KCSE TOP ACHIEVERS YEAR 2020

FORM 4 EXAMS

COMPLETE FORM FOUR EXAMS AND ANSWERS

NAME……..…… INDEX NO…….....……..…..

SCHOOL…… CANDIDATE'S SIGNATURE……..…..

DATE……..……..

233/3
CHEMISTRY
(PRACICAL)
PAPER 3
TIME: 2¼ HOURS

Kenya Certificate of Secondary Education
CHEMISTRY
PAPER 3
(PRACTICAL)
TIME: 2¼ HOURS

INSTRUCTIONS TO CANDIDATES:

*(a) Write your **name** and **number** in the spaces provided **above**.*
*(b) **Sign** and write the **date** of examination in the spaces provided **above**.*
*(c) Answer **ALL** the questions in the spaces provided.*
(d) Mathematics tables and electronic calculators may be used.
(e) All working must be clearly shown where necessary.
(f) The first 15 minutes should be used to go through the questions.

FOR EXAMINER'S USE ONLY:

Question	Maximum Score	Candidate's Score
1	12	
2	15	
3	13	
Total Score	40	

1. You are provided with:
   - Solution B_1 containing 3.15g of a dibasic acid represented as H_2A dissolved to make 250cm³ of a solution.
   - Solution B_2, 0.2M sodium hydroxide.
   - Phenolphthalein indicator.

You are required to:

(i) Titrate solution B_1 against solution B_2.

(ii) Determine the molecular mass of the organic acid.

Procedure:

Fill the burette with sodium B_1.

Add 1 to 2 drops of phenolphthalein indicator into the solution in the conical flask and then titrate with solution B_1.

Pipette 25.0cm³ of solution B_2 sodium hydroxide into a conical flask.

Record your results in the table 1 **below**.

TABLE 1	1	2	3
Final burette reading			
Initial burette reading			
Volume of solution B_1 (cm³)			

(4mks)

(i) Calculate the average volume of solution B_1 used. (Show your working clearly). (1mk)

(ii) Write an equation for the reaction between the acid H_2A and solution hydroxide. (1mk)

(c) Calculate:-

(i) The concentration of the acid solution B_1 in moles per litre. (2mks)

(ii) The concentration of acid B_1 in grams per litre. (1mk)

(iii) The relative molecular mass of the acid B_1. (1mk)

(d) Given that the formula of the acid is $H_2A.XH_2O$. Calculate the value of X. (H = 1.0, O = 16.0, A = 88.0). (2mks)

