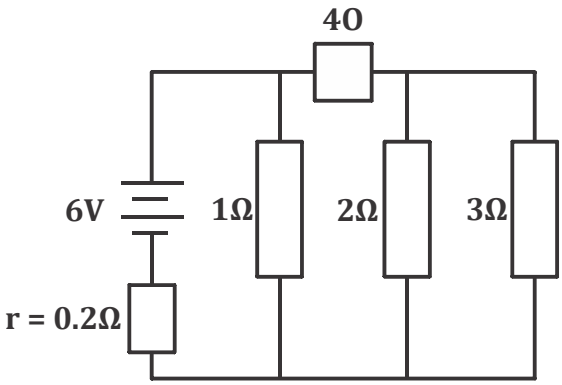
Draw on the diagram to show how the waves proceed in the deep region. (2 marks)

9. The figure below shows a set up made by a student to measure current.



i) What type of material should be used for mass P ? (1 mark)
ii) What happens when the switch S1 is closed ? (1 mark)
iii) Identify the polarities A and B when S_1 is closed. (1 mark)

10. The figure below shows four resistors and a source of voltage of 6V with internal resistance of 0.2Ω

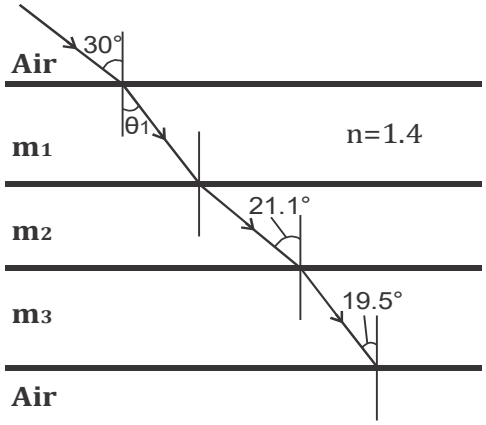


Find the total current flowing in the circuit. (3 marks)

SECTION B: (55 MARKS)
Answer all the questions in this section in the spaces provided.

11. a) Define the term critical angle. (1 mark)

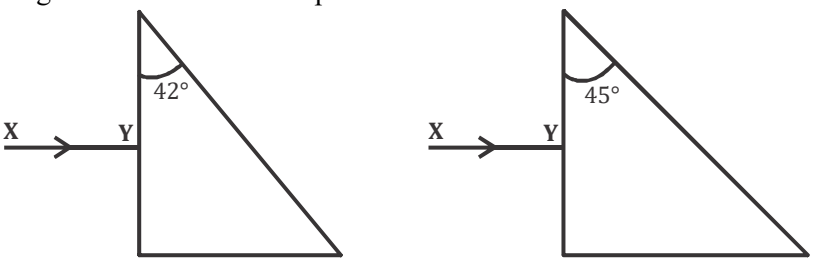
b) A ray of light travels from air through multiple layers of transparent media m_1, m_2 and m_3 whose boundaries are parallel as shown in the figure below.



Calculate:

i) the angle θ_1 (1 mark)
ii) the refractive index of m_2 (2 marks)
iii) the speed of light in m_1 (speed of light in air = 3.0×10^8m/s) (2 marks)
iv) the refractive index of m_3 with respect to m_1 (2 marks)

c) The diagrams below show two prisms.

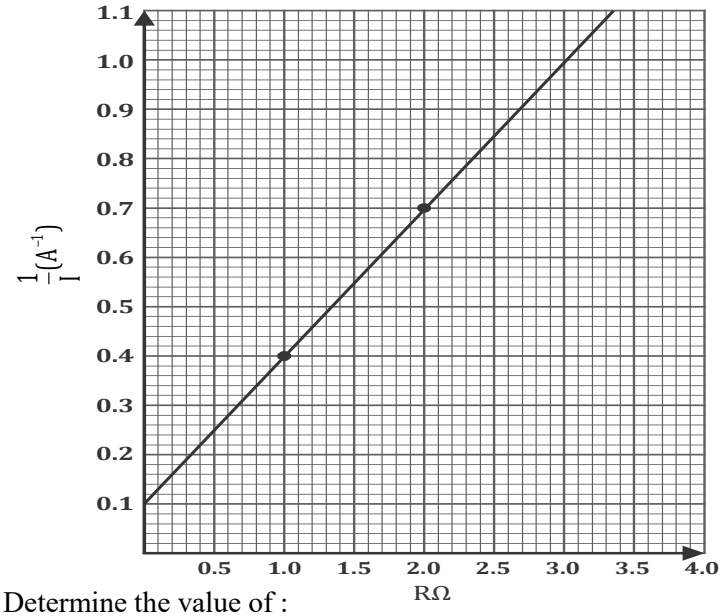


Given that the critical angle of the glass in both prisms is 42°, sketch the paths of two beams of monochromatic lights indicating all the angles. (2 marks)

d) Give two applications of total internal reflection. (2 marks)

12. a) Differentiate between electromotive force and terminal voltage. (1 mark)

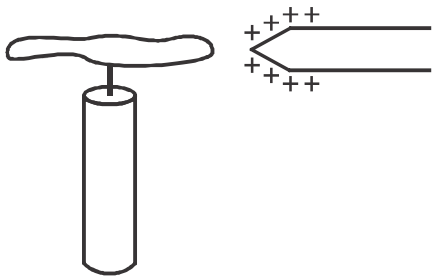
b) In an experiment to determine E and r for a battery the following graph was obtained for different values of I.



Determine the value of :

i) E (2 marks)
ii) r (3 marks)

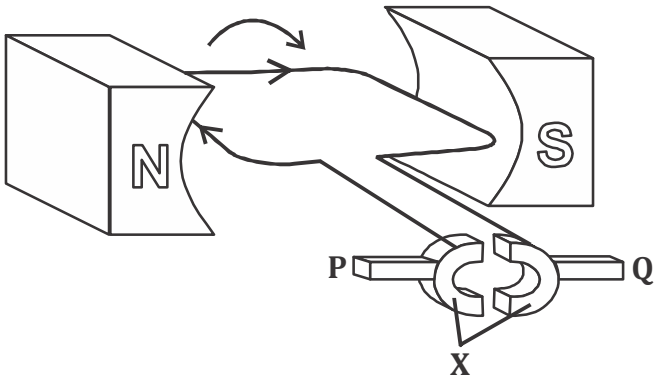
c) A thin wire connected to a charge generator and placed very close to the candle splits the candle flame as shown.



Explain this observation. (2 marks)

d) Two capacitors of X farads and 4μF are connected in series to a 10μF capacitor. The effective capacitance of the network is 5μF.
i) Draw the set up. (1 mark)
ii) Determine the value of X. (3 marks)

13. a) The following figure shows a coil in a magnetic field. The coil is rotated in the direction shown by the arrow to produce an alternating current.



i) Name the parts labelled X. (1 mark)
ii) Terminals P and Q are connected to a cathode ray oscilloscope. Sketch a graph of the electromotive force produced with time. (3 marks)
iii) State two factors that influence the magnitude of the induced e.m.f (2 marks)
iv) Explain the changes that should be made in the set up for it to produce a direct current. (2 marks)

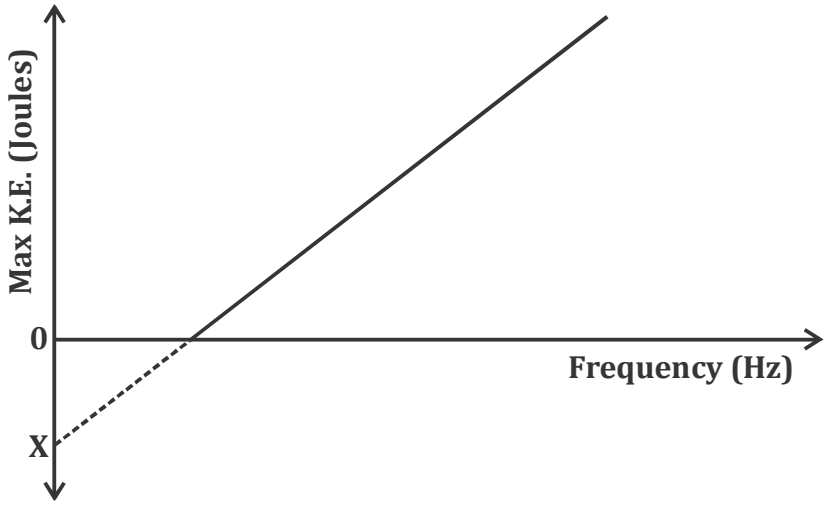
b) The cost of electricity in a region is sh.7.20 per kwh.
i) What would be the monthly bill for a household using the following appliances. (2 marks)
I. a 1.5KW water heater for 1 hour per day.
II. a 100W light bulb for 30 days at 12 hours per day and
III. a fan of resistance 24ohms connected to a 240V supply for 30 days at 2 hours per day.
ii) The above connection was made by a household in one month. Find the total monthly bill for this household if, in addition to the energy consumed, the power company charges each consumed:
I. a monthly standing charge of sh.150.00
II. a fuel cost levy of 50 cents per kwh consumer
III. a foreign exchange levy of 40cts per kwh
IV. a value added tax of 16% of the monthly energy consumption (2 marks)

14. a) Consider the following types of waves: Radio, U.V, sound, blue light, X-rays and Indigo light.
i) Which wave is not an electromagnetic wave ? (1 mark)
ii) Which wave has the shortest wavelength ? (1 mark)
iii) Arrange the electromagnetic waves in order of increasing penetrating power. (1 mark)

b) Given that the wavelength of red light is 4×10^{-7}m, determine
i) its frequency ($C = 3.0 \times 10^{8}$m/s) (2 marks)
ii) the energy it possesses, $h = 6.63 \times 10^{-34}$JS (2 marks)

15. a) A graph of kinetic energy of photoelectrons emitted by metal surface A against the frequency of

radiation used is shown in the figure below.



i) From the graph, state the relationship between K.E and frequency. (1 mark)
ii) What is the significance of the gradient of the graph ? (1 mark)
iii) What is the significance of OX from the graph. (1 mark)

b) The experiment was repeated with a photocell of a metal surface B which has a lower work function than metal A. Sketch on the same axes the expected graph if metal surface B photocell were used. (1 mark)

c) The minimum frequency of light which will cause photoelectric emission from a metal surface is 5.0×10^{14}Hz. If the surface is illuminated by light of frequency 6.5×10^{14}Hz, calculate :
i) the work function of the metal surface. (2 marks)
ii) the maximum K.E (in eV) of the electrons emitted. (2 marks)
iii) the maximum speed of the electrons. (2 marks)

d) One of the applications of photoelectric effect is in the photoemissive cell. State two uses of photoemissive cells. (2 marks)
($L = 6.63 \times 10^{-34}$JS, $Me = 9.11 \times 10^{-31}$kg)

GRAPHICS
PHYSICS
Paper 3
CONFIDENTIAL INSTRUCTIONS

Question 1

Each candidate will require :

- 7 connecting wires
- a bulb (2.5V)
- 2 new dry cells (size D, 1.5V)
- voltmeter (0 - 3V)
- ammeter (0 - 2.5A)
- switch
- rheostat
- glass prism (60^o - 60^o - 60^o)
- 4 optical pins
- plain paper
- protractor
- some plasticine

Question 2

Each candidate will require :

- a retort stand, boss, clamp
- a test tube
- a piece of duplicating paper
- a thermometer
- a large beaker containing some water
- a tripod stand and wire gauze
- a cardboard with a hole in the middle
- a burner
- a rubber band
- a stopwatch

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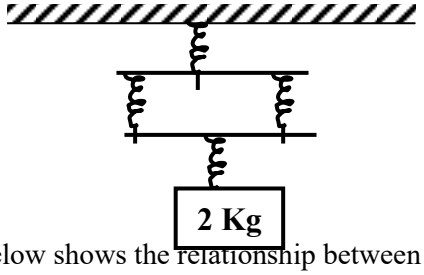
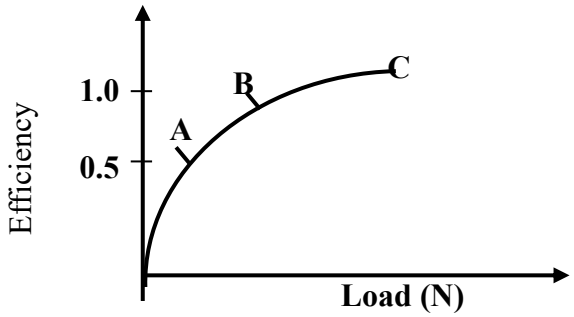
1. The load carried by a truck loader was measured to be 65,000 grams. Convert the mass of the load into milligrams and express the answer in standard form. (2 Marks)
2. A form one girl observed that when mercury is put into a glass it does not wet the glass. Explain the observations made by the girl. (2 Marks)
3. In using the lift pump to raise water from a bore hole. It is observed that practically the height the water is raised cannot be 10m and more. Give two reasons for this observation. (2 Marks)
4. When a mass of 2kg is hang from a single spring, the spring extends by a distance x. Determine the total extension in the set up below. (2 marks)



5. The sketch below shows the relationship between the efficiency and the load for a pulley system.

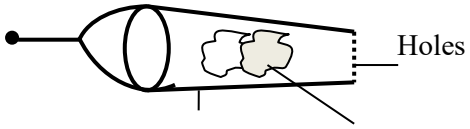


Explain the shape of the curve (2 Marks)

(b) State a reason why the efficiency of a machine is always less than 100% (1 Mark)

6. (i) Explain why bodies in circular motion undergo acceleration even when their speed is constant. (1 Mark)

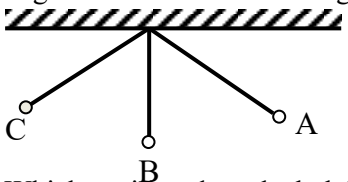
(ii) The figure below shows a container with small holes at the bottom in which wet clothes have been put.



Container Wet clothes

When the container is whirled in air at high speeds, it is observed that the clothes dry faster. Explain how the rotation of the container causes the clothes to dry faster. (2 Marks)

7. The diagram below shows a swinging pendulum.



(i) Which position does the bob have the:

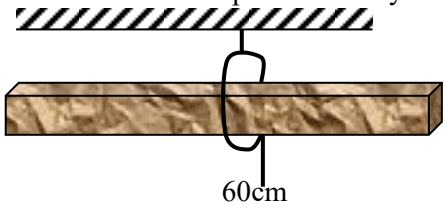
(a) Maximum momentum (1 Mark)

(b) Minimum kinetic energy (1 Mark)

(ii) What basic physical quantity can be measured using a single pendulum. (1 Mark)

8. (a) State the principle of moments (1 Mark)

(b) A uniform 1m wooden bar with uniform cross-sectional area of 2.5cm by 2.5cm is suspended at the 60cm mark and kept balanced by hanging a mass 450g at 100cm mark.



Determine

(i) The density of the material of the metre rule (2 Marks)

(ii) The tension T in the string (1 Mark)

9. Explain the term sea breeze (3 Marks)

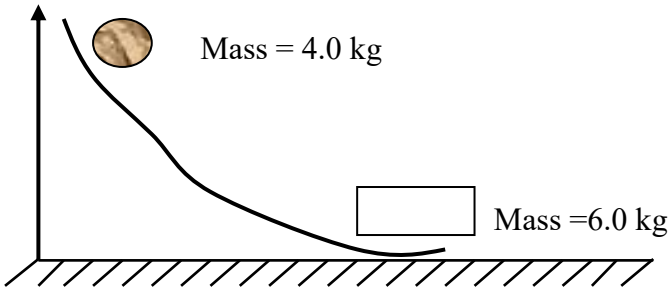
10. State two factors which affect the rate of diffusion in gases (2 Marks)

SECTION B – 55 Marks

Answer all the questions in this section in the spaces provided

11. (a) State two characteristics of perfectly inelastic collisions (2 Marks)

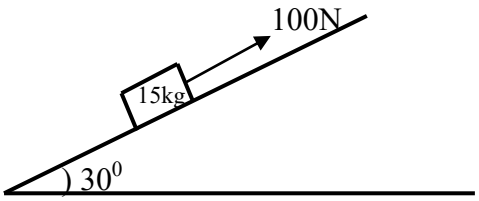
(b) A body of mass 4.0 kg held at a vertical height of 500cm is released to travel along a frictionless curved path as shown in the figure below.



The 4.0kg mass strikes body of mass 6.0kg at rest immediately it reaches the horizontal. The bodies stick together and move in the same direction. Determine the velocity of the bodies immediately after collision. (4 Marks)

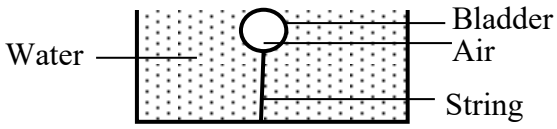
(c) (i) A matatu whose mass is 2500kg is lifted with a jack screw of 10mm pitch. If the handle is 30cm from the screw, find force applied (Neglect frictional force) Take $\pi = 3.14$ (4 Marks)

(ii) The figure below shows an inclined plane and a load of mass 15kg pulled by an effort of 100N.



Find the efficiency of the machine (3 Marks)

12. (a) The diagram below shows a rubber bladder filled with air and fixed to the bottom of a water container with a string.



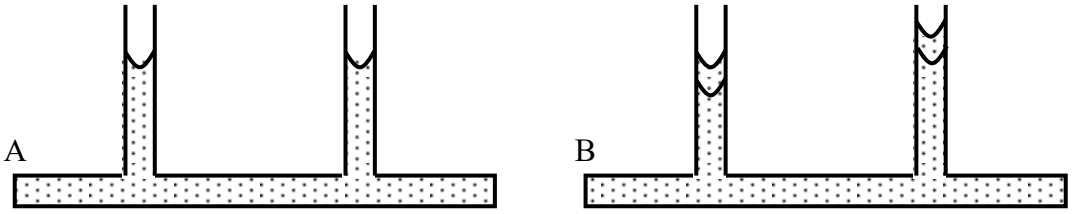
Explain why the tension in the string increases when the water is heated (3 Marks)

15. (a) State what is meant by streamline flow (1 Mark)

(b) The figure shows the cross section of an aeroplane wing, with the aeroplane moving in the direction shown by the arrow.

Sketch streamlines to show how air flows past the wing as the aeroplane moves (1 Mark)

(c) The diagram below shows two horizontal pipes, A and B. Tube A contains liquid at rest while tube B contains liquid in motion.



(a) Liquid at rest (b) Liquid at motion

(i) Sketch graphs for (a) and (b) to show variation in pressure (2 Marks)

(d) A jet of water emerges from a hose pipe of cross-sectional area $5.0 \times 10^{-3} m^2$ with a velocity of $3.0 ms^{-1}$. The water strikes a wall at a right angle and comes to rest without rebounding. Determine the mass of water striking the wall per second (Density of water is 1000 kgm^{-3})

16. (a) Explain how a hydrometer may be used to test whether a car battery is fully charged (2 Marks)

(b) A submarine made of iron was observed to float in water while a piece of iron rod sinks in water. Explain this observation (2 Marks)

(c) A solid displaces 5.0cm3 of paraffin when floating and 20cm3 when fully immersed in it. Given that the density of paraffin is 0.8g/cm3. Calculate the density of the solid (4 Marks)

(d) Define the term relative density as used in liquids (1 Mark)

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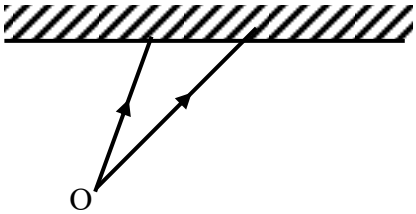
SECTION A: 25 MARKS

1. The image formed by a convex mirror is virtual. State two other characteristics of image formed by the convex mirror. (2 Marks)
2. State the function of the control grid in a cathode ray oscilloscope (1 Mark)
3. A metal iron has work function of 6.8×10^{-19}J. Calculate the minimum frequency of light that can cause photoelectric emission. (Take $h = 6.63 \times 10^{-34}$ Js) (2 Marks)
4. In the figure shows a rectifier circuit for an alternating current input.

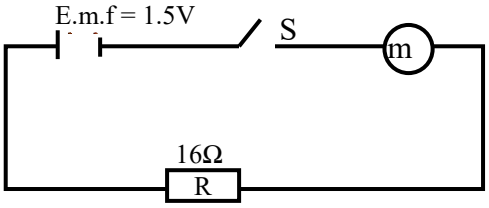
   (a) On the circuit, indicate the flow of current to illustrate rectification. (1 Mark)
   (b) Sketch a graph to show how the voltage across R varies with time.
5. Complete the nuclear equation below by inserting the values of a and b. (2 Marks)

$$^{14}_{6}C \longrightarrow ^{b}_{a}X + ^{14}_{7}N$$

6. State and explain the effect of increasing the E.H.T in an ex-ray tube on the x-rays. (2 Marks)
7. The figure below shows the incident rays from a point object O. Draw a ray diagram to show the image formed (3 Marks)



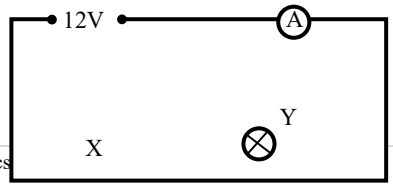
8. When the switch is closed in the figure below, the milliameter reads 75mA. Determine the internal resistance of the cell (3 Marks)

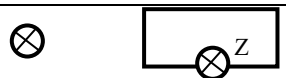


9. Determine the cost of using an electric heater rated 3kW for 12 hours given that the cost of electricity per kilowatt-hour is Sh. 8.00. (2 Marks)
10. Name two types of electromagnetic radiations whose wavelengths are greater than that of ultraviolet radiation (2 Marks)
11. What is the main difference between an a.c. and d.c generators (1 Mark)
12. State two conditions to be satisfied for total internal reflection of light to take place. (1 Mark)
13. Give an example of a longitudinal wave (1 Mark)

SECTION B

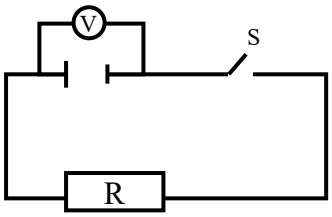
14. (a) The figure below shows how a student set up a circuit using 3 identical bulbs X, Y and Z each rated "12V, 2.0A"





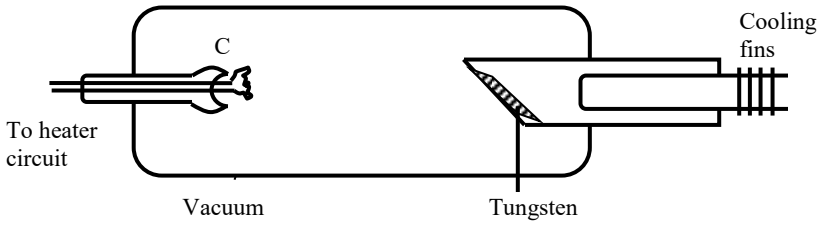
(i) When operating normally, calculate the resistance of one of the bulbs (2 Marks)
(ii) Calculate the effective resistance of the three bulbs. (2 Marks)
(iii) What will be reading of the ammeter? (2 Marks)
(iv) Draw a circuit diagram showing the three bulbs connected in such a way that they would all work at the same brightness especially if they are not identical. (2 Marks)

(b) When the switch S is kept open in the circuit shown below the voltmeter reads 1.5V. When the switch is closed, the readings drops to 21.3V and the current through the resistor is 0.5A.