2. You are provided with:-
- Acid D, labeled solution D.
- 2.0M sodium hydroxide, solution G.

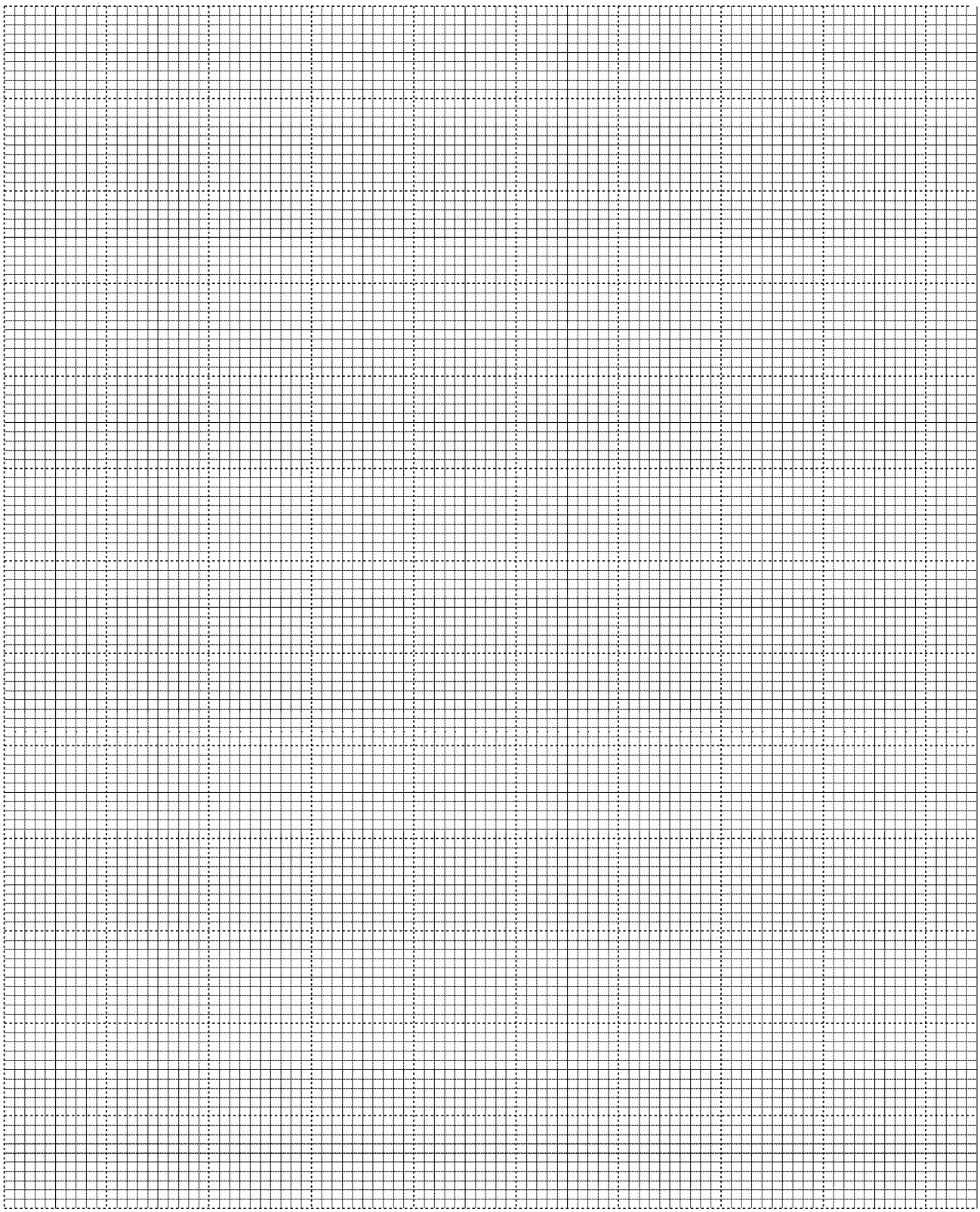
You are required to:-
Determine the:-
(i) reaction ratio between sodium hydroxide and acid D/
(ii) molar heat of neutralization of acid D with the alkali sodium hydroxide (solution G).

Procedure:
Fill a clean burette with solution D. Place 5cm³ of solution D into a 100ml beaker. Measure the initial temperature of solution D in the beaker and record it in table 2. Using a 10ml or a 50ml measuring cylinder, measure 25cm³ of solution G. Add it to solution D in the beaker and immediately stir the mixture gently with the thermometer. Record the maximum temperature reached in table 2. Repeat the experiment with other sets of volumes of solution D and G and complete the table

TABLE 2

Volume of solution D (cm³)	5	9	13	17	21	25
Volume of solution G (cm³)	25	21	17	13	9	5
Maximum temperature (°C)						
Initial temperature (°C)						
Change in temperature, ΔT (°C)						

(a) On the grid provided, plot a graph of ΔT (vertical axis) against the volume of solution D. (3mks)



(b) From the graph, determine the volume of solution D which gave the maximum change. (1mk)

(c) Determine the volume of G that reacted with the volume of solution D in (b) above. (1mk)

(d) Calculate the:-

(i) reacting ratio between sodium hydroxide and acid D.
(Assume that the volume ratio is the same as the mole ratio). (1mk)

(ii) the number of moles of sodium hydroxide, solution G used. (1mk)

(iii) the molar heat of neutralization between sodium hydroxide and the acid.
(Density of the solution = $1gcm^{-3}$)
sp. ht. capacity = $4.2kJkg^{-1}k^{-1}$) (2mks)

3. (a) You are provided with solution Q.

(i) To about $1cm^3$ of Q add drops of 2.0M sodium hydroxides.

Observation	Inferences
(½mk)	(½mk)

(ii) Dip a metallic spatula in solution Q and burn it directly on a non-luminous flame.

Observation	Inferences
(½mk)	(½mk)

(iii) To about 1cm³ of Q add three drops of 1.0M barium nitrate solution provided and keep the mixture.

Observation	Inferences
(1mk)	(1mk)

(iv) To the mixture in (iii) above add a few drops of 2.0M hydrochloric acid drop wise till in excess.

Observation	Inferences
(1mk)	(1mk)

(v) To about 1cm³ of Q add three drops of acidified potassium dichromate (VI) solution.

Observation	Inferences
(½mk)	(½mk)

(b) (i) To about 2cm³ of solution B_1 in a test tube add 2-3 drops of bromine water.

Observation	Inferences
(1mk)	(1mk)

(ii) To about 2cm³ of solution B_1 in a test tube add 2-3 drops of acidified of potassium manganate (VII) solution.

Observation	Inferences
(1mk)	(1mk)

(iii) To the remaining solution B_1 test with both blue and red litmus.

Observation	Inferences
(1mk)	(1mk)

NAME…….. **INDEX NO**……....

SCHOOL…….. **CANDIDATES SIGNATURE**…….

DATE…….……

451/1
COMPUTER STUDIES
PAPER 1
(THEORY)
TIME: 2½ HOURS

Kenya Certificate of Secondary Education

INSTRUCTIONS TO CANDIDATES

- *This paper consists of **TWO** Sections **A** and **B***
- *Answer all questions in Section **A***
- *Answer question **16 (compulsory)** and any other **THREE** question in section **B***
- *All answers should be written in the space provided in the question paper*

FOR OFFICIAL USE ONLY:

Section	Question	Candidates Score
A	1-15	
B	16	
	17	
	18	
	19	
	20	
Total Score		

This paper consists of 12 printed pages.
Candidates should check the question paper to ascertain that all pages are printed and no questions are missing

SECTION A: (40 MARKS)

Answer ALL the questions in this section in the space provided.

1. (a) Distinguish between Optical scanners and Magnetic ink scanners. (2mks)

(b) Differentiate between hardware and software portability. (2mks)

2. (a) Explain the difference between digital signal and analog signal in data communication. (2mks)

(b) Give **two** ways in which computers are used in communication industry. (2mks)

3. (a) Name **two** special purpose memories found either inside or outside the microprocessor. (2mks)

(b) Distinguish between an accumulator and an address register. (2mks)

4. Differentiate between formatting and editing as used in word processing. (2mks)

5. (a) Distinguish between a paste board and a printable page. (2mks)

(b) Differentiate between a margin guide and a column guide as used in D.T.P. (2mks)

6. (a) Define the term normalization as used in a database design. (1mk)

(b) Explain **two** objective of normalization. (2mks)

7. Describe **two** methods used to secure data in a database. (2mks)

8. Explain the meaning of the following terms as used with DTP. (4mks)

(i) Crop.

Embedded object.

(iii) Master page.

(iv) Tool box.

9. Make a clear difference between a Website and Web portals. (2mks)

10. State **two** advantages of using wireless transmission media to connect to the internet. (2mks)

11. (a) What is a protocol? (1mk)

(b) Write the following in full:
TCP/IP, HTML, HTTP and FTP. (2mks)

12. Make a clear difference between Log file and Firewall. (2mks)

13. Explain the meaning of the terms below as used in data security and controls. (3mks)

(i) Information security.

(ii) Fraud.

(iii) Eavesdropping.

14. Make a clear difference between the following information gathering methods. (2mks)

(a) Observation.

(b) Questionnaire.

15. Explain the importance of control structure in program development. (1mk)

SECTION B (60 MARKS)

Answer question 16(compulsory) and any other THREE questions from this section.