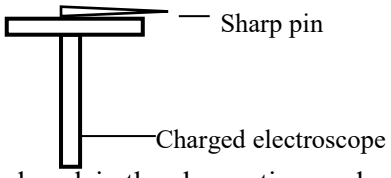
(i) What is the e.m.f of the cell? (1 Mark)
(ii) What the terminal voltage of the cell? (1 Mark)
(iii) Calculate the value of R. (2 Marks)

15. The figure below is of an x-ray tube



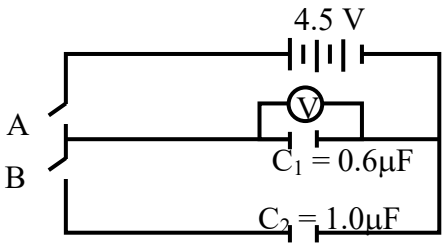
(a) Explain how x-rays are produced by the tube (4 Marks)
(b) Explain briefly the energy changes that take place when the x-ray tube is operating (3 Marks)
(c) Why is it necessary to maintain a vacuum inside the tube? (2 Marks)
(d) The accelerating voltage of an x-ray tube is 12V. Calculate the speed of the electron on reading the anode. (Charge to mass ratio of an electron $\frac{e}{me} = 1.76 \times 10^{11}$ (3 Marks)

16. (a) Define capacitance (1 Mark)
(b) In the figure below, a sharp pin is fixed on a cap of a leaf of the electroscope. The electroscope is highly charged and then left for some time.



State and explain the observation made after sometime (2 Marks)

(c) The figure below shows a circuit where a battery of e.m.f. 4.5V, switches A and B, two capacitors C_1 =0.6μF and C_2 = 1.0μF and a voltimeter are connected.

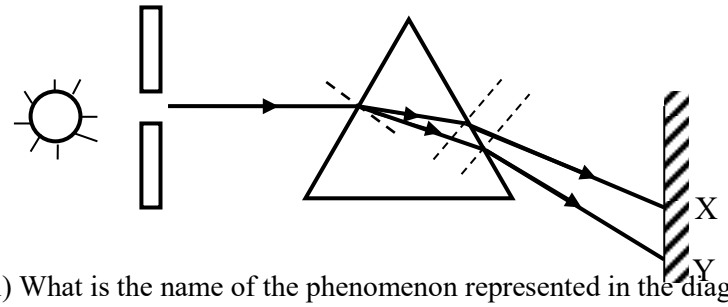


(i) Determine the charge on C_1 when both switch A is closed and switch B is open. (2 Marks)
(ii) What is the effective capacitance when both switches are closed? (2 Marks)
(iii) State and explain what is observed on the voltmeter when;
- Switch A is closed and switch B is open (2 Marks)

- Switch A is closed and B is closed (2 Marks)

(d) State two ways in which the capacitance of a parallel plate capacitor can be reduced. (2 Marks)

17. (a) The diagram below shows a narrow beam of white light onto a glass prism.



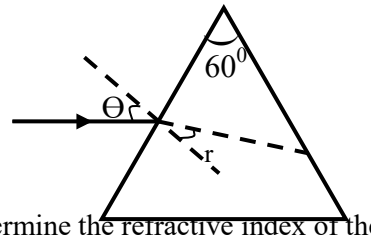
(i) What is the name of the phenomenon represented in the diagram? (1 Mark)

(ii) Name the colour at X and Y (2 Marks)

(iii) Give a reason for your answer in part (ii) above (1 Mark)

(iv) What is the purpose of the slit (1 Mark)

(b) The figure below shows the path of ray of yellow light through a glass prism. The speed of yellow light in the prism is 1.8×10^8 m/s

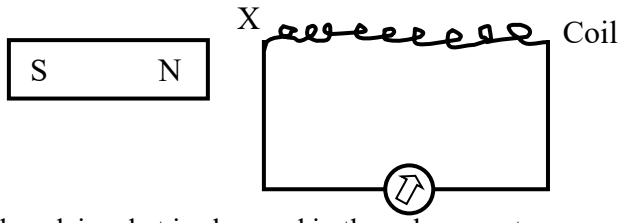


(i) Determine the refractive index of the prism material (Speed of light in vacuum, $C = 3.0 \times 10^8$ m/s) (3 Marks)

(ii) Show on the same diagram, the critical angle C and hence determine its value. (3 Marks)

(iii) Give that $r = 31.2^0$ determine the angle θ (3 Marks)

18. (a) In the figure below the bar magnet is moved into the coil.



State and explain what is observed in the galvanometer (2 Marks)

(b) State two ways in which energy is lost from a transformer and explain each. (2 Marks)

NAKURU CLUSTER
FORM FOUR TRIAL EXAMINATION 2018
232/3
PHYSICS

CONFIDENTIAL

Each candidate is required to have the following

- A clean burette
- Retort stand
- Two clamps and two bosses
- A metre rule
- Water in a 250ml beaker
- 100ml beaker
- A stop watch
- Two 200g masses
- Two pieces of thread approximately 15cm each
- About 200ml of water in a 250ml beaker labeled L
- A knife edge
- A vernier calipers

Each candidate will require the following

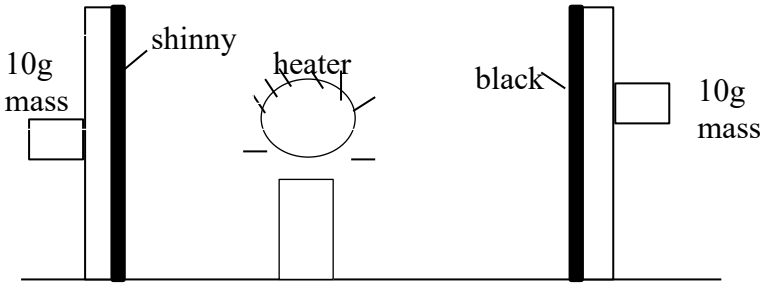
- One metre rule
- 100cm of Nichrome wire (S.W.G.28) free of kinks
- One retort stand, boss and clamp
- A stop watch
- An overflow (Eureka) can
- One 100ml beaker
- One 50ml measuring cylinder
- A piece of cotton thread about 30cm long
- Water in a 250ml beaker
- Two pieces of wood approximately 5cmx3cm by 0.5cm
- A micrometer screw gauge (to be shared)
- One three hundred gram (300g) mass with a hook Labeled m

Each candidate is required to have the following

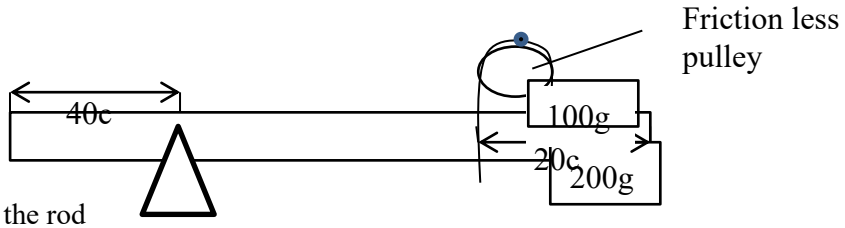
- Two dry cells (1.5V size D Eveready Red)
- An ammeter (0-1A)
- A voltmeter (0-5v)
- A cell holder
- Five connecting wires, two with crocodile clips
- A jockey
- A nichrome wire (SWG 28) mounted on a mm scale and labeled PQ

CEKENA
232/1
PHYSICS
SECTION A (25 MARKS)

1. A micrometer screw gauge with zero error of 0.01mm is used to determine the diameter of a marble whose diameter is 2.32mm.
   (i) State the reading taken when the marble is grasped by the jaws (1 mk)
   (ii) In the space below sketch the scale that gives the reading in (a) above if the micrometer has a pitch of 0.5mm (2 mks)
2. A motorbike negotiating a sharp bend may topple over if its speed exceeds a certain limit. Name the force that provides for the centripetal force (1 mk)
3. An elephant weighs 5000kg. Determine the pressure it exerts on the ground if its area of contact with the ground is $25cm^2$ (3 mks)
4. Smoke particles in air when strongly illuminated were observed to describe a continuous random and haphazard motion. Explain what would be observed if air temperature is decreased (2 mks
5. During hot weather some metal doors have been found not to close properly. Explain why (1 mk)
6. Two 10g masses were fixed using wax on the sides of two aluminium plates of same thickness. One of the plates was polished shinny while the other was painted black. The heater was placed close to the shinny plate but further away from the blackened plate. Explain why the two masses fell off at the sametimes (2 mks)

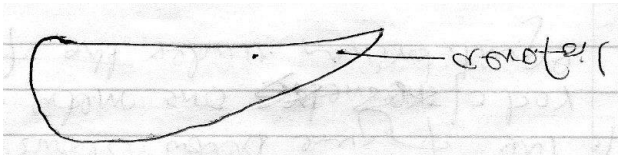


7. The figure below shows a uniform rod of one metre in length in equilibrium under the forces shown



Determine the weight of the rod (3 mks)

8. The pointer of a spring points at 2 cm when no load has been added. A mass of 200g is added and the pointer points at 6cm. Find the load that makes the pointer indicate 9.5cm (3 mks)
9. The diagram below shows an aerofoil. Use the diagram to explain how dynamic lift is achieved in an aeroplane (2 mks)



10. Define force in terms of momentum (1 mk)
11. On the axis below draw a velocity – time graph to show motion of a body thrown vertically upwards with an initial velocity of u,m/s upto the maximum height (1 mk)

12. State two factors that raise the boiling point of water (2 mks)
13. State newton's first law of motion (1 mk)

SECTION B (55 MARKS)

14. The table below shows the values of the square of velocity (V^2) and distance moved for a uniformity accelerated car. Use the informationin the table to answer the question that follows.

Distance S (m)	0	5	10	15	20	25	30
Square of velocity (v^2) (m/s)	4	29	54	79	104	129	154

(i) Plot a graph of the square of velocity (V^2) y – axis against the distance S (4 mks)

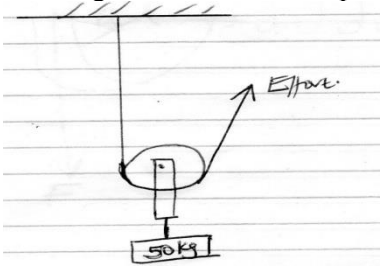
(ii) From the graph, find the acceleration of the car. (3 mks)

b) A block of mass 200 rests on a rough horizontal table. A force of 0.6N put the block so that it move with a constant acceleration of $1m/s^2$, calculate;

(i) The time taken to travel a distance of 200m (3 mks)

(ii) The frictional force between the block and the table (2 mks)

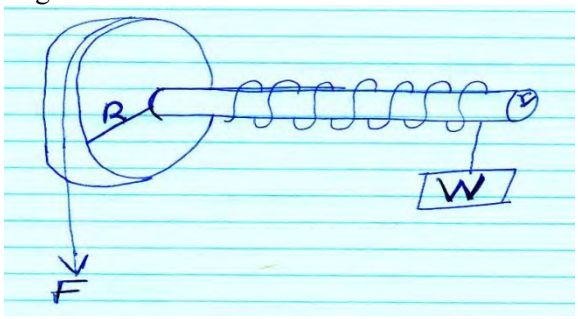
15. The diagram below shows a pulley system used to lift a load.



a) Determine the velocity ratio (1 mk)

b) If the effort used to raise the mass of 50kg uses 280N, find the efficiency of this pulley system (3 mks)

c) The figure below shows a wheel and axle used to raise a load W by applying an effort F. The radius of the large wheel is R1 and that of the small wheel is r.



(i) Given that r = 5cm and R = 8 cm, find the V.R (1 mk)

(ii) The mechanical advantage given that the efficiency of the system is 80% (2 mks)

(iii) The effort needed (2 mks)

16. a) Explain why water is a good coolant liquid in a car's engine cooling system (2 mks)

b) Water of mass 5kg initially at 18oC is heated in an electric kettle rated 2.5 kw. The heater is heated until it boils at 98^0C. Taking specific heat capacity of heater to be $4200Jkj^{-1}k^{-1}$, heat capacity of kettle 438J/kg, specific latent heat of vaporization of water = 2.28MJ/kg, Calculate;

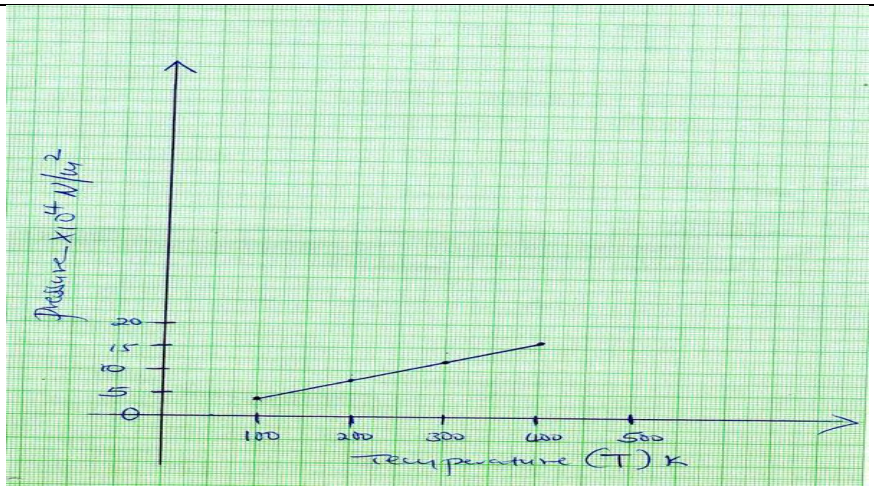
(i) The heat absorbed by the heater (2mks)

(ii) Heat absorbed by the electric kettle. Answer may be given in terms of t (2mks)

(iii) The time taken for the water to boil (2mks)

(iv) How much longer it will take to boil away all the water into vapour. (2mks)

17. a) The graph in the figure below shows the relationship between the pressure and temperature for a fixed mass of an ideal gas at constant volume.



Given that the relationship between, pressure P, and temperature T in kelvin is of the form P = MT + N, Determine;

(i) The value of M (2mks)

(ii) The value of N (1 mks)

b) A gas is put into a container of fixed volume at a pressure of 1.75 x 10^5N/m^2 and Temperature 22^0C. The gas is then heated to a temperature of 487^0C. Determine the new pressure (3 mks)

c) A column of air 5cm is trapped by mercury threed of 10cm as shown in the figure below. If the tube is laid horizontally as shown below, calculate the new length of trapped air. (Atmospheric pressure = 75.0cmHg and density of mercury = 13,600kg/m^3 (3 mks)

18. a) (i) Define angular velocity (1 mk)

(ii) A body going round in circular path at constant speed is said to be accelerated. Explain why? (1 mk)

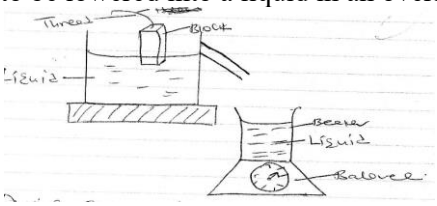
b) A stone of mass 200g is tied to a string 1m long and whirled round in a vertical circle at 2 revolutions per second

(i) Find the linear speed. (3 mks)

(ii) The maximum tension on the string given that acceleration of gravity, g = 10m/s^2 (3 mks)

19. a) State the law of floatation (1 mk)

b) The figure below shows a block with a graduated side and dimensions 4cm x 4cm by 16cm high just about to be lowered into a liquid in an overflow can



During an experiment with this set up the following results were recorded.

-The block floated with ¾ of it submerged.

- Initial reading of balance = 0g
- Final reading of balance = 154g

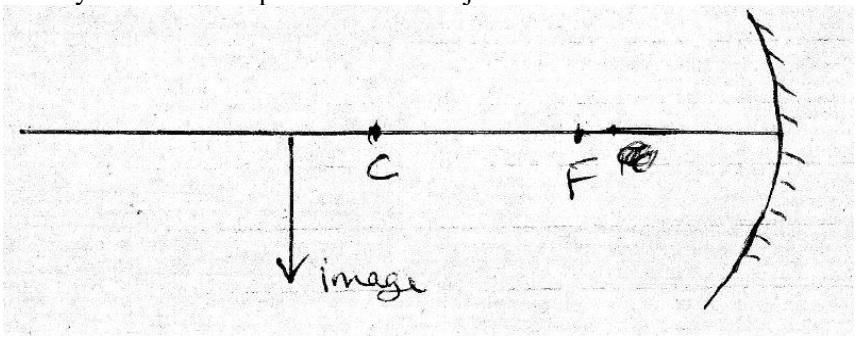
Use the information to determine the density of

(i) The block (3 mks)

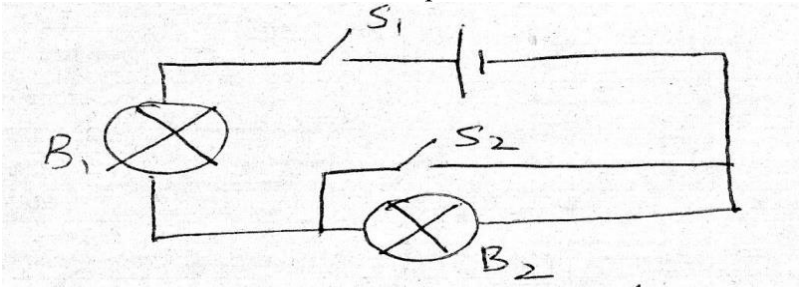
(ii) The liquid (3 mks)

CEKENA
232/2
PHYSICS
SECTION A (25 MARKS)

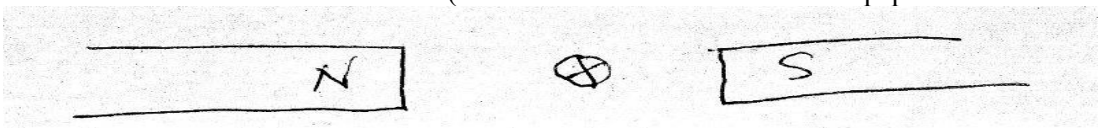
1. State the effects on an image on the pin-hole camera when more holes are added to the first hole (1 mk)
2. The diagram below shows an image of an object after reflection through a concave mirror.
   Use rays to locate the position of the object.



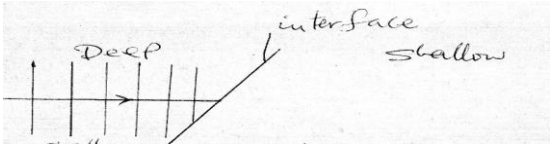
3. A negatively charged rod is brought near the cap of a lightly charged electroscope. The leaf first decreases in divergence butas the rod is brought nearer, it diverges more. Explain the behaviour of the leaf. (2 mks)
4. A form one student connected a simple electric circuit as shown in the figure below:-



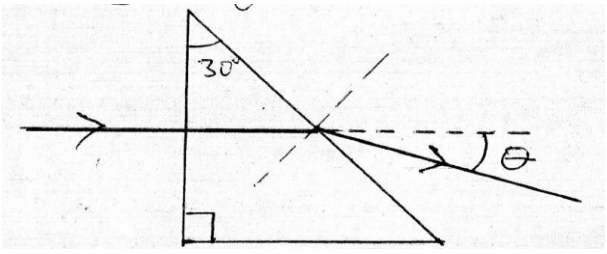
   State and explain the observation when switches S1 and S2 are both closed (2 mks)
5. The end of a bar magnet was taken near some office pins. The experiment was repeated using the middle part of the magnet. State and explain what happens (2 mks)
6. Sketch the magnetic field pattern between the two poles of the magnet shown below. Also show with an arrow the directions of the force on the wire (The current in the wire is into the paper (2 mks)



7. A certain broadcasting station is sending out waves at 98.6MHz. Find the wavelength of the waves given that speed of light is 3.0×10^8m/s. (3 mks)
8. A mine worker stands between two verticle cliffs 500m from the nearest cliff. The cliffs are X metres apart. Everytime he strikes two rocks together, he hears the first echo after 2.5s and the other coming 3s later. Calculate the value of X (3 mks)
9. The figure below shows plane water waves travelling from deep to shallow water. Sketch the wave pattern as they travel in the shallow region (2 mks)



10. The figure below shows a glass prism of refractive index 1.5



    Determine the value of angle Q (3 mks)

11. The table below shows electromagnetic spectrum arranged in order of decreasing frequency. Complete the gaps (2 mks)

Gamma rays		U.V	V.L		Micro waves	Radio waves

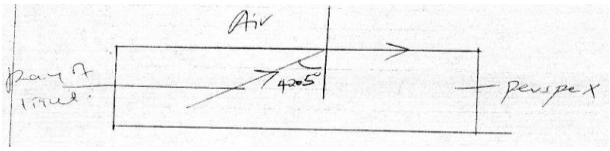
12. What causes local action in a simple cell (1 mk)

SECTION B (55 MARKS)

Answer all the questions in this section

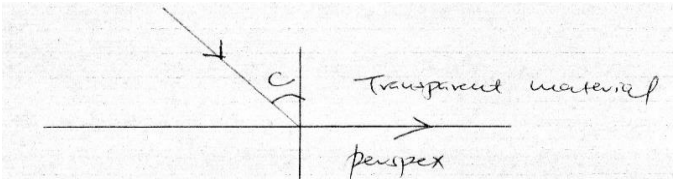
13. a)State two conditions necessary for total interval reflection to occur. (2 mks)

b) The figure below shows the path of a ray of light passing through a rectangular glass block of perspect placed in air. The angle of incidence is 42.5^0 as shown below



(i) Calculate the reflactive index of Perspex (3 mks)

(ii) A ray of liqht now travels from a transparent medium of reflactive index 2.4 into the Perspex as shown in the figure below



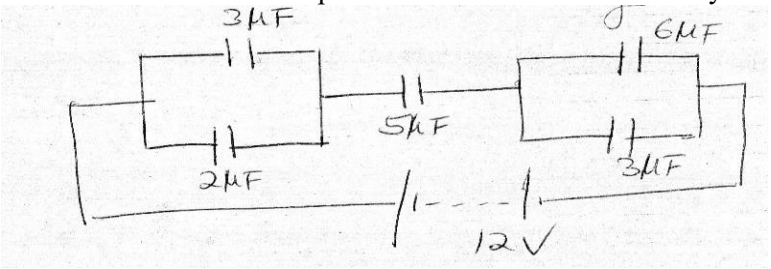
Calculate the critical angle, C (3 mks)

a. State any two application of prisms (2 mks)

14. a) Define capacitance of a capacitor (1 mk)

b) State the effect on the capacitance of increasing the distance of separation of a parallel plate capacitor. (1 mk)

c) The circuit below shows capacitor connected to a 12V battery.



(i) Find the combined capacitance (3 mks)

(ii) Find the total charge stored in the circuit (3 mks)

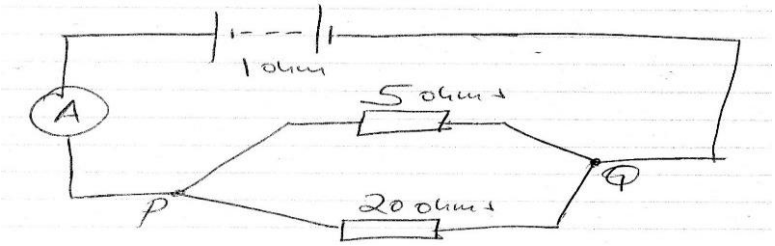
(iii) Find the charge on the 2uF capacitor (2 mks)

(iv) Find the total energy stored (3 mks)

15. a) State Ohm's law (1 mk)

b) Differentiate between ohmic and non-ohmic conductors (1 mk)

c) A batter of 12V and an interval resistance of 1 ohm is used in the circuit below.