16. Mwangi deposits 8500 shillings in a microfinance company at an interest rate of 15% per annum. At the end of each year, the interest earned is added to the deposit and the new amount becomes the deposit of that year.

(a) Write an algorithm for a program that would track the growth of the deposits over a period of five years. (6mks)

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(b) Draw a flowchart for above algorithms. (7mks)

(c) List **four** Selection Controls used in writing a program. (2mks)

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17. (a) Define the term network topology and explain the **two** types of topology. (5mks)

_____

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(b) Define the following terms as used with network. (4mks)

(i) Routers _____

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_____

(ii) Repeaters _____

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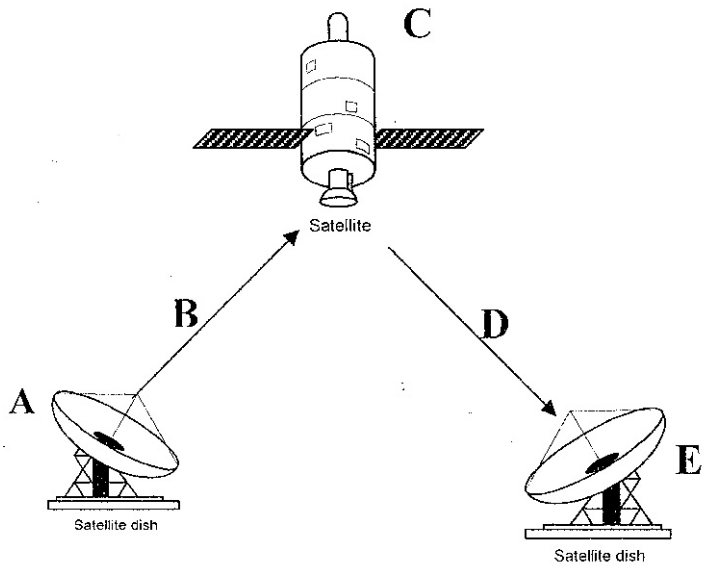
_____

(c) Name the parts labeled **A**, **B**, **C** and **D** in the diagram **below.** (2mks)



A _____

B _____

C_____

D _____

(d) Explain the meaning of the following terms as used in signal transmission. (2mks)

(i) Attenuation _____

_____

_____

(ii) Noise _____

_____

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(e) State **two** advantages of using fiber optic cables. (2mks)

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18. (a) (i) Define the term spreadsheet. (1mk)

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(ii) Give **two** examples of spreadsheet packages available in the market today. (2mks)

_____

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(iii) Explain the following terms as used in spreadsheet.
What IF analysis. (2mks)

_____

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Cell. (1mk)

Formula. (1mk)

Pie-chart. (1mk)

(b) Distinguish between the following sets of terms used in spreadsheet.

(i) Worksheet and workbook. (2mks)

(ii) Filtering and sorting. (2mks)

(c) State **one** way in which a user may reverse the last action taken in a spreadsheet package. (1mk)

(d) Distinguish between a Formula and a function as used in spreadsheet. (2mks)

19. (a) Describe each of the following data processing methods and give an example of where used. (6mks)

(i) Online processing _____

_____

(ii) Batch processing _____

_____

(iii) Real-time. _____

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(b) Make a clear difference between: (6mks)

(i) Logical file and physical file _____

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(ii) Master file and back-p file. _____

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(iii) Random and indexed sequential file organization methods. _____

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(c) An organization is facing threats to data integrity. Explain **three** of how the threats can be minimized. (3mks)

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20. (a) Give **two** reasons why data and information in a computer system needs to be converted to other number systems other than binary. (2mks)

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(b) Explain **two** reasons for use of binary in digital technology. (2mks)

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(c) Using ones complement, subtract 17 from 28. (5mks)

(d) Using BCD coding system convert 796 to binary. (5mks)

(e) Differentiate Database administrator and web administrator. (2mks)

(f) (i) Define the term accreditation as used in education. (2mks)

(ii) Explain **two** factors you would consider before enrolling for an ICT course in a college. (2mks)