Determine

(i) The ammeter reading (3 mks)

(ii) The reading on a voltmeter placed across the terminals of the battery (2 mks)

(iii) The reading on the voltmeter placed across pQ. (2 mks)

16. a) The figure below shows a human eye with a defect

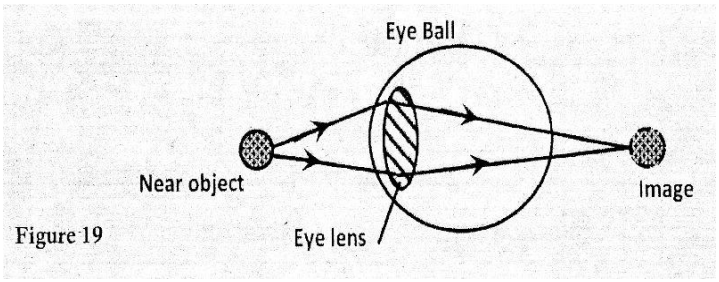


Figure 19

(i) Name the defect (1 mk)

(ii) State one possible cause of this defect (1 mk)

b) A lens forms an image that is four times the size of the object on a screen. If the distance between the object and the screen is 150cm, determine;

(i) Image distance (3 mks)

(ii) The focal length of the lens (2 mks)

(iii) The power of the lens (2 mks)

17. a) State why a fuse is always connected to the live wire in an electrical appliance not in the neutral (1 mk)

b) State two uses of the long pin in a 3 pin plug (2 mk)

c) The following electrical appliances are used in a certain house, ten 60w bulbs, one 2500watts electric kettle, one 300w television and one 250w refrigerator.

(i) Determine the rate of power consumption in the house when all appliances are switched on. (1mk)

(ii) The cost of electricity in a month if each appliance is on for 5 hours a day and electricity cost Ksh. 8.90 per unit,assume month of April (3 mks)

18. a) State Faradey's law of electro-magnetic induction (1 mk)

b) Two of the ways a transformer may loose energy are edd current losses and flux linkage. State one other (1 mk)

c) A transformer of 960turns in the primary coil and N turns in the secondary coil is connected to 240V main supply. Given that the transformer is 100% efficient and it will operate a bulb rated 6V, 24w, Find;

(i) The number of turns in the secondary coil (3mks)

(ii) The current flowing in the primary coil (3 mks)

(iii) Why is power transmission in the National grid done at very high voltage. (1 mk)

CEKENA
232/3
PHYSICS
CONFIDENTIAL

Question 1

- One jockey or crocodile clip
- Two new dry cells (size D)
- An ammeter 0 – 1A
- A voltimeter 0 – 5V
- A cell holder
- Switch, S
- Six connecting wires at least three crocodile clips at one end.
- A resistance wire mounted on a mm scale (SWG 28)

Question 2

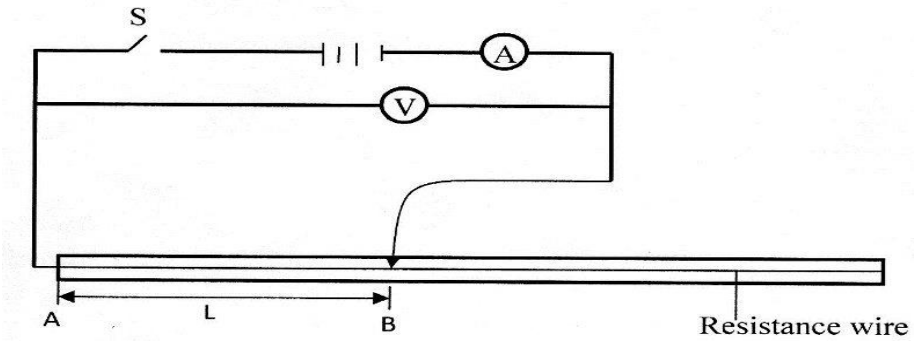
- Candle wax
- Source of heat
- Stop watch
- Boiling tube
- Thermometer
- Cork with a hole or cardboard with hole
- Water
- Tripond stand
- Test Tube holder
- A candle
- Metre rule
- White screen
- Lens holder
- Convex lens of focal length 20cm

CEKENA
232/3
PHYSICS
Question 1

1. You are provided with the following
   - ✓ One jockey or crocodile
   - ✓ Two new dry cells (Size D)
   - ✓ An ammeter 0 – 1A
   - ✓ A voltimeter 0 – 5V
   - ✓ A cell holder
   - ✓ Switch, S
   - ✓ Six connecting wires at least three with crocodile clips at on end
   - ✓ A resistance wire mounted on a mm scale.

Proceed as follows

a) Set up the circuit as shown in the figure below.



b) Using a micrometer screw guage, measure the diameter d, of the nichrome wire.
d = ...mm ($^1/_2$mk)
d = ...mm ($^1/_2$mk)

c) Close the switch and place the jockey/crocodile in contact with the resistance wire such that the length, L of the wire = 0.10m. Measure and record the current, I, through the wire AB and the potential difference, pd, (V) across. Record your results in table 1 below

L (m)	0.1	0.3	0.5	0.7	0.9
p.d (v)					
I (A)					
R = $^V/_I$ (Ω)					
1/I (A^{-1})					

d) Repeat procedure (b) above for the other values of L given in the table 1 above. Read and record corresponding values of I and v in table 1 above

e) Plot a graph of $^1/_I$ against R (5 mks)

f) Determine the slopes S of your graph (3 mks)

g) Given that $\frac{1}{I} = \frac{R}{E} + \frac{r}{E}$determine the value of

(i) E (3 mks)

(ii) r (2 mks)

QUESTION 2
PART A

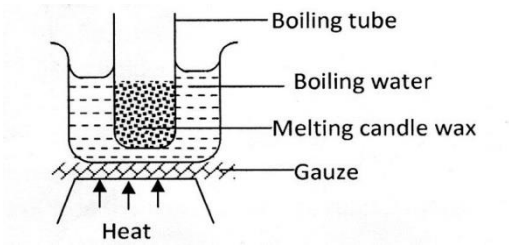
You are provided with the

- ✓ Candle wax
- ✓ Source of heat
- ✓ Stop watch
- ✓ Boiling tube
- ✓ Thermometer
- ✓ Cork with a hole or cardboard with hole
- ✓ Water
- ✓ Tripod stand
- ✓ Tube holder

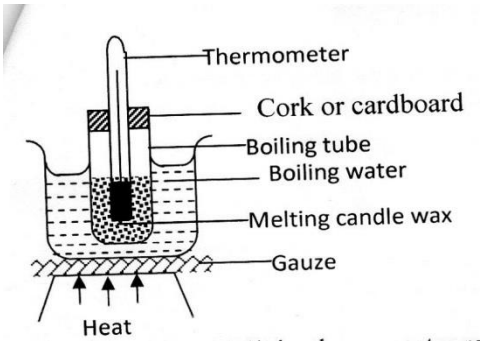
Proceed as follows:

(i) Heat the water in the beaker until it starts to boil

(ii) Place some candle wax in the boiling tube and heat the wax indirectly using the boiling water in beaker as shown in the figure below.



When the wax completely melted, continue heating for about two minutes. Meanwhile insert the thermometer in the boiling tube through the hole or cardboard. Adjust the thermometer until the bulb of the thermometer is completely immersed in melted wax.



Continue heating until the thermometer records no further change in temperature. This the maximum temperature reached. Record this temperature as $T_{max.}$

T_{max} = ... ^0C

(iii) Now remove the boiling tube from the boiling water and simultaneously start the stop watch. Record the temperature of the cooling wax at intervals of two minutes. Record and complete Table 2 below.

(5 mks)

Time (min)	0	2	4	6	8	10	12
Temperature (^0C)							

(iv) In the axis below plot a graph of temparature, ^0C against time, t (5 mks)

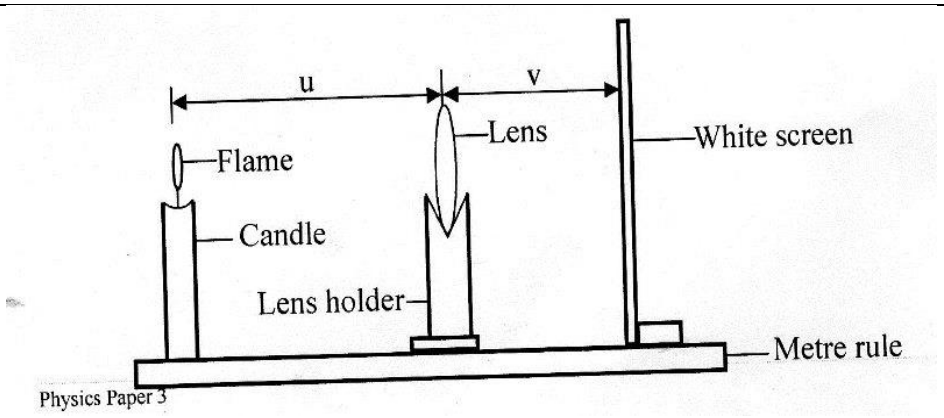
(v) Determine the rate of cooling at t= 5 min. (3 mks)

PART B

2. You are provided with the following:
   - ✓ A candle
   - ✓ Metre rule
   - ✓ White screen
   - ✓ Lens holder
   - ✓ Convex lens

Proceed as follows:

a) Place the lens on a metre rule. Arrange the set up as shown in the figure below.



b) Adjust the position of the lens so that it is a distance u = 30cm from the candle. Adjust the position of the screen until a well focused image of the flame is formed on the screen. Measure and record in the table 2, the image distance v, between the screen and lens.

c) Repeat part (b) for other values of (u) shown in the table 3 and complete the table.

u (cm)	30	35	40
v (cm)			
x = $\frac{v}{u}$			
y = $\frac{v}{(x+1)(cm)}$			

Determine the mean value of y (2 mks)

KASSU JET EXAMINATION - 2018
232/1
PHYSICS
PAPER ONE

1. A micrometer screw gauge has a zero error of 0.12mm.Sketch the reading of the micrometer screw gauge when used to measure the size of a ball of diameter 3.44mm. (1 mark)
2. **Figure 1 (a) and 1(b)** shows capillary tubes inserted in water and mercury respectively.

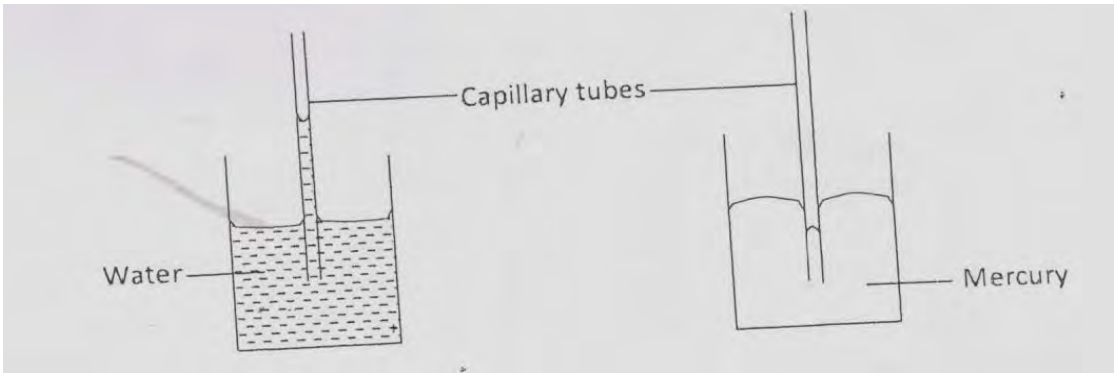


Figure 1(a) **Figure 1(b)**

It is observed that in water the meniscus in the capillary tube is higher than the meniscus in the beaker, while in mercury the meniscus in the capillary tube is lower than the meniscus in the beaker. Explain these observations. (2 marks)

3. A block of mass 500g and measuring 30cm by 25cm by 15cm rests on a flat floor. Determine maximum pressure exerted on the floor. (3 marks)
4. In **figure 2** ammonia gas and an acid gas diffuse and react to form a white deposit on the walls of the glass tube. Explain why the white deposit forms nearer end B than A. (1mark)

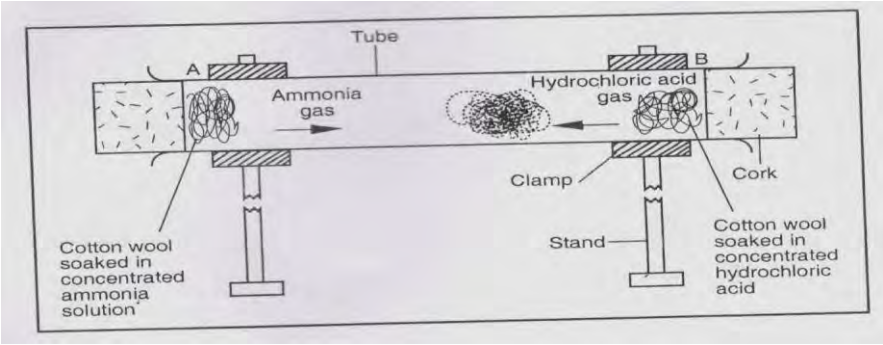


Figure 2

5. A man wants to fit a brass ring tightly onto a steel rod of equal diameter to the inner diameter of the ring. Explain how this can be achieved. (2 marks)
6. State how conduction and radiation is minimized in a thermos flask. (2 marks)
7. A body moving around a circle is accelerating and yet the speed is constant. Explain. (1 mark)

8. **Figure 3** shows a uniform bar of mass 0.8kg supported by a spring balance at its centre and the bar is at equilibrium.

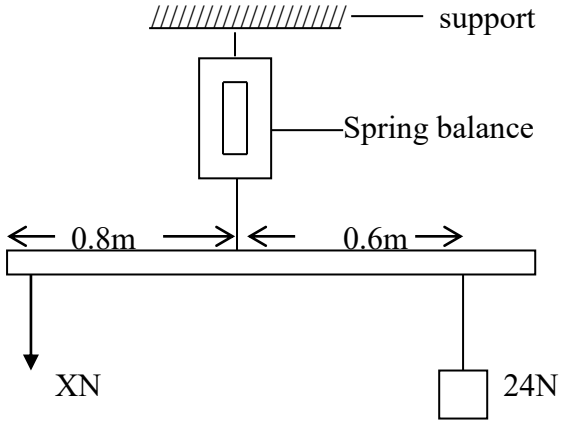


Figure 3

Determine the:

(a) value of X (3 marks)

(b) reading of the spring balance (1mark)

9. **Figure 4** shows a load-extension graph for various loads hung from a single spring.

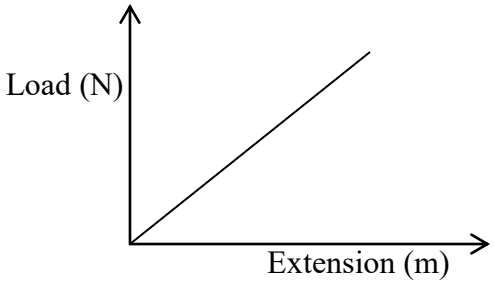


Figure 4

On the same axes, sketch a graph for a spring double the diameter of the first one. (1mark)

10. An aeroplane is moving horizontally through still air at uniform speed. State with reason what is observed when the speed of the plane is increased. (2marks)

11. A crane lifts a load of 2000kg through a vertical distance of 4.0 m in 5 seconds. Determine the power developed by the crane. (3 marks)

12. Sketch a displacement time graph for a freely falling body and describe the motion. (2marks)

13. State Newton's first law of motion. (1mark)

SECTION B (55 marks)

*Answer **ALL** the questions in this section in the spaces provided.*

14. **Figure 5** shows a crate of mass 70kg being pushed by a man with a force of 150 N along the plane AB.

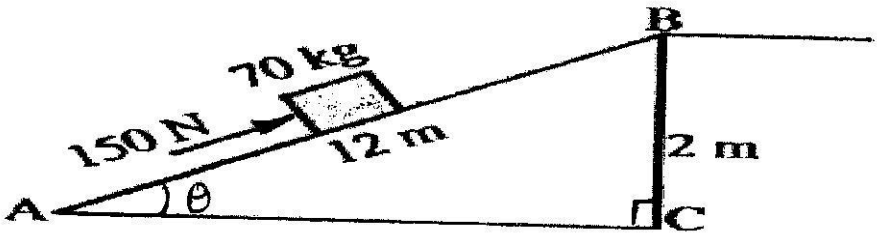


Figure 5

(a) Show that V.R of the inclined plane is given by $\frac{1}{Sin\theta}$ (2 marks)

(b) Determine the work done:
(i) by the force of the man. (2marks)
(ii) on the mass. (2marks)
(iii) to overcome friction. (1mark)

(c) Determine the efficiency of the inclined plane. (2marks)

(d) Suggest one method of improving the efficiency of an inclined plane. (1mark)

15.(a) **Figure 6** shows incomplete set up that can be used in an experiment to determine the specific heat capacity of a solid of mass m by electrical method.

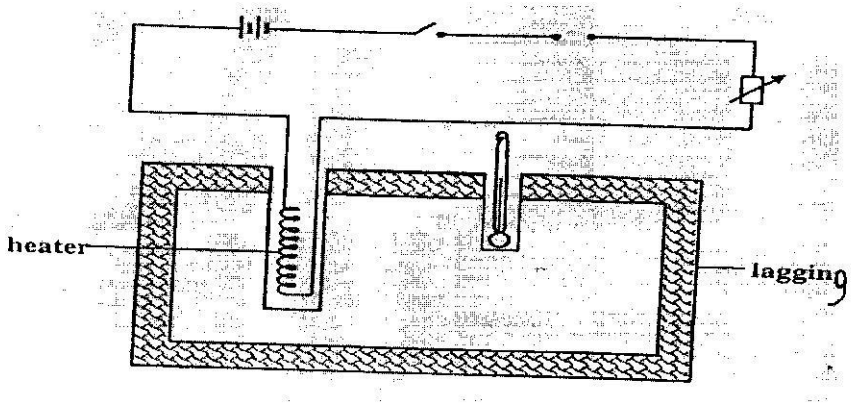


Figure 6

(i) Complete the diagram by inserting the missing components for the experiment to work. (2 marks)

(ii) State four measurements that should be taken. (2 marks)

(iii) The final temperature was recorded as Θ. Write an expression that can be used to determine the specific heat capacity of the solid. (2 marks)

(b) **Figure 7** shows a graph of temperature against time for a 200g mass of ice at -14^{0}C slowly heated by an electric heater of power 30W.

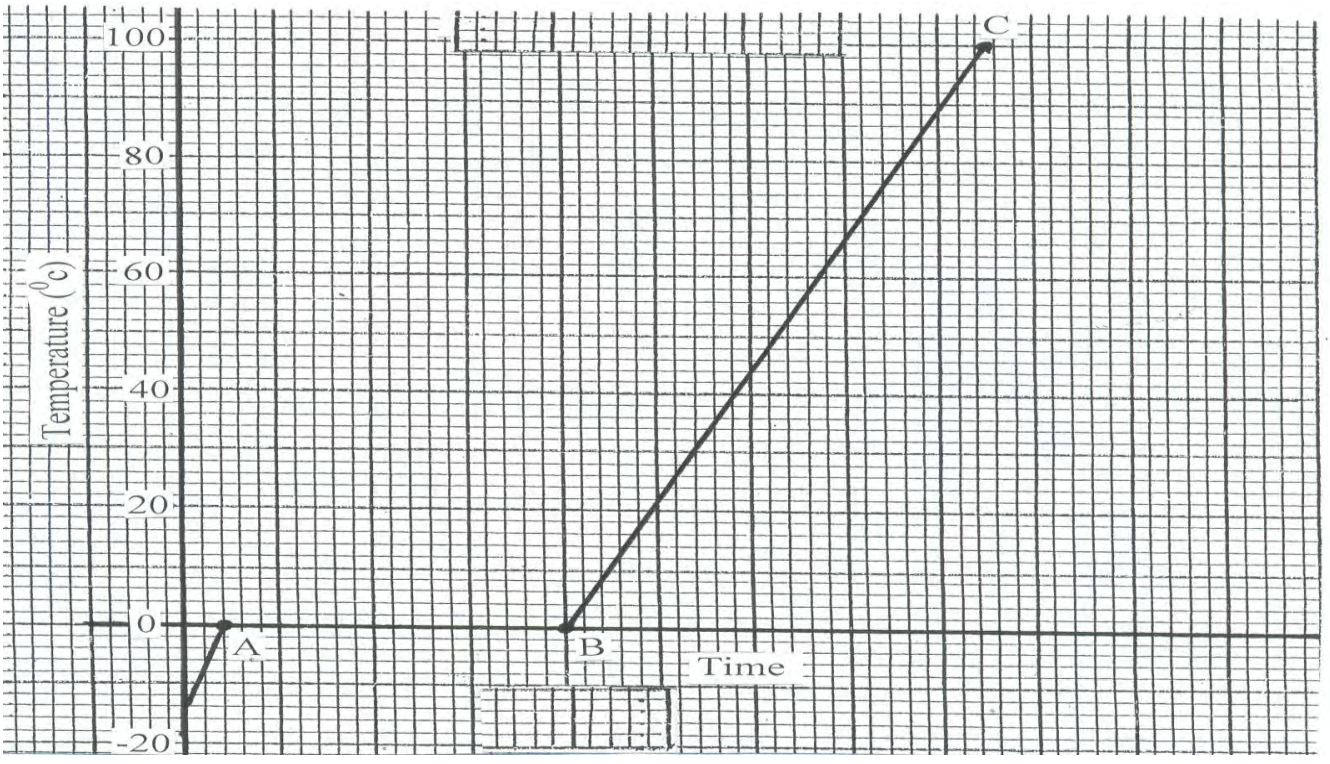


Figure 7

I) Determine the:-
(i) the time corresponding to the line AB (2marks)
(ii) The time corresponding to the line BC (2marks)
II) Determine the specific heat capacity of ice (3marks)
(Specific heat capacity of water = 4200J/kgK and specific latent heat of fusion of ice = 336000J/kg)

16. (a) When the temperature of a gas in a closed container is raised, the pressure of the gas increases. Explain how the molecules of the gas cause the increase in pressure. (2 marks)
(b) **Figure 8** shows a set up that may be used to verify Boyle's law.

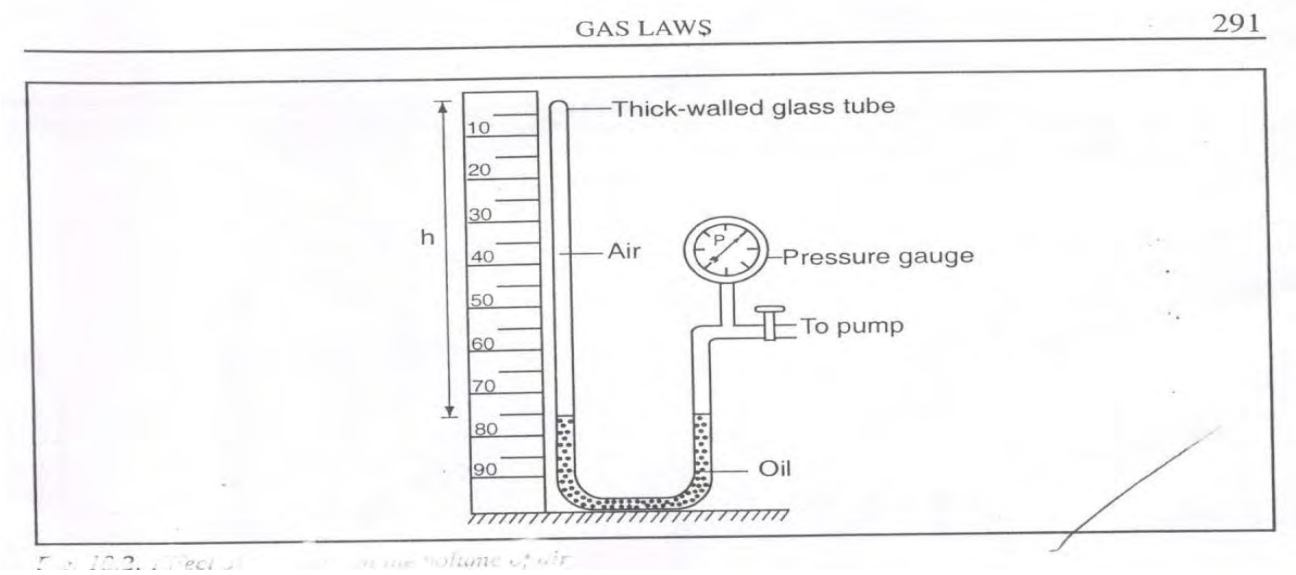


Figure 8

(i) State the measurements that should be taken in the experiment. (2 marks)
(ii) Explain how the measurements taken in (i) above may be used to verify Boyle's law. (3 marks)
(c) A certain mass of hydrogen gas occupies a volume of $1.5m^3$ at a pressure of $1.6x10^5$Pa and temperature 14^0C.Determine its volume when the temperature is 0^oC at a pressure of $1.0x10^5$ Pa (3 marks)

17. (a) State the principle of conservation of linear momentum. (1 mark)
(b) Distinguish between elastic and inelastic collision. (1 mark)
(c) A striker kicks a ball of mass 200g initially at rest with a force of 78N.Given that the foot was in contact with the ball for 0.30s; determine the take off velocity of the ball. (3 marks)
(d) A high jumper usually lands on thick soft mattress. Explain how the mattress helps in reducing the force of impact. (2 marks)
(e) A ball is thrown horizontally from the top of a vertical tower of height 75m and strikes the ground at a point 80m from the bottom of the tower. Determine the:
(i) time taken by the ball to hit the ground. (*Acceleration due to gravity=10m/s^2)* (3 marks)
(ii) initial horizontal velocity of the ball. (2 marks)

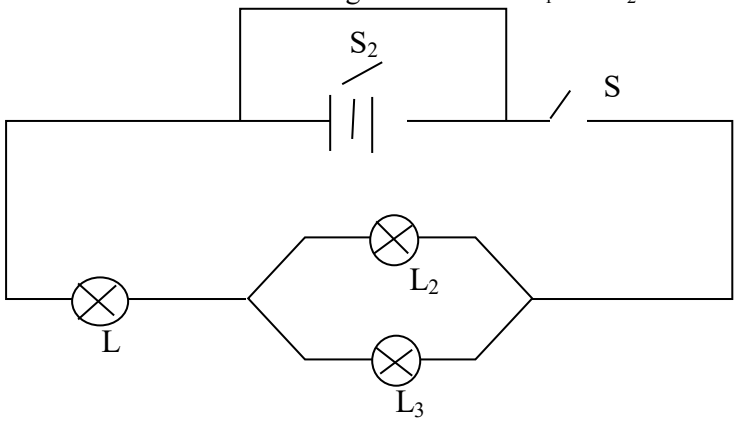
18 (a) State the Archimedes' principle. (1 mark)
(b) A block of wood of mass 300g is held under water by a string attached to the bottom of the container. The tension in the string is 0.6N.Determine the density of the wood.*(Gravitational field strength =10N/kg and Density of water=1000kg/m^3*) (4marks)
(c) Define angular velocity. (1mark)
(d) State one way in which the centripetal force on a body of mass m can be reduced. (1 mark)
(e) A turntable of radius 5cm is rotating at 40 revolutions per second. Determine the linear speed of a point on the circumference of the turn table. (3 marks)

Signature:.....

KASSU J O I N T E X A M I N A T I O N - 2018
232/2
PHYSICS
JUNE 2018
TIME: 2 HRS

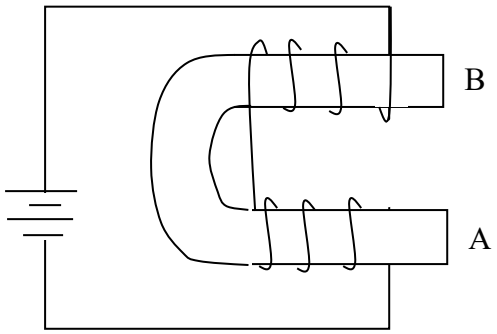
SECTION A (45 MARKS)

1. Determine the number of images formed when an object is placed between two plane mirrors inclined at an angle of 20^0 to each other. **(1 mark)**
2. State and explain what will be observed when a wire is connected between a positively charged electroscope and uncharged electroscope. **(2 marks)**
3. Figure shows an electrical circuit including two switches S_1 and S_2 and three identical lamps L_1, L_2, L_3.



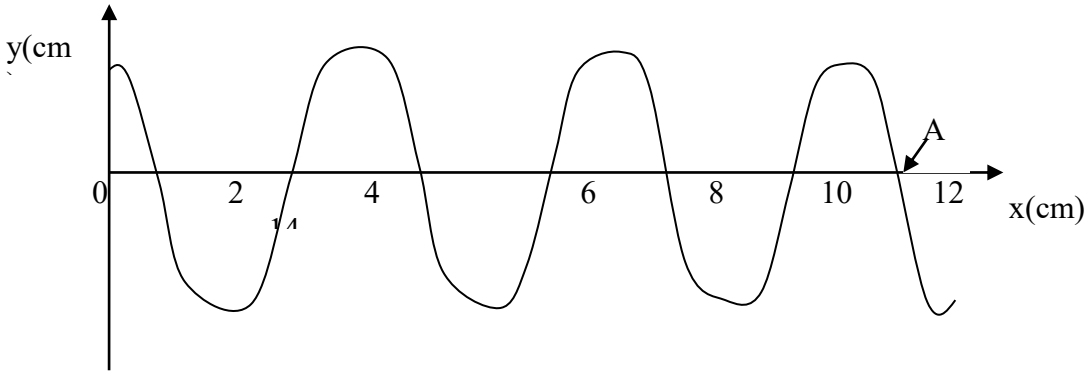
(i) Compare the brightness of L_1 and L_2 when switch S_1 is closed. **(1 mark)**
(ii) State what will be observed when all the switches are closed **(1 mark)**

4. (a) The figure below shows a horse shoe electromagnet. Determine the polarity at the ends A and B. **(1 mark)**



(b) Two steel needles are placed at the poles A and B state and explain what happens to the needles. **(2 marks)**

5. An object 5cm tall is placed 20cm in front of a concave mirror of focal length 15cm. Using a ray diagram and the grid below, determine the distance of the image from the object. (2 marks)
6. Figure shows a transverse wave travelling along the x-axis



If the time taken by the wave to move from O to A is 0.13 seconds determine the;

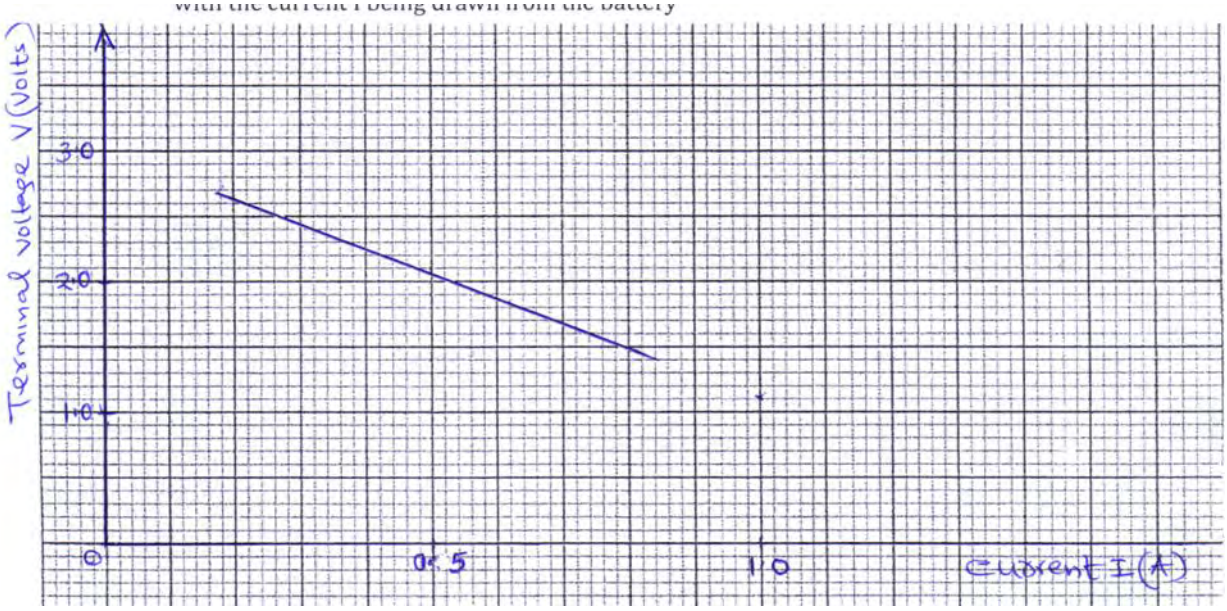
(i) Frequency of the wave. **(1 mark)**

(ii) Speed of the wave. **(2 marks)**

7. (i) An optical fibre provides an efficient way of transmitting light energy. State and explain the property of light behind its functioning. **(2 marks)**

   (ii) State the advantage of optical fibre over ordinary cables. **(1 mark)**

8. The graph below shows how the terminal voltage V of a certain battery varies with the current I being drawn from the battery



Given that E = I (R+r)

From the graph determine the

I. internal resistance r of the battery. **(2 marks)**

II. e.m.f E of the battery. **(1 mark)**

9. Arrange the following radiation in the order of their increasing energy given the radiations below and their wavelengths. **(1 mark)**

Type of radiation	Yellow light	Gamma rays	Radio waves	Micro wave
Wave length (m)	3.0×10^{-7}	3×10^{-14}	300	3×10^{-3}

10. State Lenz's law. **(1 mark)**

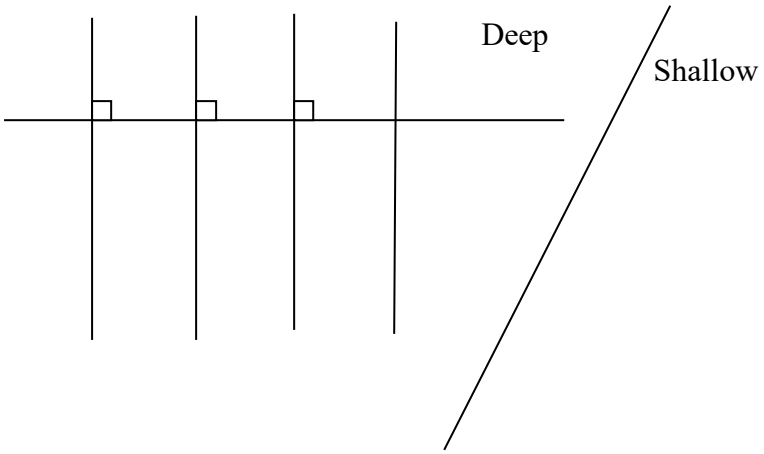
11. A consumer has the following appliances operating in his house for the time indicated in a day.
    - Two 60W, 250V bulbs for 30minutes
    - One 1000W, 250V fridge for 10hours
    - One 3KW, 250V heater for 2 hours

    Calculate:

    (a) total power used in kwh in 30 days assuming that power consumption per day is the same. **(2 marks)**

    (b) cost of electricity consumed in 30 days if 1 unit cost sh.1.50 **(1 mark)**

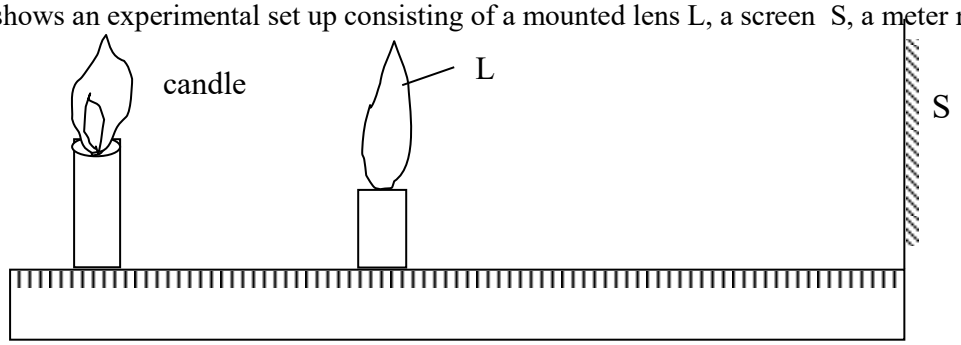
12. The diagram below shows water ripples generated in a ripple tank moving from deep to shallow end.



Sketch on the same diagram the refracted waves. (1 mark)

SECTION B (55 MARKS)

13.(a) Figure shows an experimental set up consisting of a mounted lens L, a screen S, a meter rule and a candle.



(i) Describe how the setup may be used to determine the focal length f of the lens. **(5 marks)**

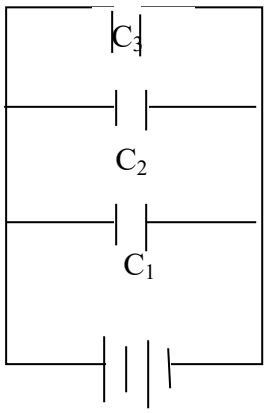
(ii) State the reason why the setup would not work if the lens was replaced with a diverging lens. **(1 mark)**

(b) (i) A real object of height 1 cm placed 5cm from a converging lens forms a virtual image 10cm from the lens (i) determine the focal length of the lens. **(2 marks)**

(ii) On the grid provided draw to scale the ray diagram for the setup to show how the image is formed. **(2 marks)**

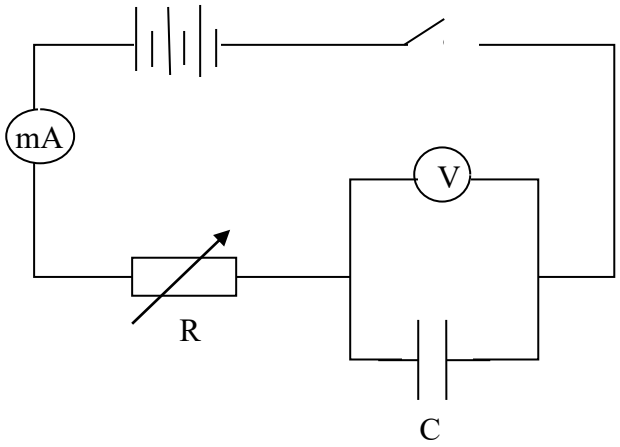
14. (a) State one factor that affects the capacitance of a parallel plate capacitor. **(1 mark)**

(b) The figure below shows three capacitors C_1, C_2 and C_3 connected in parallel to a battery V.



Show that the effective capacitance C_T is given by $C_T = C_1 + C_2 + C_3$ **(2 marks)**

(c) The figure below shows a circuit for charging a capacitor



(i) State what is observed on the following when the switch S is closed

I. the milliammeter (1 mark)

II. the voltmeter (1 mark)

(ii) Explain how the capacitor works. (2 marks)

(iii) State the purpose of the resistor R. (1 mark)

(iv) Sketch the graph of voltage V (y-axis) against time t when the switch is closed. (2 marks)

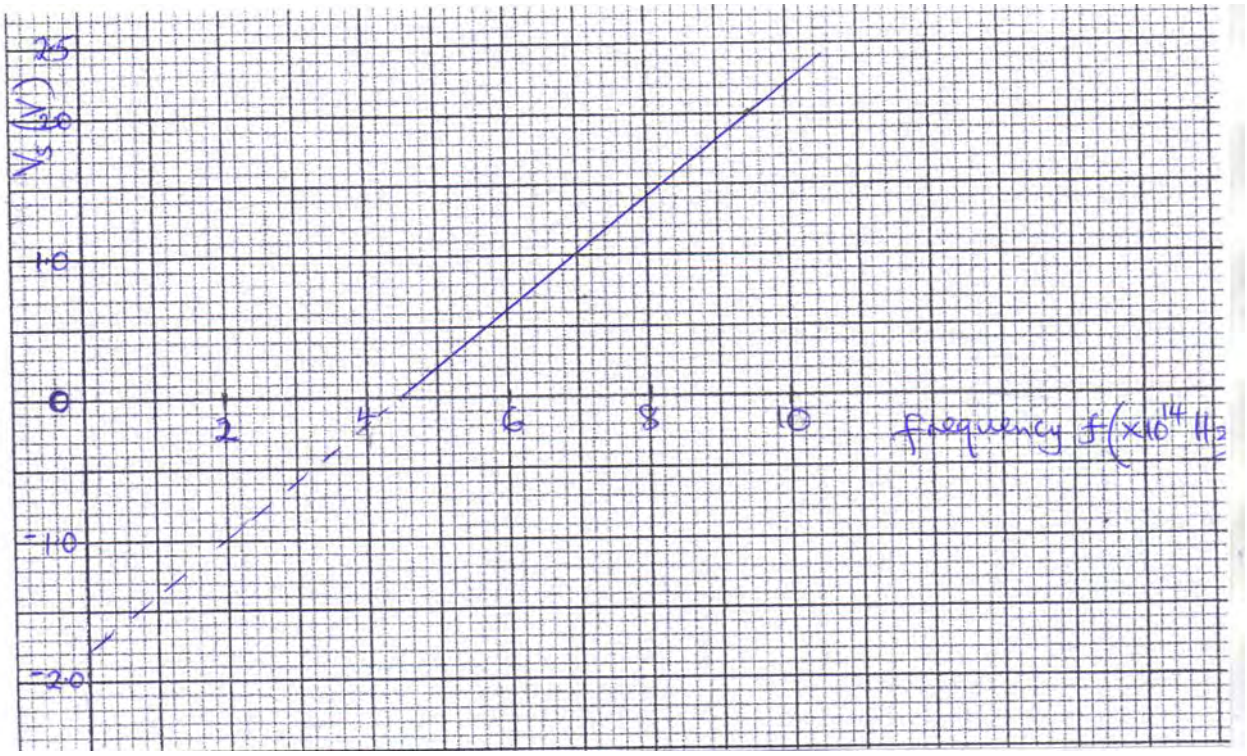
15. (a) State **two** factors that affect photo electric effects. **(2 marks)**

(b) Define the following terms. **(2 marks)**

(i) work function (Wo)

(ii) threshold frequency (f_o)

(c) Light beam was radiated onto a metal surface in an experiment and the results obtained were used to plot a graph of stopping potential Vs against frequency f of the radiation as shown



From the graph determine:-

(i) the threshold wavelength λ_o (2 marks)

(ii) Planck's constant h given that

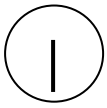
$hf = hf_o + eV_s$ $e = 1.6 \times 10^{-19}c$

$c = 3.0 \times 10^8 m/s$ (2 marks)

(iii) work function Wo (in eV) (2 marks)

(iv) Draw on the same axis a graph for a metal of lower work function. (1 mark)

16. (a) With the time base switched off the trace shown below was observed in a C.R.O. State the nature of the p.d applied and state to which plate it was applied. (1 mark)



(b) With the time base switched on the trace shown below was observed in a C.R.O. State the nature of the p.d applied and state to which plate it was applied. (2 marks)

(c) How can a radiographer increase the;

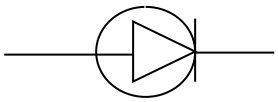
(i) intensity (1 mark)

(ii) energy of x-rays produced by an x-ray tube. (1 mark)

(d) Calculate wavelength of x-rays whose energy is 9.5eV given that

$c = 3.0 \times 10^8 m/s$, $h = 6.63 \times 10^{-34} JS$ and $1eV = 1.6 \times 10^{-19} J$. **(3 marks)**

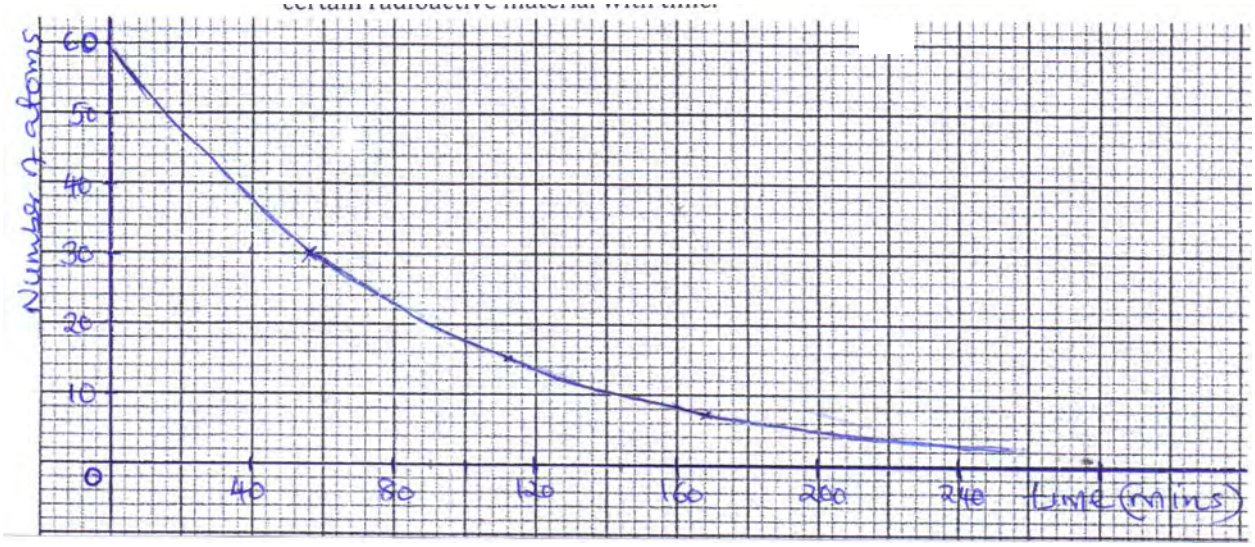
17. (a) The diagram below shows a junction diode. Complete the diagram to show how the diode can be connected in a reverse bias mode. **(1 mark)**



(b) Explain how an n-type semi-conductor is formed. **(1 mark)**

(c) (i) Define half-life of a radioactive material. **(1 mark)**

(iii) Figure below shows a graph of variation of the number of atoms of a certain radioactive material with time.



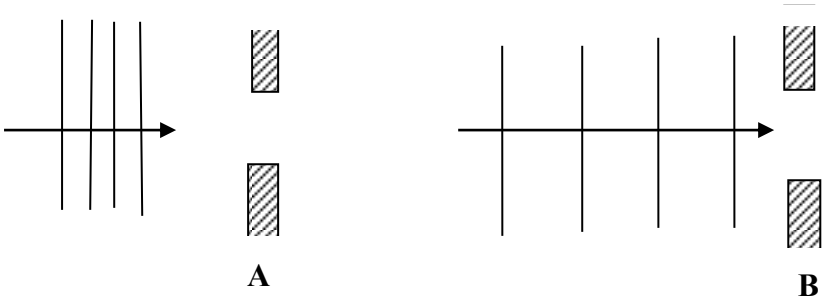
Determine the half-life of the material. **(1 mark)**

(iii) Cobalt -60 is a radioactive isotope of half-life 5.25years. What fraction of the original atoms in a sample will have decayed after 21 years? **(3 marks)**

18. (a) Distinguish between transverse waves and longitudinal waves. **(1 mark)**

(b) A ship in an ocean sends out an ultra sound whose echo is received after 3 seconds. If the wavelength of the ultra sound in water is 7.5cm and the frequency of the transmitter is 20 KHz; determine the depth of the ocean. **(3 marks)**

(c) Figure shows water waves of different wavelengths incident on identical apertures A and B.



Complete the diagrams to show the patterns of the waves beyond the aperture in each case. **(2 marks)**

(d) Figure shows two speakers S_1 and S_2 which produce sound of the same frequency they are placed equidistant from a line AB and a line PQ (PQ is perpendicular to line AB.

(i) A student walking from A to B hears alternating loud and soft sounds. Explain why at some points the sound heard is loud. **(2 marks)**

(ii) State the nature of the sound the student hears if he walks along line PQ. **(1 mark)**

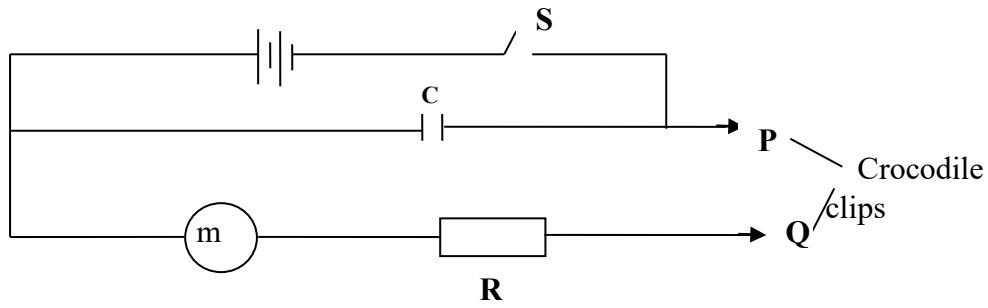
KASSU JET EXAMINATION
232/3
PHYSICS PAPER 3
(PRACTICAL)

Question one
You are provided with the following:

- 2 new dry cells size D
- A cell holder
- A switch
- A milliammeter of range 0 to 1 mA
- A capacitor labeled C
- 8 connecting wires; at least four with crocodile clips on one end
- A stopwatch
- A carbon resistor labeled **R**

Proceed as follows

a. Connect the circuit as shown in the **figure 1**below, where **P** and **Q** are crocodile clips.



b. Close the switch **S**
c. Name the process which takes place when the switch **S** is closed (1 mark)
d. Connect the crocodile clips P and Q. Observe and record the highest reading of the milliammeter $\mathbf{I_o}$ **(** This is the current at $t_0 = 0$)
$\mathbf{I_o}$ = …… mA (1 mark)
e. While the milliammeter show the maximum value of current I_o, open the switch S and start the stop watch simultaneously. Stop the stop watch when the current has dropped from I_o to 0.5 mA. Read and record in the table below the time taken
f. Reset the stop watch and close the switch. Repeat the procedure in (e) to measure and record the time taken for the current to drop from $\mathbf{I_o}$ to each of the other values shown in the table below.
(8 marks)

Current **I** (mA)	**0.5**	**0.4**	**0.3**	**0.2**	**0.1**
Time **t** (s)					

g. Plot a graph of Current **I** (y – axis)(mA) against time **t** (s) (5 marks)
h. From your graph, find **W** the value of **I** when **t = 10s**. (2 marks)
i. Given that **A = 10W**, determine the value of **A.** (2 marks)
j. Determine the voltage across **R** at **t = 10s** given that R = 4.7k**Ω** (1 mark)

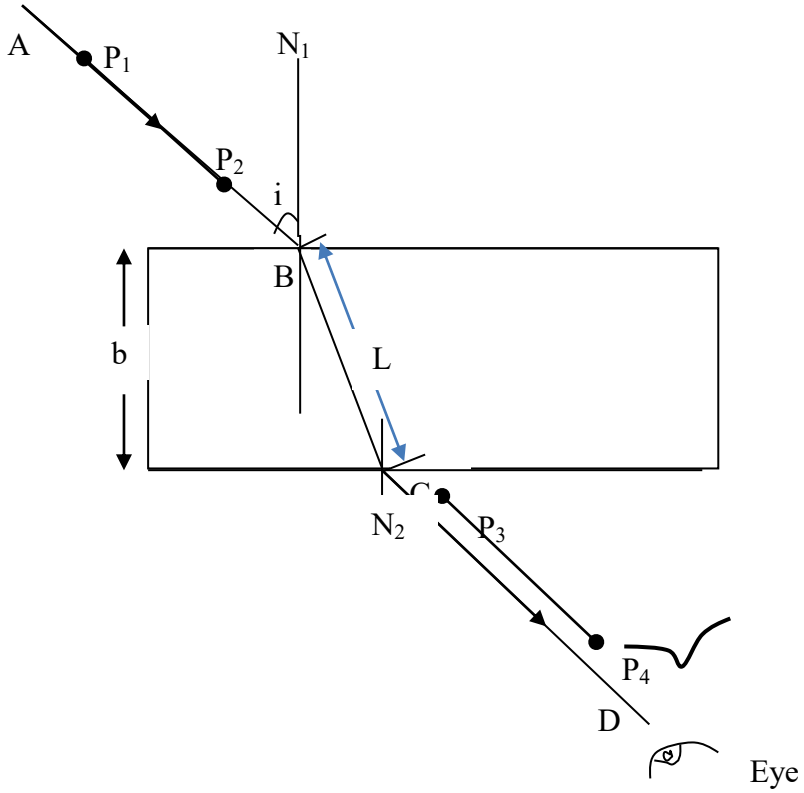
Question Two

You are provided with the following;

- a rectangular glass block
- 4 optical pins
- 2 thumb pins
- a soft board
- a plain paper

Proceed as follows:

(a) Place the glass block on the plain paper with one of the largest face upper most. Trace round the glass block using a pencil as shown below.



(b) Remove the glass block and construct a normal at B. Construct an incident ray AB of angle of incidence, i = 20^0.

(c) Measure the breadth **b** of the glass block

breadth **b** =…… (1 mark)

(c) Replace the glass block and trace the ray ABCD using the optical pins.

(d) Remove the glass block and draw the path of the ray ABCD using a pencil.

(e) Measure the length L and record it in the table below

Angle i^0	L (cm)	L^2 $(cm)^2$	$\frac{1}{L^2}$ $(cm\text{-}^2)$	$Sin^2 i$
20				0.1170
30				0.25
40				0.4312
50				0.5868
60				0.75
70				0.8830

(6 marks)

(f) Repeat the procedure above for the angles of incidence given.

(g) Calculate the values of $\frac{1}{L^2}$ and record in the table above.

(h) Plot a graph of $\frac{1}{L^2}$ (y-axis) against Sin^2i. **(5 marks)**

(i) Calculate the gradient **S** of the graph **(3 marks)**

Given that the equation of that graph is; $\frac{1}{L^2} = -\left(\frac{1}{n^2b^2}\right) \text{Sin}^2 i + \frac{1}{b^2}$

(j) Determine the value of ***n*** (3 marks)

(k) Present your work sheet; attached to the exam paper (2 mark)

KASSU JET 2018
PHYSICS PAPER 3
CONFIDENTIAL

The following apparatus should be provided for the Physics practical paper;

Question one
You are provided with the following:

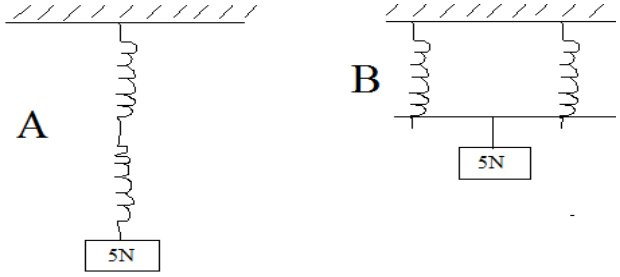
- 2 new dry cells size D
- A cell holder
- A switch
- A millimeter of range 0 to 1 mA
- A capacitor labeled C (2200μF)
- 8 connecting wires; at least four with crocodile clips on one end
- A stopwatch
- A carbon resistor labeled **R (4.7KΩ)**

Question Two
You are provided with the following;

- a rectangular glass block of dimensions; 9.6cm X 6.0cm X 2.4cm (Tolerance + or – 0.2cm)
- 4 optical pins
- 2 thumb pins
- a soft board
- a plain paper

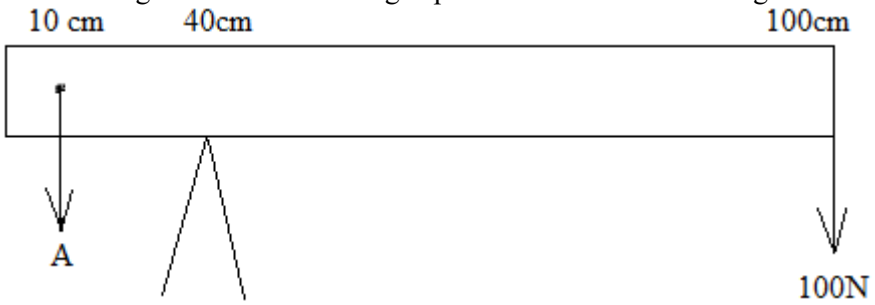
CEKENA MOCK
232/1
PHYSICS
SECTION A (25 MARKS)

1. The mass of a density bottle is 20g when empty, 70g when full of water and 69.5g when full of another liquid. Calculate the density of the other liquid. (3mks)
2. A student heated some pure water and noticed it boiled at 94^0c instead of 100^0c. If the thermometer was not faulty, what is the possible cause of this? (1mk)
3. The springs in the figure below are identical



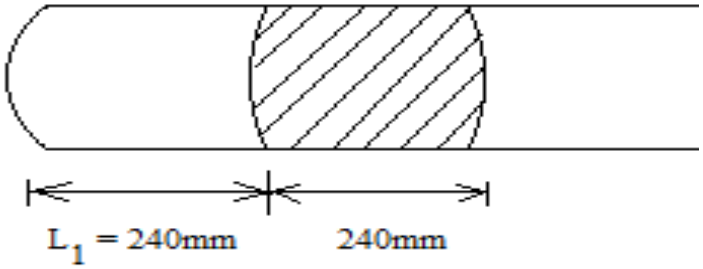
The extension produced in A is 4cm. Determine the extension produced in B. (3mks)

4. Explain why methylated spirit at room temperature when poured on the back of the palm makes the palm to feel very cold (2mks)
5. State why a pin floating on water sinks when a detergent is added. (1mk)
6. Water flows through a tube of length 50cm and of cross-sectional area $50cm^2$ in 2.5 seconds. Calculate the rate of flow in cubic metres per second. (2mks)
7. A uniform wooden bar of length 1m and mass 800g is pivoted at 40cm as in the figure below.



Calculate the value of force A if the system is to be in equilibrium. (3mks)

8. Name a branch of physics that deals with the study of light and its properties (1mk)
9. The reading on a mercury barometer at Mombasa is 760mm. Calculate the pressure at Mombasa in Nm^{-2} (Density of mercury is 1.36×10^4 Kgm^3) (2mks)
10. A car decelerated uniformly from a velocity of 20m/s to rest in 4 sec. If it took 4 sec. to reverse with a uniform acceleration to its original starting point sketch a velocity – time graph of the motion (2mks)
11. Air is trapped inside a glass tube by a thread of mercury of 240mm long. When the tube is held horizontally the length of air column is 240mm

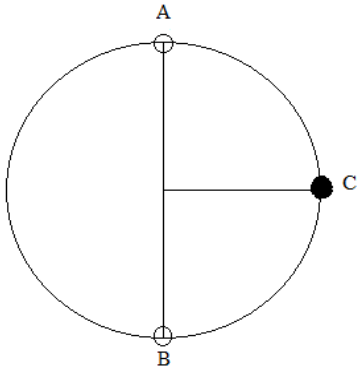


Assuming that the atmospheric pressure is 750mmHg and the temperature is constant, calculate the length of air column when the tube is held vertical with open end up. (2mks)

12. State the purpose of the constriction in a clinical thermometer. (1mk)
13. Using particulate nature of matter, explain why a solid expands when heated. (2mks)

SECTION B (55 MARKS)
Attempt all questions in this section

14. a) Define angular velocity (1mk)
    b) The diagram below shows an object of mass 2kg being whirled in a vertical circle of radius 0.6m, at a uniform speed of 50m/s



Determine

i) the centripetal force on the object. (3mks)

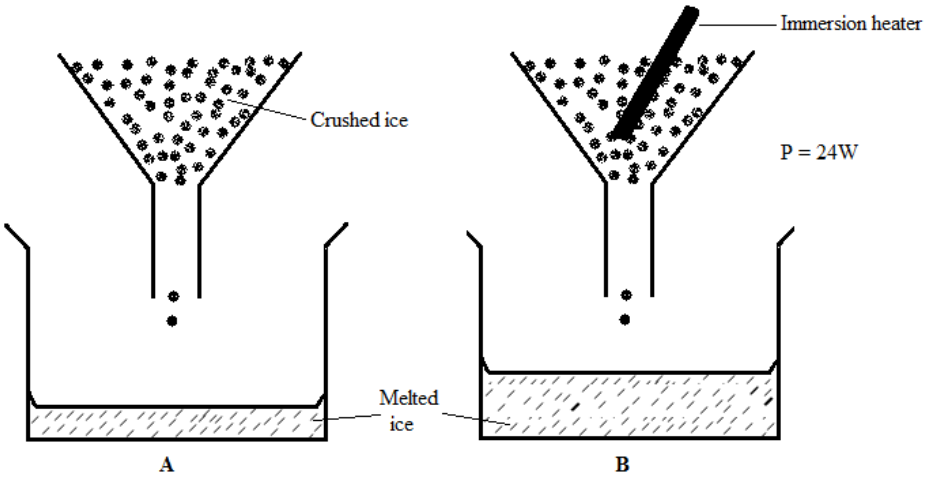
ii) the tension in the string when the object is at A (3mks)

iii) the tension in the string when the object is at B. (3mks)

c) The speed of rotation is gradually increased until the string snaps. At what point is the string likely to snap? Explain (2mks)

15. a) Define the term specific latent heat of fusion. (1mk)

b) Figure below shows one method of measuring the specific latent heat of fusion of ice. Two funnels A and B contain crushed ice at 0^0c



The mass of melted ice from each funnel is measured after 11 minutes. The results are shown below.

Mass of melted ice in A = 24g

Mass of melted ice in B = 63g

i) What is the reason for setting up funnel A? (1mk)

ii) Determine the

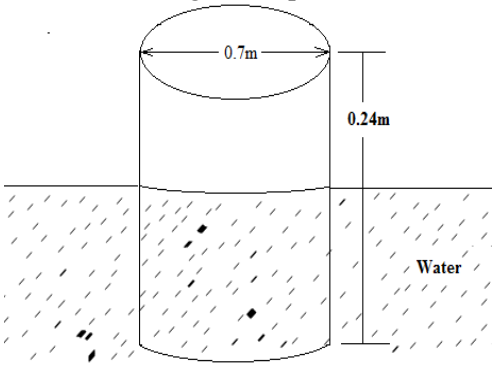
a) quantity of heat supplied by the heater (2mks)

b) mass of ice melted by the heater. (1mk)

c) specific latent heat of fusion of ice. (3mks)

16. a) State the law floatation. (1mk)

b) The figure below shows a plastic disc floating to a depth of 0.12m in water.



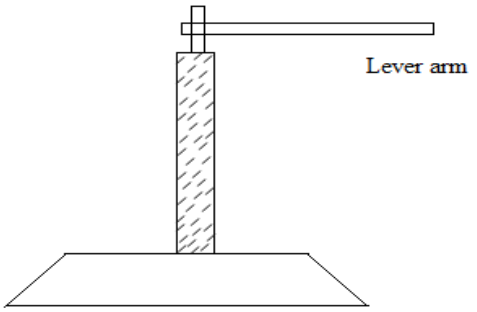
Determine:-

i) The mass of the disc (3mks)

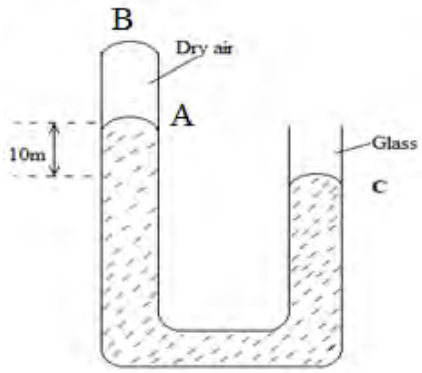
ii) The density of the disc (3mks)

iii) Determine the number of 10g coins which will make the disc to be just submerged if placed on it (3mks)

17. A man uses the inclined plane to left a 50kg load through a vertical height of 4.0m. The inclined plane makes an angled 30^0 with the horizontal. If the efficiency of the inclined plane is 72%, calculate;
    a) the velocity ratio of the inclined plane (2mks)
    b) The effort needed to move the load up the inclined plane at a constant velocity. (2mks)
    c) the work done against friction in raising the load through the height of 4.0m (3mks)
    d) The figure below shows a car sack with a lever arm of 0.04m and a pitch of 0.005m. If the efficiency is 40%, what effort would be required to lift a load of 300kg. (3mks)



18 a) The figure below represents a transparent glass sealed on one end and containing mercury. The set up was used to verify Boyle's law



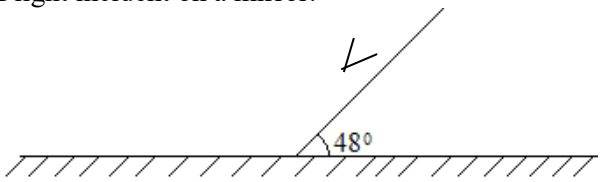
    i) Explain why the gas should be dry (1mk)
    ii) Describe how the set up can be used to verify Boyle's law of gases. (3mks
    iii) Sketch a graph to represent the results that would be obtained. (1mk)
    iv) Use Kinetic theory of gases to explain;
    a) Boyle's law (1mk)
    b) Why pressure of a gas increases with temperature. (1mk)

19 a) i) Define inelastic collusion (1mk)
    ii) A truck of mass 3000kg moving at 3m/s collide head on with a car of mass 600kg. The two stop dead on collision. At what velocity was the car travelling? (3mk)
    b) A Kangaroo jumps vertically upwards with a velocity of 10m/s. Calculate
    i) the time of flight (2mks)
    ii) the maximum height reached (2mks)

CEKENA MOCK
232/2
PHYSICS

SECTION A (25 MARKS)

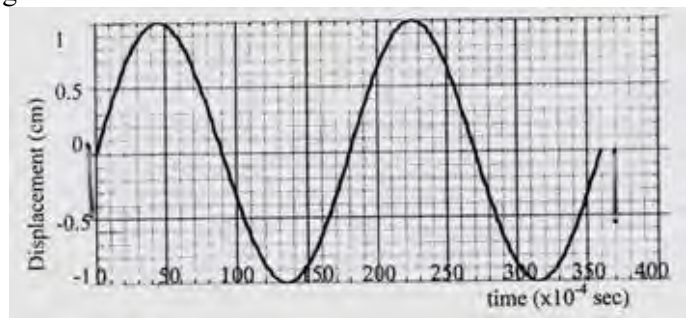
1. The figure below shows a ray of light incident on a mirror.



Determine the angle of reflection when the mirror is rotated 10^0 anticlockwise (2mks)

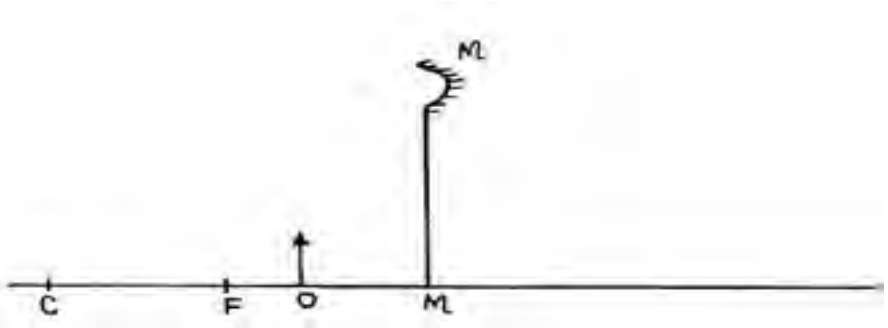
2 Distinguish between thermionic and photo-electric emission (1mk)

3. A soldier standing between two cliffs fires a gun. He hears the first echo after 2.16s and the next after 4.75s. Determine the distance between the two cliffs (Take speed of sound as 330m/s) (2mks)
4. What is local action and how is it minimized in a simple cell (2mks)
5. The wave shown in the figure below



Determine the frequency of the wave (2mks)

6. The activity of a radioactivity source is initially 450 counts per second. After 72 hours, it reduces to 100 counts per second. If the background count is 50 counts per second, determine the half-life of the substance (3mks)
7. The figure below shows an object O of a curved mirror M, on the same figure locate the image. (3mks)



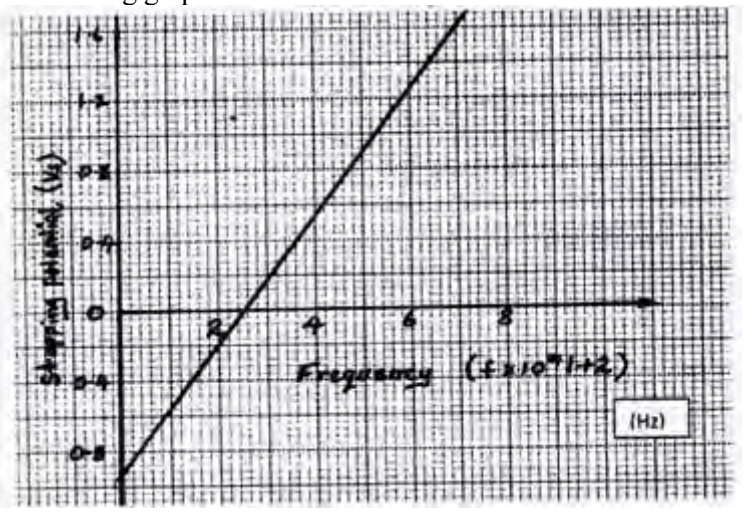
8. Define the term critical angle (1mk)
9. Using the domain theory, explain how heating caused demagnetization. (2mks)
10. Complete the following table (2mks)

Radiowave		Infrared		Ultraviolet

11. State the faradays law of electromagnetic induction (1mk)
12. A transformer with 1200 turns in the primary circuit and 120 turns in the secondary has its primary circuit connected to a 400V a.c. source. Assuming it is 100% efficient, determine the voltage in the secondary circuit. (2mks)
13. An uncharged metal rod is brought closed but not touching the cap of a positively charged electroscope. State and explain the observation. (2mks)

SECTION B (55 MARKS)

14. In an experiment to find the relationship between frequency of radiation and Kinetic energy of photoelectrons in a photoelectric device, the following graph was obtained



Use the graph to answer the following questions.

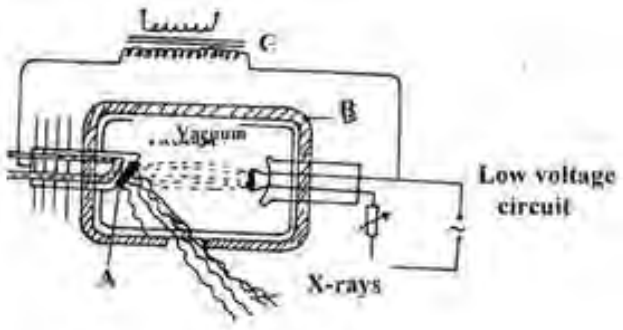
a) i) Determine the threshold frequency. (1mk)

ii) Find the plank's constant h. (Take the charge of an electron to be 1.6×10^{-19}C) (3mks)

iii) Calculate the work function of the metal in joules (3mks)

iv) The threshold frequency of sodium is 4.8×10^{14} HZ. Calculate the work function of sodium. (Take the plank's constant to be 6.6×10^{-34} Js) (3 mks)

15. The figure below shows an X-ray tube.



a) i) Name the element used in making the part labeled A and B (2mks)

ii) Explain the use of the part labeled C (2mks)

iii) Explain how the X-rays are produced (3mks)

iv) Why is the X-ray tube evacuated ? (1mk)

b) The penetrating power of X-ray is normally varied depending on the intended use. Explain briefly how this is done. (2mks)

c) The energy of X-ray is 2.089×10^{-14} Joules. Given that the speed of light is 3.0×10^{8} m/s and the plank's constant is 6.6×10^{-34} Js, find the wavelength of the X-ray (3mks)

16 a) State Snell's law (1mk)

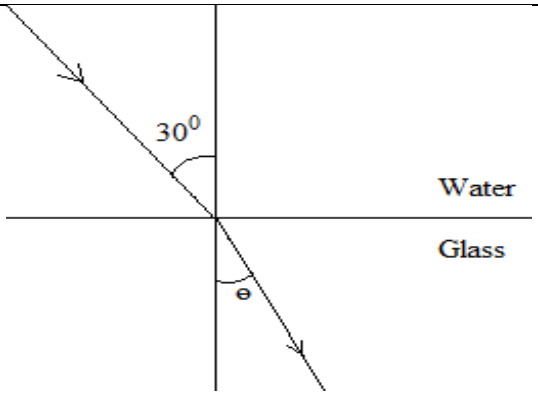
b) A coin is placed beneath a transparent block of thickness 10cm and refractive index 1.56. Calculate the vertical displacement of the coin. (2mks)

c) i) The speed of green light in a prism is 1.94×10^{8} m/s. Determine the refractive index of the prism material (Speed of light in air = 3.0×10^{8} m/s) (2mks)

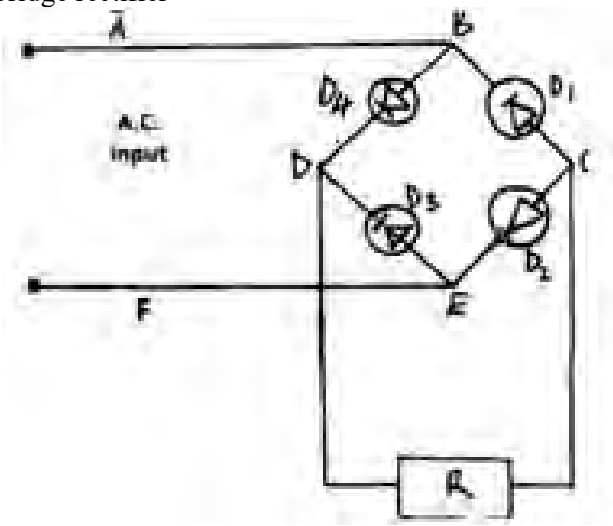
ii) Determine the critical angle of the prism material. (2mks)

d) State two advantages of using optic fibre in communication. (2mks)

e) The refractive indices of water and glass are $^{3}/_{2}$ and $^{4}/_{3}$ respectively. Find the value θ in the figure below. (3 mks)



17. a) The figure below shows a bridge rectifier

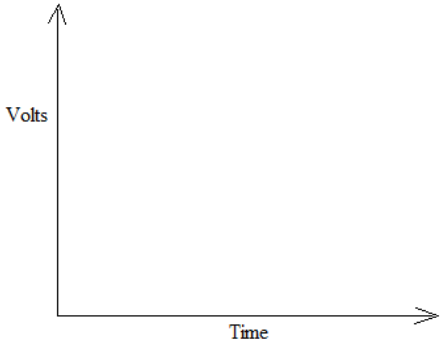


i) Define the term rectification (1mk)

ii) Describe how the rectifier above works (3mks)

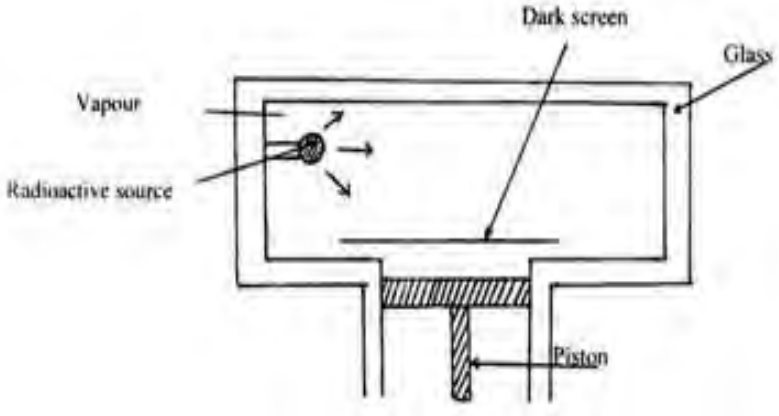
iii) What modification can we make on the arrangement to improve the quality of the output. (1mk)

iv) Sketch on the graph below how the improved output is displayed on a C.R.O. screen. (1mk)



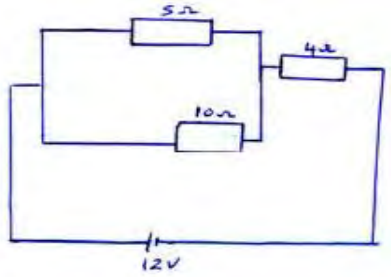
v) Draw a circuit diagram to show forward biasing in a p-n junction. (2mks)

b) The figure below shows an expansion cloud chamber



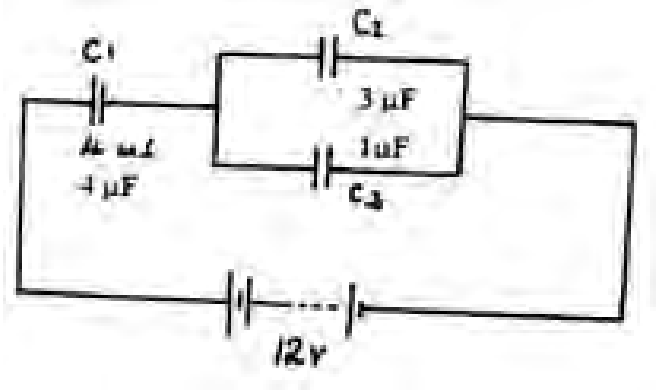
i) What is the purpose of the vapour? (1mk)
ii) Explain how the radiation emitted by the radioactive source in the chamber are detected. (3mks)

18. The figure below shows a network of resister connected to a 12v source.



Determine;
i) The total resistance (2mks)
ii) The voltage drop across 4Ω resister (3mks)
iii) The current through 5Ω resister (2mks)

b) In the circuit below C_1=4μF, C_2 = 3μF and C_3 = 1μF. Given that V=12v



Determine
i) Effective capacitance (3mks)
ii) Total charge in the circuit (2mks)

CEKENA MOCK
PHYSICS
CONFINDENTIAL

1 (A)
- A piece of candle
- A plane mirror (5cm x 5cm)
- A metre rule
- A thin lens (focal length 20cm)
- A lens holder
- A piece of cellotape 10cm
- A piece of plastacine
- A white screen

(B)
- A glass block
- 5 optical pins
- 4 thumb tacks
- A white plain sheet A4 size
- A soft board

2 (A)
- 2 new dry cells (Size D)
- A cell holder
- A switch
- An ammeter (0-2.5A)

- 6 connecting wires, 2 with crocodile clips
- Nichrome wire 1.0m long mounted on a scale (SWG 32) labeled X
- A micrometer screw gauge

(B)

- Concetrated solution of Nacl coloured with KM nO4
- Two identical cylindrical 100g masses
- A complete stand
- A knife edge wedge
- A 100ml measuring cylinder
- Two pieces of thread each 20cm

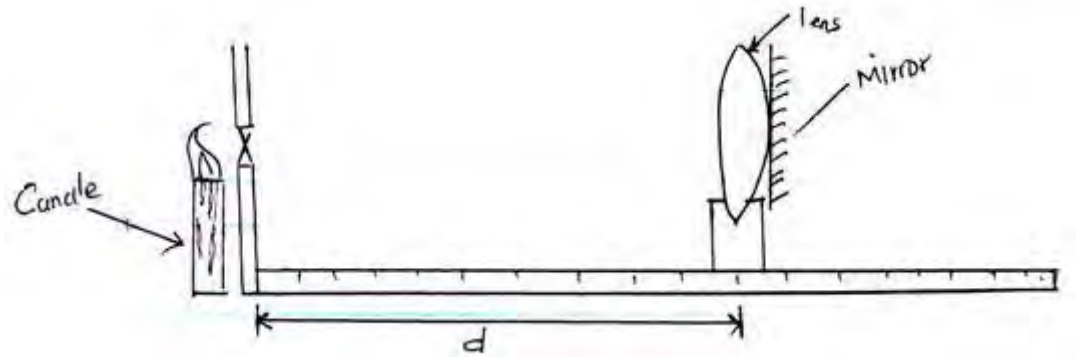
CEKENA MOCK
PHYSICS
PAPER 3
PRACTICAL
Question 1
Part A

You are provided with the following

- A piece of candle
- A plane mirror
- A metre rule
- A thin lens
- A cardboard with cross-wire at its centre
- A piece of cellotape
- A piece of plastacine
- A white screen
- A lens holder

Proceed as follows;

a) Set up the apparatus as shown below



Ensure that the candle flame is at the same height as the cross-wire.

The plane mirror should also be attached to the lens as shown using a cellotape. Use the plastacine to fix the meter ruler on the table.

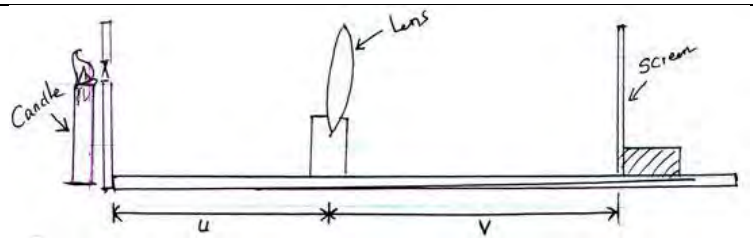
b) Place the cardboard with cross-wire at the O mark of the meter ruler.

c) Move the object along the meter rule until a sharp image of the cross-wire is formed alongside the cross wire.

d) Measure the length d.

d = _____M (1mk)

e) Now arrange the candle frame, lens and screen as shown.



f) Adjust the distance between the lens and the object (cross wire) to be 35cm. adjust the position of the screen until a sharp image of the cross-wire appear on the screen. Measure the value of V and record in the table below

g) Repeat the procedure (f) above for each of the other values of U and complete the table below

U (cm)	35	40	45	50	55	60	65	70
V (cm)								
UV (cm^2)								
U+V (cm^2)								

h) i) Plot a graph of UV against U + V (4mks)

ii) a) Calculate the slope (2mks)

b) Determine the focal length of the lens (1mk)

c) How is the focal length obtained in (b) above related to d obtained in part (d) (1mk)

Question 1

Part B

You are provided with the following apparatus

- A glass block
- 5 optical pins
- A plain paper
- A drawing board (Piece of soft board)

Follow the following procedure

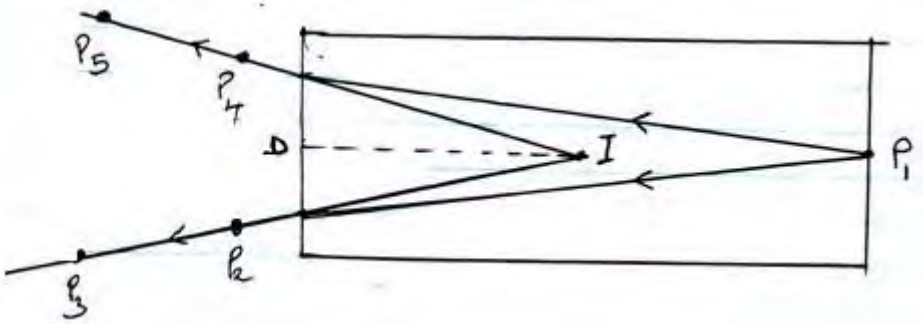
a) Place a glass block on a white paper which has been fixed on the soft board, then trace the outline of the block on the plain paper.

b) Place a pin P_1 firmly at one end of the block with your eye at opposite end of the block.

c) Place pins P_2, P_3 so that they are in line with the image of P_1 as shown in the figure.

d) Similarly locate the same image using pins P_4, P_5 as shown in diagram.

e) Produce lines P_2, P_3 and P_4 P_5 to their point of intersection which is the image I



f) Measure the real depth DP_1 and apparent depth DI (2 mks)

Find the ratio of $\frac{DP_1}{DI}$ = (1mk)

g) What does the ration above represent? (1mk)

Question 2

Part A

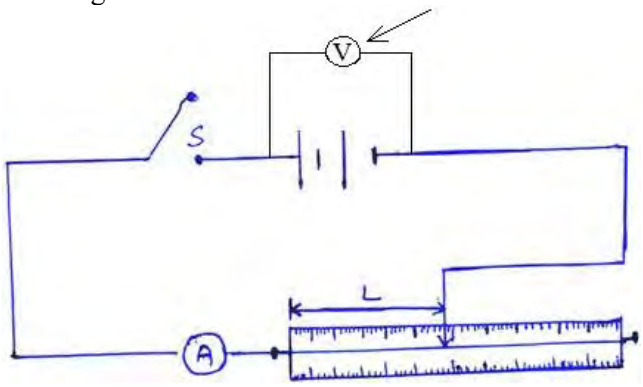
You are provided with the following apparatus

- 2 new dry cells
- A cell holder
- A switch
- An ammeter
- A voltmeter
- 6 connecting wires, 3 with crocodile clips

- Nichrome wire mounted on the meter ruler labeled X
- A micrometer screw gauge (can be shared)

Proceed as follows

a) Connect the circuit as shown in the figure below.



(b) Measure the voltage, E before closing the switch

E = _____ (1mk)

c) Adjust the length L of the wire to be 0.2m, close the switch S and read the value of current and record the table below.

Length L (cm)	0.2	0.3	0.4	0.5	0.6	0.7
Current I (A)						
$\frac{I}{I}$ (A^{-1})						

(4mks)

d) Repeat the procedure in (c) above for the value of lengths given

e) Calculate the value of $\frac{I}{I}$ and record in the table above.

f) On the grid provided below, plot a graph of $\frac{I}{I}$ against L (4mks)

g) Determine the gradient of the graph obtained (2mks)

h) Given that the equation of the graph obtained above is $\frac{I}{I} = \frac{KL}{E} + \frac{Q}{E}$, determine

i) The value of K (2mks)

ii) The value of Q (1mk)

Question 2

Part B

You are provided with the following apparatus

- Coloured solution in a 500ml beaker
- Two identical cylindrical 100g mass
- Two pieces of thread
- A complete stand
- A meter rule
- A knife wedge
- A 100ml plastic measuring cylinder

Follow the following procedure

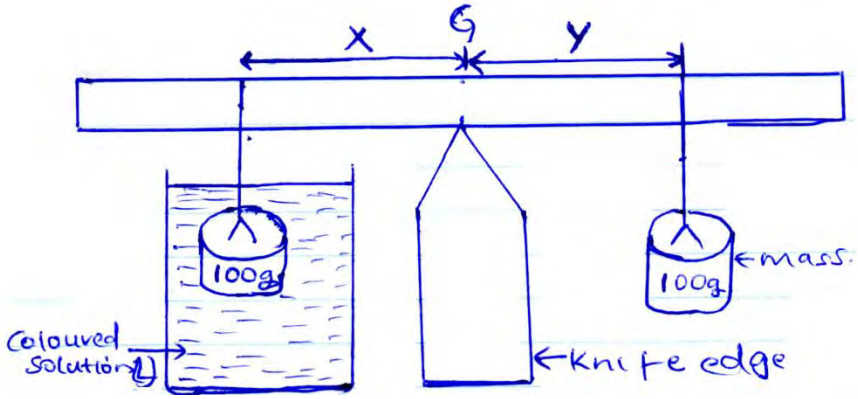
a) Determine the volume V of one of the 100g mass using the measuring cylinder and record V

V = _____ cm^3 (1mk)

b) Determine the centre of gravity of the metre and record it as

G = _____ cm mark (1mk)

c) Arrange the apparatus as shown in the diagram below such that X=15cm from the pivot G with the 100g mass completely immersed in the coloured solution, hang the other 100g mass on the metre rule and adjust its position until the system is in equilibrium as shown in the diagram below. Measure distance Y and record it in the table below.



d) Repeat the procedure (c) above for x=20cm

NB: During each experiment ensure that the position of the pivot does not change

X (cm)	Y (cm)	$S = {}^{Y}/_{X}$
15		
20		

(3mks)

e) Determine the average value of S from the table above (1mk)

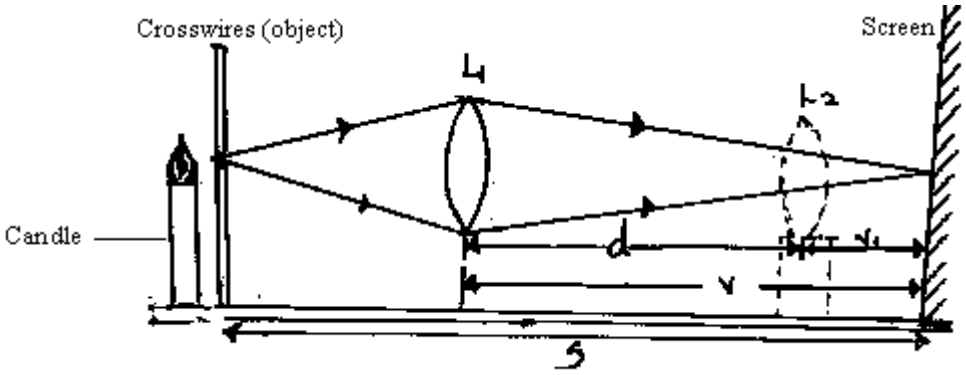
a) Given that $S = {}^{f}/_{w}$, determine the apparent weight (f) of the mass in the coloured solution, if its actual weight is w.

f = _____ (1mk)

KURIA EAST
232/3
PHYSICS
PRACTICAL PAPER

Q. 1 You are provided with the following apparatus
- A candle (source of light illuminating cross wires mounted on a circular hole)
- A convex lens
- A lens holder
- One metre rule
- A whole screen

Set the apparatus as shown in the diagram below



a) Illuminate the object cross wires using the candle provided when the distance between cross wires and screen S = 60cm.
By moving the lens away form the cross wires obtain a focused clear image of the object (cross wires) on the screen. Measure and record the distance V, between the lens position L_1 and the clear image on the screen.
Keeping the distance S fixed i.e. S = 60cm move the lens further away from the object until another sharp image but diminished image of the cross wires is obtained on the screen. Measure and record the distance between the new lens position L_2 and the sharp diminished image. Record this as V_1. Repeat the procedure for other values of S shown in the table. Complete the table (8marks)

S (cm)	60	65	70	75	80	85	90
V (cm)							
V_1 (cm)							
d = V - V1(cm)							
S^2 (cm^2)							
d^2 (cm^2)							
$S^2 - d^2$(cm^2)							

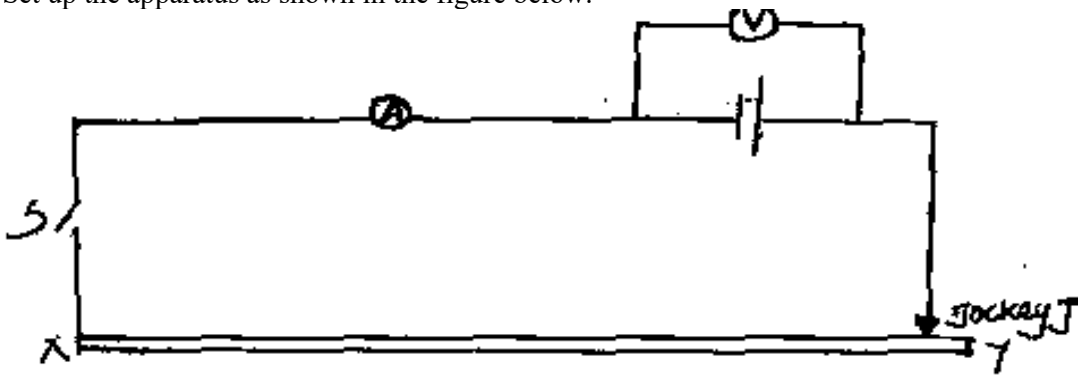
iii) Plot a graph of $s^2 - d^2$ against S (5marks)
iv) Determine the gradient (k) of the graph (3marks)
v) Given that K =4f where f is the focal length of the lens used, determine the value for f. (2marks)
vi) State the advantage the method used above to determine the focal length of a lens has over the other methods. (1mark)
vii) Focus the window frame or any distant object and obtain a rough estimate of the focal length of the lens. (1mark)

Q.2 You are provided with the following

- Dry cell
- An ammeter 0 – 0.25A
- A voltmeter 0 – 2.5v
- A mounted resistance wire XY
- 6 connecting wires
- A jockey or crocodile clip
- A switch

Proceed as follows:

a) Set up the apparatus as shown in the figure below.



b) With the jockey at X, record the ammeter and voltmeter reading. Ammeter reading = ———— voltmeter reading = ————————

c) Vary the length of the mounted wire through which current flows by moving away form X to a new point Y and record the corresponding ammeter and voltmeter readings. Tabulate your readings as shown in table. (8marks)

Length (cm)	0.0	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.0
Voltmetre readings V									
Ammeter reading /A									

d) On the grid provided, plot a graph of V (y-axis) against L. (5marks)

e) Determine the slope M of the graph. (3marks)

f) The E.M.F of the cell from which current is being drawn is E = v + Ir.
Use the equation to determine

i) E.M.F of the cell (2marks)

ii) The internal resistance of the cell. (2marks)

KURIA EAST
232/3 PHYSICS
CONFIDENTIAL

The teacher in charge of physics should ensure that each student gets the following apparatii;

Q1.

- A biconvex lens of focal length 15cm
- A lens holder
- A metre rule
- A white screen
- A candle illuminating crosswires mounted on a circular hole
- A matchbox

Q2.

Each candidate should be provided with the following.

- I new dry cell size –D" 1.5V
- An ammeter range (0 - 0.25A)
- A voltmeter range (0 - 2.5V)
- A mounted resistance wire XY on a mm scale (swg 32)
- 6 connecting wires
- A jockey
- A switch

NB:

The information contained herein is strictly confidential and by no way should it reach the student directly or indirectly.

KISII CLUSTER
232/1
PHYSICS
Paper I
Theory

SECTION A (25 MARKS)

Answer ALL the questions in this section in the spaces provided

1. (a) Draw a diagram to represent a scale of a micrometer screw gauge of thimble scale 50 divisions and reading 3.68mm (2mks)
   (b) Determine the actual reading if the micrometer screw gauge above has a zero error of 0.03mm. (1mk)
2. State why braking systems use Liquid and not gases. (lmk)
3. The figure 1 below shows the level of mercury and water in a beaker.

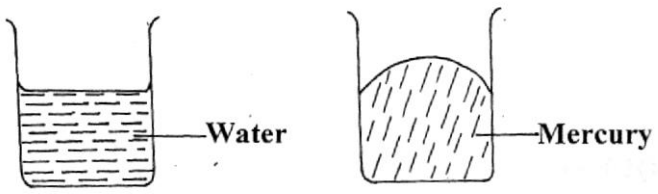


Fig 1

Explain the difference in the shape of the meniscus. (1mk)

4. The figure 2 below shows a wooden sphere with a nail hammered into it at point H as shown below.

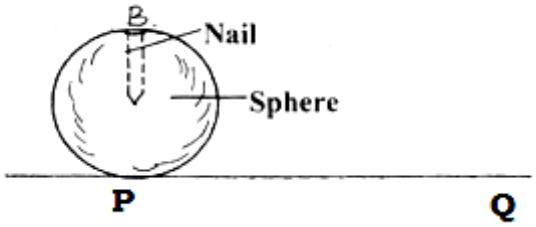
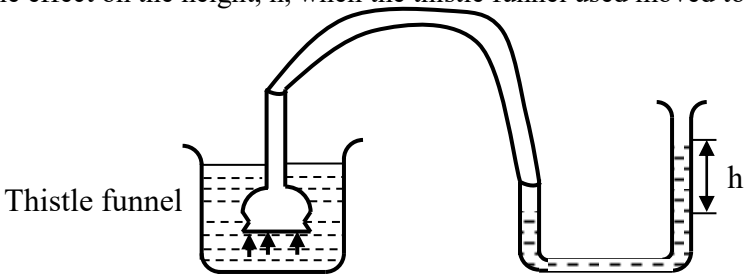


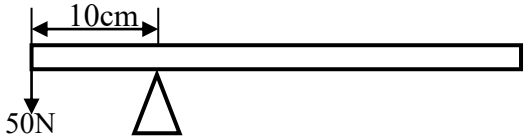
Fig 2

The sphere is rolled on a horizontal ground and comes to rest after sometime at point Q.
Draw the sphere after it comes to rest at point Q (1mk)

5 The diagram below shows a set up used by a student to show variation of pressure in a liquid . State and explain the effect on the height, h, when the thistle funnel used moved towards the surface of the liquid. (2 mks)



b) A uniform half metre rod is balanced on a knife edge by a force of 50N placed as shown in the figure below.



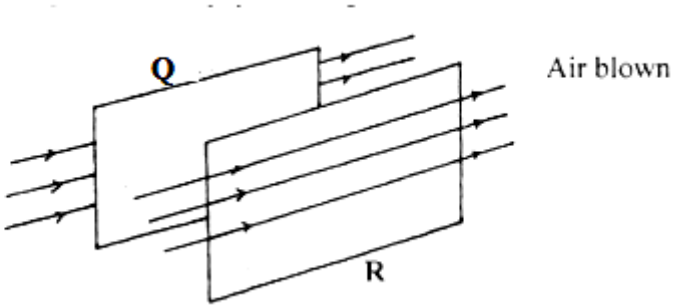
Determine the weight of the rod (2mks)

6. What is the safe speed a motorist should drive at on a level bend of radius 96m if the co-efficient of friction between the road and the tyres is 0.36m? (2mks)

7. A roller coaster has a vertical loop of radius 12m. The cars hurtle round the loop at l4ms^{-2} what point in the loop does the passenger feel heaviest. (1mk)
8. Sketch on the axis provided below a velocity - time graph of a motion of a stone thrown vertically upward from the edge of a platform and eventually the stone lands without bouncing on the ground below the platform. (1mk)

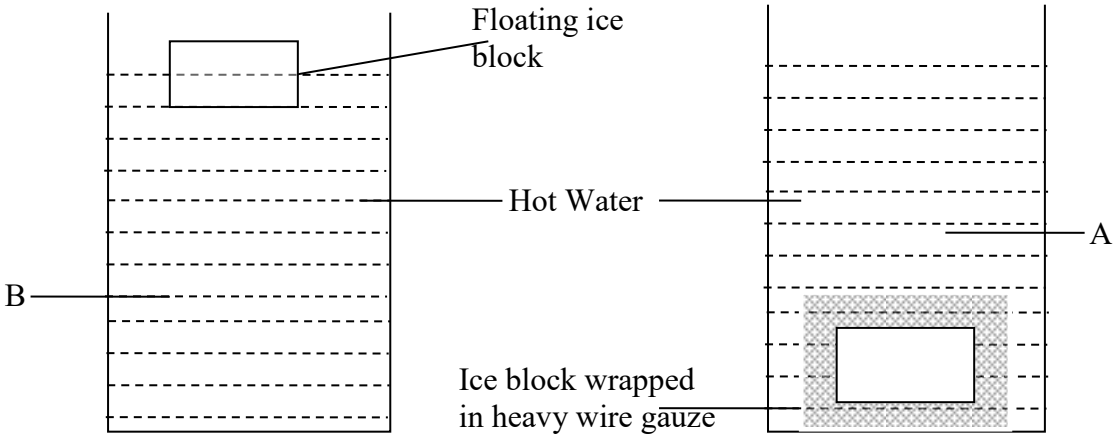
9. The figure 4 below shows two light sheets of paper arranged as shown.

Fig 4



State what is observed if strong air is blown at the same time behind paper Q and in front of paper R as shown (1mk)

10. A glass stopper is weighed in air then immersed wholly in water and reweighed. The readings obtained are 2.5N in air and 2.0N in water. Given that the density of water is 1000kg/m. Calculate the density of the stopper. (3mks)
11. Explain why it is safe to hold the other end of a burning match stick. (1mk)
12. State two physical quantities that remain constant while pure ice is being converted to water. (2mks)
13. a) State any two characteristics of an ideal gas. (2mks)
    b) The figure below shows two identical containers A and B containing hot water and ice block.



SECTION B (55 MARKS)

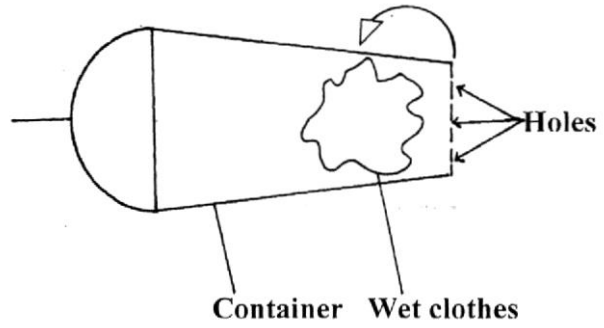
Answer all the questions in this section.

14. A lead shot of mass 40g is tied to a string of length 70cm. It is swung vertically at 5 revolutions per second.
(a) Determine;

(i) Periodic time, (2mks)
(ii) Angular velocity (2mks)
(iii) Linear velocity (2mks)
(iv) Maximum tension in the string.

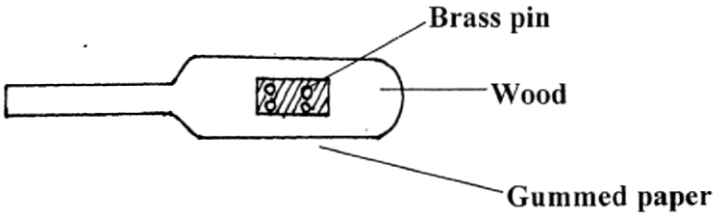
(b) The figure 5 below shows a container with small holes at the bottom in which wet clothes have been put. When the container is whirled in air at high speed as shown, it is observed that the clothes dry faster. Explain how the rotation of the container causes the clothes to dry faster. (2mks)

Fig 5



15. A certain substance contracts when heated at a certain temperature and expands when cooled at the same temperature.
(i) Name the substance (lmk)
(ii) State one disadvantage of this behaviour. (lmk)

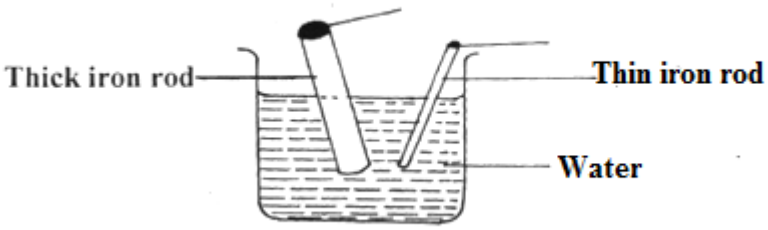
(b) The figure 6 below shows four brass pins pressed on a cooking stuck until they are flat on the wood. A white gummed paper was then stuck on the wood covering the pins. The stick was then passed over a Bunsen flame a few times.



It was observed that the paper got charred leaving four white spots. Explain this observation. (1 mk)

(c) The figure 7 below shows an experiment carried out by form one student.

Fig 7

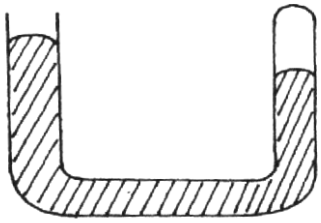


(i) The students dipped two iron rods of the same length but of different thickness into a beaker of hot water at the same time. What was the experiment about? (1mk)
(ii) State and explain the observations made after about 10 minutes. (2mks)
(iii) If the two rods were much longer, state and explain any difference from C (ii) above that would be made in the observation. (2mks)

16. (a) Explain why a gas exerts increased pressure when it is compressed into a small space. (2mk)
(b) State the law that relates the volume of a gas to the temperature of the gas. (lmk)

(c) A balloon is filled with air to a volume of 200ml at a temperature of 293K. Determine volume when the temperature rises to 353K at the same pressure.

(d) To verify Boyle's law a set-up consisting of a U-tube was made as shown in the figure 8 below. The tube contains mercury with air in the sealed end.



(i) Explain what is observed when more mercury is added. (2mks)

(ii) Suggest a method used to maintain the temperature of air constant in the experiment. (lmk)

e) (i) Explain why Boyle's law would not hold for gases such as methane, (lmk)

(ii) Sketch the graph of pressure against volume for an ideal gas. (2mks)

17. State the Archimedes's principle. (1mk)

(b) You are provided with the following apparatus;

- A spring balance
- A small piece of metal
- Eureka can
- A beam balance
- A string
- A beaker
- A retort stand
- Some water.

With the aid of a well labeled diagram, describe an experiment you would perform in the laboratory using the above apparatus to verify Archimedes's principle for a totally immersed body. (7mks)

(c) A simple hydrometer has a cylindrical cross-sectional area of $2.0cm^2$ and weighed to have a total mass of 15g. What length of the hydrometer is immersed when it floats on water of density:1.0 g/cm^3?

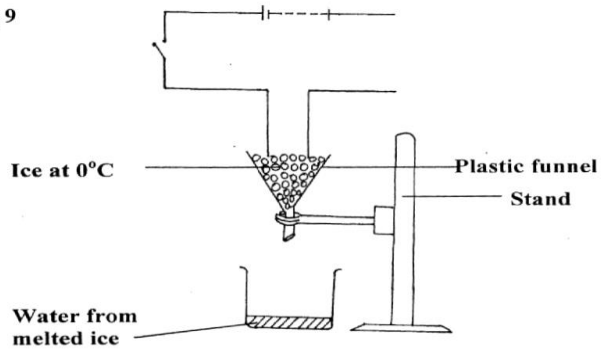
(3mks)

18. (a) What is specific latent heat of fusion? (1mk)

(b) State two factors which affect freezing point of a substance (2mks)

(c) Figure 9 below illustrates an experiment in which electrical energy is used to determine specific latent heat of fusion.

Fig 9



(i) Other than time, state other measurements that would be used to determine the quantity of heat Q, absorbed by ice in unit time. (2mks)

(ii) Complete the circuit to show connection of the essential circuit components. (3mks)

(iii) Describe how the experiment can be used to determine the latent heat of fusion of a substance (2mks)

(d) In a similar experiment, the following readings were obtained when the heater was switched on for 5 minutes

Voltmeter reading = 6.OV

Ammeter reading = 1.25 A

Temperature rise reading = 10°C

If by the end of the experiment, 200g of water at 0°C was collected determine the latent heat of fusion of ice. (3mks)

KISII CLUSTER II
232/3
PHYSICS
(PRACTICAL)

1. You are provided with the following apparatus

- . Two metre rules (one metre rule and half rule)
- . Two stands and clamps
- . Two bosses
- . Three pieces of threads (at least 1m, 30cm, 30cm)
- . A spring
- . A pieces of cello-tape or a plasticine
- . One mass 100g
- . A stop watch
- . A ruler
- Proceed as follows

Set the apparatus as shown in the figure below. Attach the optical pin(to act as the pointer) at one end of the metre rule using a cello tape.

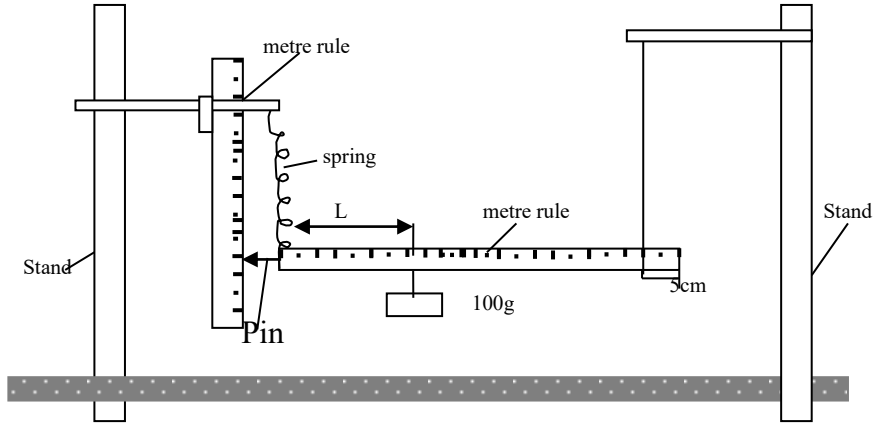


Figure 1

ii) Suspend one end of the metre rule with a thread at 5cm mark from the other end.
iii) Suspend the other end with a spring also 5cm from the end so that the metre rule is horizontal.
iv) Hold the other ruler vertically on the bench so that it is near the end with a pointer as shown in the diagram
above.
v) Read the pointer position, L_0 = ……..cm
(1mk)
vi) Hang on the horizontal metre rule, the 100g mass at a length, L=10cm from the spring. Record the extension,
e, of the spring in the table below.
vii) Displace the mass slightly downwards and release it to oscillate vertically. Take time for 20 oscillations and
record in the table below.
viii) Repeat for other position of L. of the mass.
NB: Before taking the reading, ensure the oscillation is steady.

Complete the table below (8mks)

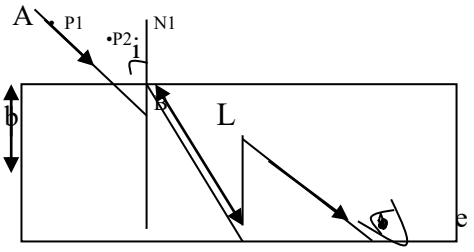
Length, (cm)		10	20	30	40	50
Extension (e)	(cm)					
	(m)					
Time t(s), for 20 oscillations						
Period time T(s)						
T^2 (s^2)						

ix) Plot a graph of extension e(m) against T^2 (s^2) (5mks)
x) Calculate the slope of the graph (3mks)
xi) Given that $e = \frac{RT^2}{4\Pi^2} + C$, determine the value of R (3mks)

QUESTION 2

You are provided with the following
. a rectangular glass block of dimensions; 9.6cm x 6.0cm x 2.4 cm
. 6 optical pins
. a soft board
. a plain paper
Proceed as follows:

a) Place the glass block on the plain paper with one of the largest face upper most. Trace round the glass block using a pencil as shown below.



b) Remove the glass block and construct a normal at B. Construct an incident ray AB of angle of incidence, $i=20^0$.

b) Measure the breadth **b** of the glass block

breadth **b**= ……..(1 mks)

c) View the path of the incident ray AB through the glass block using the other two such pins P3 and P4. This can done by ensuring that the image of P1 and P2 are in line with P3 and P4.

d) Remove the glass block and draw the emergent ray through P3 and P4 using pencil

e) Measure the length of **L** and record in the table below.

Angle i^0	L(cm)	$L^2(cm^2)$	$\frac{1}{L^2}(cm^{-2})$	$Sin^2 i$
20				0.1170
30				.25
40				0.4312
50				0.5868
60				0.75
70				0.8830

(6mks)

f) Repeat the procedure above for the angles of incidence given.

g) Calculate the values of $^1/L^2$ and record in the table above.

h) Plot a graph of $\frac{1}{L^2}$ (y-axis) against Sin^2 i. (5mks)

(i) Calculate the gradient S of the graph (3mks)

Given that the equation of that graph is; $\frac{1}{L^2} = \left(\frac{1}{n^2 b^2}\right) - \frac{\sin^2 i}{b^2} + 1$

i) Determine the value of **n** (3mks)

a) Present your work sheet; attached to the exam paper (2mks)

7. fig. 3 shows a sheet of paper rolled into a tube

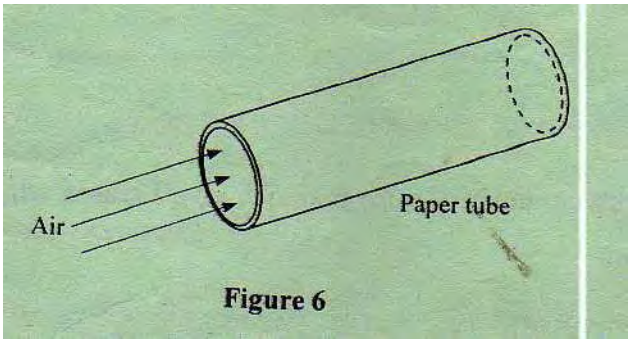


Figure 6

When a fast stream of air is blown into the tube as shown in the diagram the paper tube collapses. Explain the observation. (2 marks)

7. Figure 4 shows a uniform metal rod balanced at its Centre by different forces.

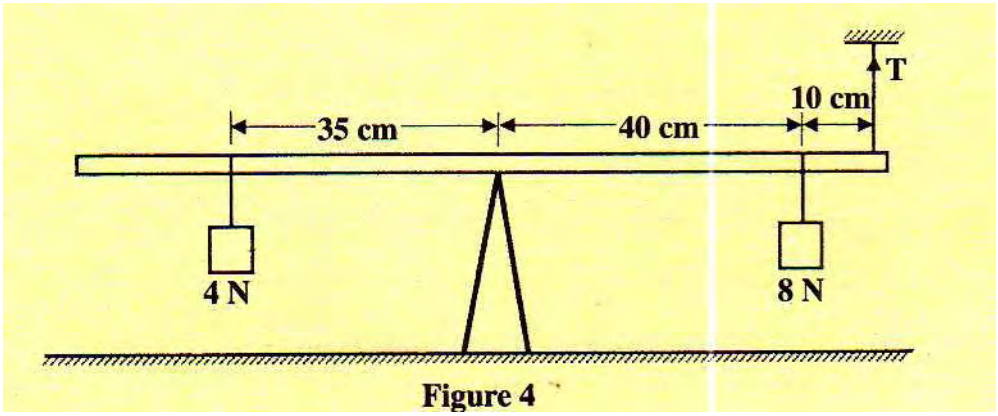
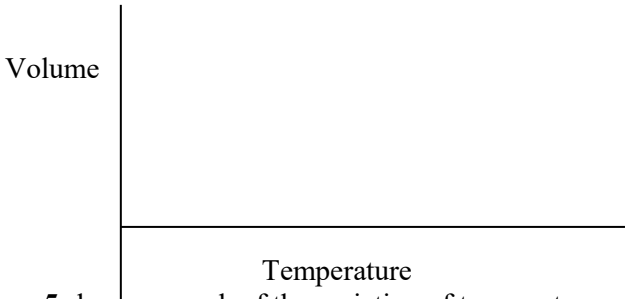


Figure 4

Determine the value of **T** (3 marks)

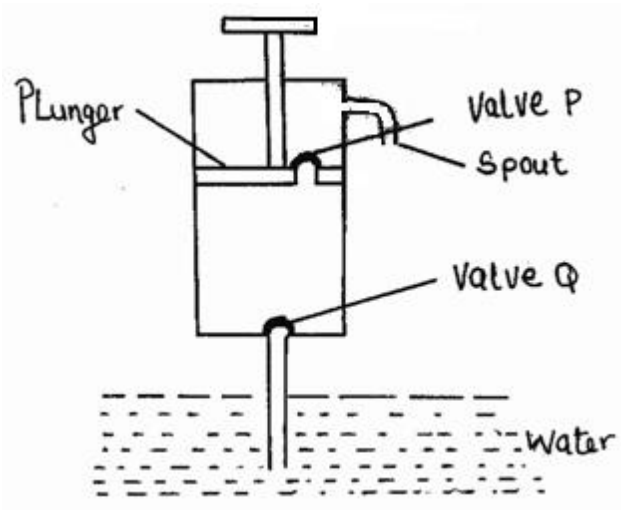
8. An object of weight 20N attached at the end of a spring causes an extension of 0.5cm on the spring.
   (a) determine the spring constant of the spring. (2marks)
   (b) Determine the weight of an object that would cause an extension of 0.086cm when attached at the end of the spring. (1mark)
9. On the axis provided, sketch the graph which shows the relationship between volume and temperature of a fixed mass of water in the temperature range 0^0C to 10 ^{o}C. (1 mark)



10. Figure 5 shows a graph of the variation of temperature with time for a pure substance heated at a constant rate.

iii) The experiment value for the specific latent heat of fusion of ice obtained is less than the theoretical value Give one reason for this observation (1 mark)

16. The figure **below** shows a lift pump.



Explain why, when the piston is

(i) Pulled upwards, valve **Q** opens while valve **P** closes. (2mks)

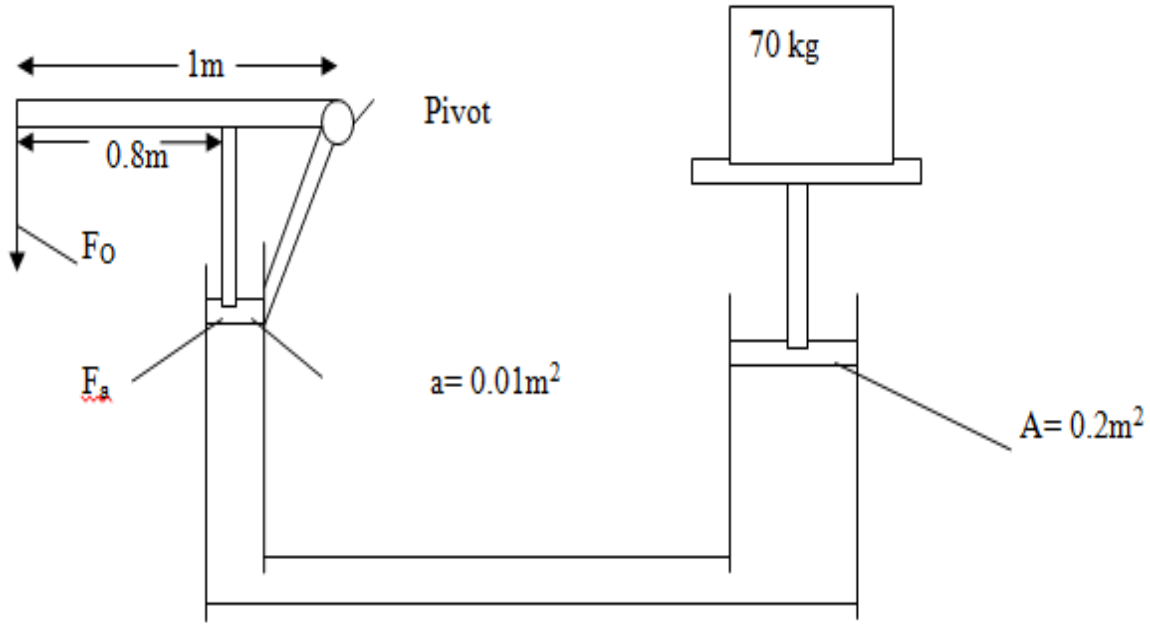
(ii) Pushed downwards, value **Q** closes while valve **P** opens. (2mks)

(iii) State two advantages of a force pump over the lift pump. (2mks)

b) A lift pump can lift water to a maximum height of 10m.determine the maximum height to which the pump can raise alcohol (take density of alcohol as 800kgh/m^3 and density of water as 1000kgm^3) (3marks)

c) State one factor that determine the height to which a force pump can lift water. (1mark)

17. Use figure 7 below to answer the questions



If A and a are areas of cross-sections of the pistons and the lengths of the arm are as given. Find

a) (i) the value of force F_0 (4 marks)

(ii) Mechanical advantages of the machine (2 marks)

(ii) velocity ratio of the machine (3marks)

(iv) The efficiency of the machine (3marks)

18. (a) (I) a car goes round a plat circular bend whose radius is 100m at a constant speed of 30m/s. Calculate its acceleration. (2marks)

(ii) If the mass of the car is 1500kg, calculate the frictional force required to provide this acceleration (3marks)

(b) (i) calculate the maximum speed at which the car can go round the bend without skidding if the coefficient of friction between the tyres and the ground is 0.5 (2marks)

(ii) Give a reason why the driver of the car has to move though the same bend at a lower speed during a rainy day (1mark)

GATUNDU SOUTH SUB- COUNTY EVALUATION EXAMINATION 232/2
PHYSICS
Paper 2
THEORY

SECTION A (25 MARKS)

1. Two electric heaters A and B rated 1000 W and 2500 W respectively are connected in parallel across a 240 mains supply. Calculate the ratio R_A: R_B of their resistances. (3mks)
2. Fig. 2 represents crests of water waves approaching a wide opening.

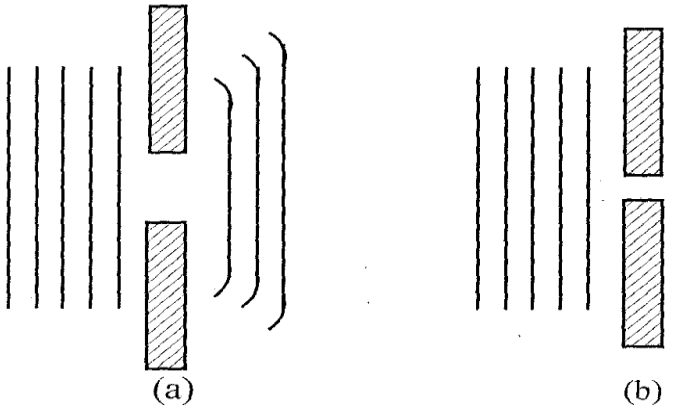


Fig. 2

Crests of the same water waves are now approaching a narrow opening. Sketch the crests after passing through the opening. (2mks)

3. One of the factors which affect the capacitance of a parallel plate capacitor is the area of overlap of the plates. Name **two** other factors. (2mks)
4. Fig. 5 shows two rays of light incident on a water-glass surface.

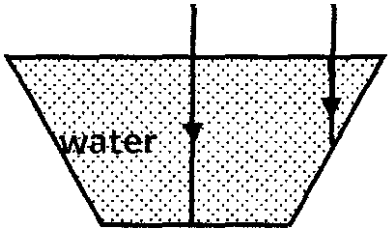
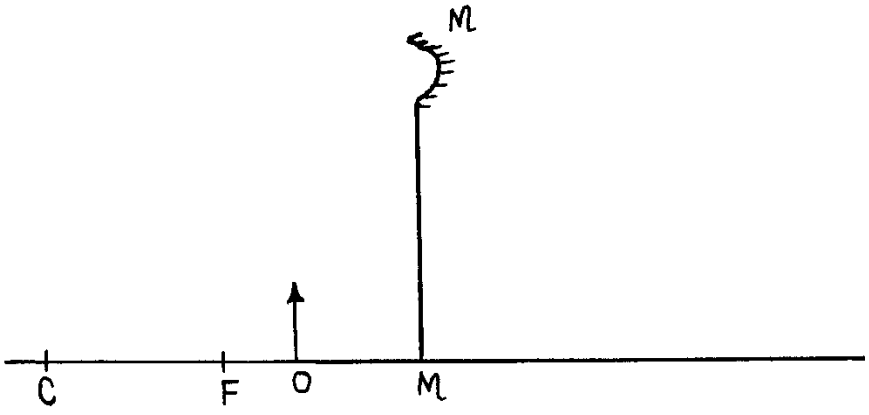


Fig. 5

Complete the rays to show their paths from the glass to water. (2mks)

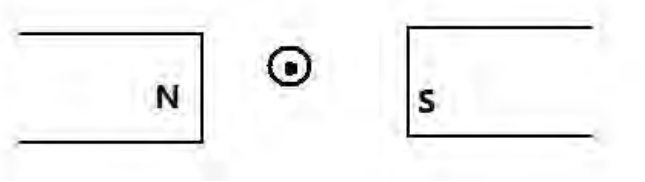
5. The transmission of mains electricity on the national grid is at high voltage. Give a reason (1mk)
6. The figure below shows an object O in front of a curved mirror M.
   a) On the figure, locate the image formed. (2 marks)



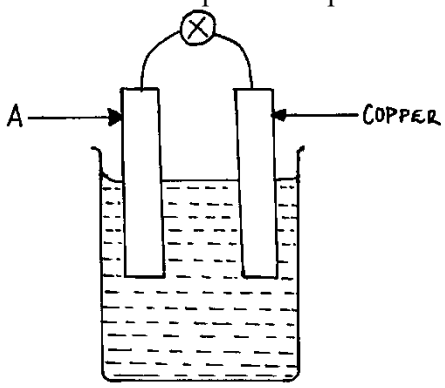
7. Complete the table by stating the different types of radiations (3 marks)

Type of radiation	Use
	Sending information to and from satellites
	Emitted by a remote control unit
	Producing shadow pictures of bones

8. The figure below shows a conductor carrying current placed in the magnetic field of two magnets. Complete the diagram by showing the field pattern and the direction of force F that acts on the conductor. (2mks)

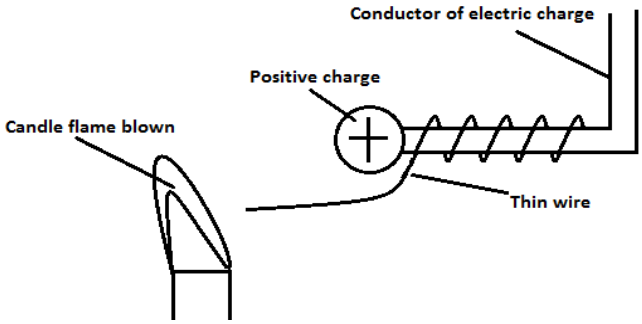


9. The figure below shows a setup for a simple cell.



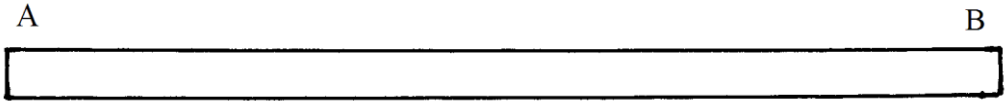
a) Name the electrode A (1 mark)
b) Explain why the bulb goes off after only a short while (1 mark)
c) Explain how the defect can be minimized. (1 mark)

10. Light of a certain wavelength strikes a metal surface. State two factors that determine the maximum kinetic energy of the electrons emitted (2 marks)
11. The figure below shows a thin wire connected to a charge generator and placed close to a candle flame.



Explain why the candle flame is deflected as shown (2 marks)

12. You are provided with a long metal steel rod as shown below.



On the diagram, show how you would magnetize end A to obtain a south pole using an electric current. (2marks)

SECTION B (55MARKS)

13. The figure below shows an x-ray tube

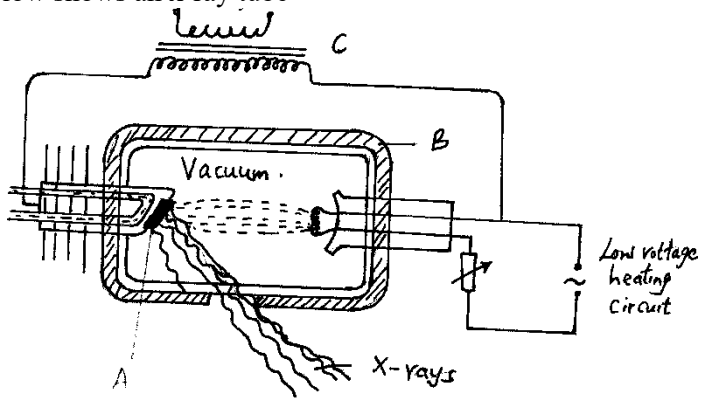


Fig. 6

a) i) Name the elements used in making the parts labeled A and B. (2 marks)
ii) Explain the use of the part labeled C. (1 mark)
iii) Explain how the x-rays are produced. (3marks)

b). (i) Give a reason why X-ray tube is evacuated. (1mk)
(ii)How is the intensity of X-rays increased? (1mk)

c) The energy of x-ray is 1.989 x 10^{-14} joules. Given that the speed of light is 3.0 x 10^{8}m/s and plank's constant is 6.6 x 10^{-34}Js, find the wavelength of the x-rays. (3 marks)

14. a) The figure below shows the diagram of a Geiger – Muller tube connected to a power supply and a pulse counter.

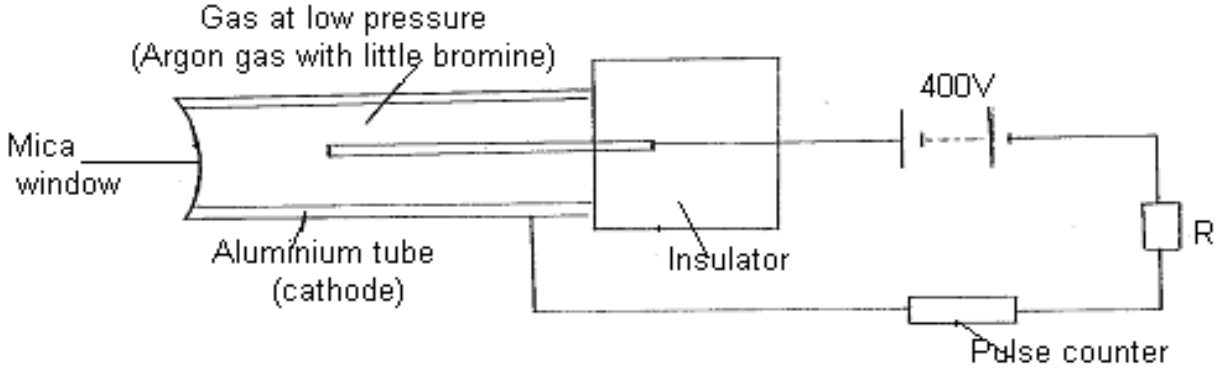


Fig. 5

(i) Why should the Argon gas be at low pressure? (1 mark)
(ii) Briefly explain how the Geiger – Muller tube detects the radiation emitted by a radioactive element (3 marks)
(iii) State the purpose of the bromine gas in the tube (1 mark)

b) A radioactive element A of half-life 31 days' decays to element B. A sample of A of mass 32g is kept in a container. Assuming B is stable; calculate the mass of B that will be in the container after 124 days. (3 marks)

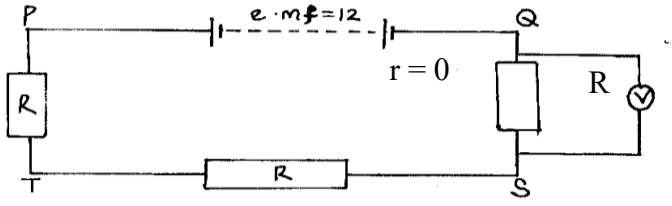
c) Find the value of a and b up the following equation (2marks)

$$^{234}_{92}U \longrightarrow {}^{a}_{b}X + 2\alpha$$

a =.....
b =.....

15. a) The circuit diagram in figure 8 shows three identical resistors connected to a cell of e.m.f. 12V.

Figure 8



(i) Determine the reading of the voltmeter. (2 marks)

(ii) If another identical resistor R is connected parallel to PT, determine the potential difference across QS (3 marks)

b). (i) Distinguish between semi-conductors and conductors. (2 marks)

(ii) Give one example of a semi-conductor and one example for a conductor. (2 marks)

(iii) What is meant by donor impurity in a semi-conductor. (1 mark)

(iv). Draw a circuit diagram including a cell, a diode and a resistor in the reverse biased mode. (1 mark)

(v). In the circuit in figure 12 below, when the switch is closed, the voltmeter shows a reading. When the cell terminals are reversed and the switch is closed the voltmeter reading is zero.

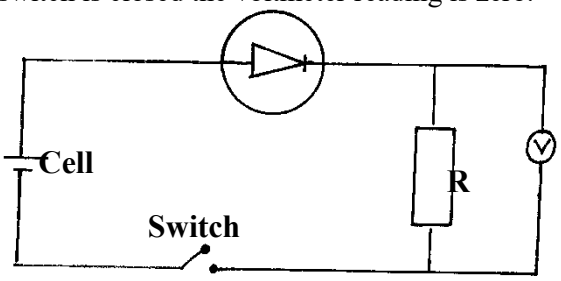


Figure 12

Explain this observation. (2 marks)

16. a) State one difference between:
Mechanical and electromagnetic waves. (1mk)

(b) Briefly describe how sound is propagated in air. (2mks)

(c) Fig. 6 shows a set up by a student.

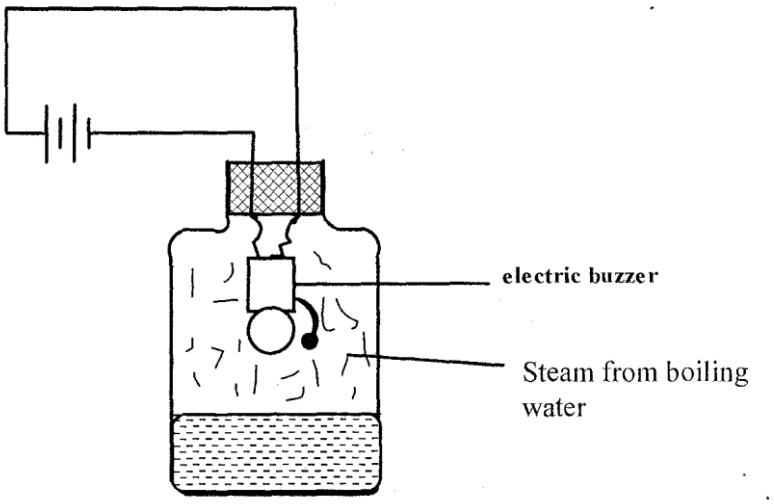


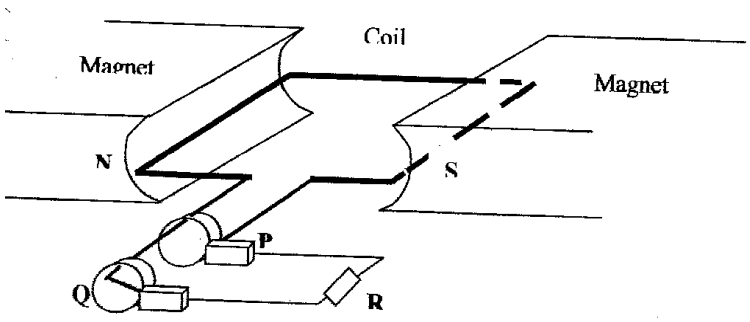
Fig. 6

(i) State what happens to the sound from the buzzer as the bottle and its contents are cooled to 0°C . (1mk)

(ii) Explain the observation you have stated in (i) above. (3mks)

(d) A boy standing in level ground between two high walls claps his hands. He hears an echo from one wall after
0.7s and from the other wall 0.2s later. Determine the distance between the two walls. (Speed of sound in air $v = 330\ ms^{-1}$) (3mks)

17. The figure below shows a simple electric generator.



a) i) Name the parts labeled P and Q (2 marks)
ii) State two ways of increasing the magnitude of the induced current in this type of generator. (2 marks)

b) The primary coil of a transformer has 1200 turns and the secondary coil has 60 turns. The transformer is connected to a 240v a.c source. Determine the:
i) Output voltage (2 marks)
ii) Output current when the primary coil has a current of 0.5A. Assume there are no energy losses. (2marks)

c) **Figure 12** shows a magnet being moved towards a stationary solenoid. It is observed that a current flow through the circuit in a direction Q to P.

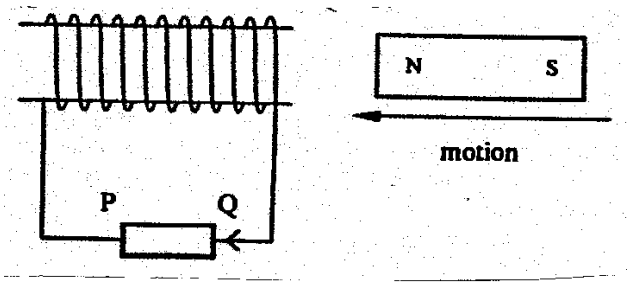


Figure 12

Explain why the current flows from Q to P (1 mark)

d). State **two** ways in which power is lost in a transformer (2 marks)

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QUESTION ONE

You are provided with the following;

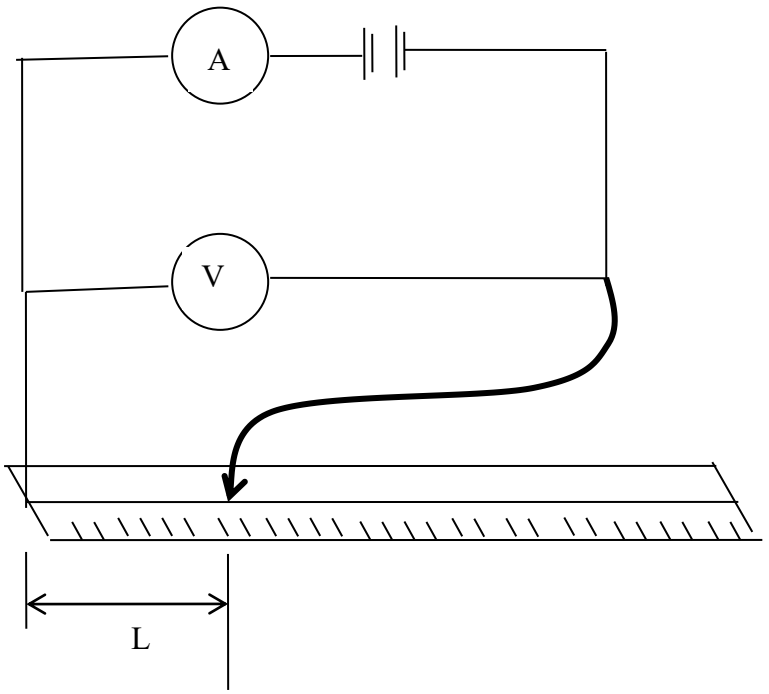
- a mounted wire gauge labelled N
- a voltmeter
- A ammeter
- A switch
- two dry cell and a cell holder
- At least six connecting wires two with crocodile clips.
- a micrometer screw gauge.

Procedure

a. Using the a micrometer screw gauge determine the diameter d of the wire at some three different points
d_1 = ……mm, d_2 = ……mm, d_3 = ……mm
dav = ……..……..m. (2mks)

b. Calculate the cross sectional area A of the wire in m^2 (2mks)

c. Set up the circuit as shown below.



d. Vary the length by using the crocodile clip along the wire from (L = 0) and record the voltmeter and the ammeter in the table below. (5mks)

Length L (cm)	0	20	30	40	60
Current I (A)					
Voltage V (V)					

e. Plot the graph of voltage V against current I (5mks)

f. Calculate the internal resistance of the cell (4mks)

g. From the graph determine the EMF of the battery. (2mks)

QUESTION TWO

This question has two parts A and B. answer both parts.

PART A

You are provided with the following:

- A meter rule
- Two identical 100g masses
- About 200ml of liquid L in 250ml beaker
- Three pieces of thread, each about half metre long.
- Stand with clamps
- Tissue paper.

Proceed as follows:

(a) Using a stand and one piece of thread, suspend the metre rule in air such that it balances horizontally. Record the position of the centre of gravity. G.

G = _____ mm (1mk)

NOTE: The metre rule should remain suspended at this point through out the experiment.

(b) Set up the apparatus as in figure 2 below.

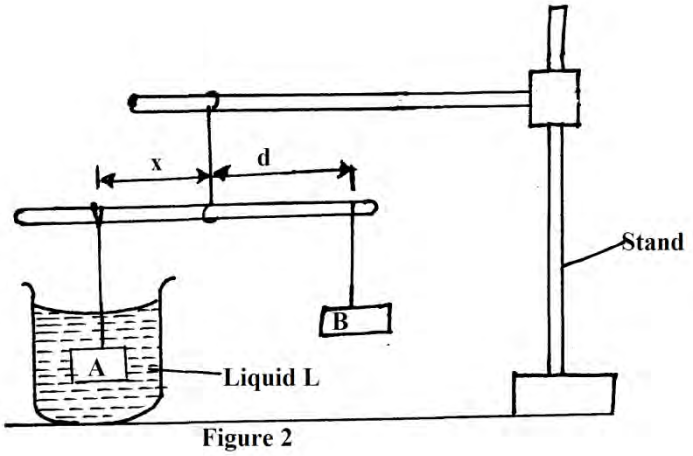


Figure 2

Suspend the mass A at a distance x = 50mm. adjust the position of mass B until it balances mass A immersed in liquid L.

Record the distance d, of mass B from the pivot.

Repeat the same process for other values of x in table 2 below and complete the table. (3 mks)

x(mm)	50	100	150	200	250	300
x(cm)						
d(cm)						

(c) Plot a graph of d (y axis) against x (cm). (5mks)

d) Determine the slope, S of the graph. (2mks)

(e) Given $S = \frac{F}{W}$, where F is the apparent weight of object A in the liquid L and W is the actual weight of A, find:-

(i) The value of F. (2mks)

(ii) The upthrust, U (3mks)

PART B

You are provided with the following:

- A concave mirror with holder
- A screen
- A meter rule
- A candle
- A match box (to be shared)

Proceed as follow:

(f) Set up the apparatus as in figure 3 below.

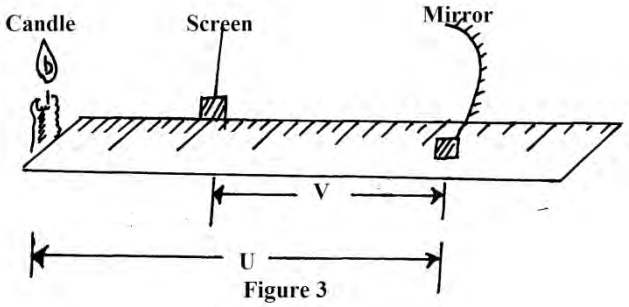


Figure 3

(g) Put the object at a distance u = 30cm from the mirror. Adjust the position of the screen until a sharp image is formed on the screen. Record the distance V.

(h) Repeat procedure (b) above for the distance u = 40cm and record the new distance V. complete the table 3 below. (2mks)

U(cm)	V(cm)	$M=^{v}/_{u}$	(m+1)
30			
40			

(i) Given $f = \frac{V}{(m+1)}$, calculate the values of f hence determine the average value f_{av}: (3mks)

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Each candidate will require the following

- 30Gw 100cm nichrome wire mounted on millimeter scale labelled N and each end marked with X and Y.
- Micrometer screw gauge (to be shared)
- A voltmeter (0-3V or 0-5V)
- An ammeter (0-2.5A)
- A switch
- Two new dry cells D size and a cell holder
- Atleast six connecting wires with Atleast two with crocodile clips.
- A meter rule
- Two identical 100g masses
- About 200ml of liquid L (water) in 250ml beaker
- Three pieces of thread, each about half metre long.
- Stand with clamps
- Tissue paper.
- A concave mirror f =10cm with holder
- A screen
- A meter rule
- A candle
- A match box (to be shared)