NAME…….. **INDEX NO……....**

SCHOOL…….. **CANDIDATES SIGNATURE…….**

DATE……..……

451/2
COMPUTER STUDIES
PAPER 2
(PRACTICAL)
TIME: 2½ HOURS

Kenya Certificate of Secondary Education
COMPUTER
PAPER 2
(PRACTICAL)
TIME: 2½ HOURS

Instructions to candidates:

- This paper has **two** questions.
- Answer all the questions.
- Type your name and index number at the right-hand corner of each printout.
- Write your name and index number on the CD.
- Write the Name and version of software used in each question on the answer sheet.
- Passwords should not be used on CD.
- All answers must be saved on the CD or diskette.
- Hand in all the **printouts** the **diskette**.

This paper consists of 4 printed pages.
Candidates should check the question paper to ascertain that all pages are printed and no questions are missing

1. (a) Using a Word Processing package, type the congratulatory note below as it appears and save it as CONGRATS in a disk provided. (15mks)

Kenya Pipeline Co. Ltd
P.O. Box 5678
Nanyuki
(Insert today's date)

<<First Name>> <<Last Name>>
<<Address>>
Dear<<First Name>>

RE: CONGRATULATIONS (Georgia Font type Bold)

Due to your hard work and sacrifices you made this year, the Kenya Pipeline Fraternity wishes to congratulate you for being voted the best <<Top Title>> of the year. Please keep up the spirit. Enclosed is a cheque worth <<Amount>> as appreciation for four excellent service.

Yours faithfully,

Daniel Mahinda
PERSONNEL

(b) Create a data source with the following details and use it with the note you have just typed to generate personal notes to the company's named personnel. Save it as Details in your disk. (15mks)

George Nyaundi P. O. BOX 5678 Nanyuki Driver Ksh.2500	Carlos Odongo P. O. BOX 5678 Nanyuki Health Officer	Henry Matara P. O. BOX 5678 Nanyuki Gateman
Monica Akinyi P.O. BOX 5678 Nanyuki Typist Ksh.2000	Benta Moraa P. O. BOX 5678 Nanyuki Secretary Shs.3000	Beth Wangoi P. O. BOX 5678 Nanyuki Accountant Shs.4500

(c) Insert data fields in main document and generate the notes for the employees.(14mks)

(d) Print the notes. (6mks)

(e) Generate envelope labels for these notes with the fields of names and address. (9mks)

(f) Print the labels. (6mks)

2. A firm keeps its details in a computer database. The information below contains details obtained from two tables of the database. Study the tables and answer the questions that follow.

Employees table

EmployeeID	EmployeeName	Department	Job Title	Salary
7369	Mark Koech	Research	Clerk	48000
7499	Philip Meme	Sales	Salesman	16000
7521	Mohamed Ali	Sales	Salesman	12500
7566	Kennedy Simiyu	Research	Manager	39750
7698	David Kamau	Operations	Manager	38500
7782	Titus Ole Simian	Accounting	Manager	34500
7788	John Onyango	Operations	Analyst	30000
7821	Patel Shah	Operations	Analyst	25000

Department Table

DeptCode	Department	Location
10	Accounting	Nairobi
20	Research	Nakuru
30	Sales & Marketing	Mombasa
40	Operations	Kisumu

Required:

(a) Create a database that can be used to store the above data and save it as **MACAL** in the disk provided. (10mks)

(b) Using appropriate primary and foreign keys create a relationship between the two tables. Enforce referential integrity between the tables. (4mks)

(c) Validate the primary key entry to exactly four and two characters for the EmployeeID and DeptCode fields respectively. (4mks)

(d) Create a form for each table and use it to enter the records shown in the tables above. Save the forms as **EmployForm** and **DepartForm** respectively. (6mks)

(e) It is required that the dates on which the employees were hired be included in the database. Koech was hired on 10/06/1998. Meme on 15/08/1996. Mohamed on 16/03/1996, Onyango on 09/03/2003, the rest were hired on 13/03/2004. Insert a new field, name it Date of Hire in the Employees table and enter the field. (5mks)

(f) Create a query that displays employees who were employed after year 2000, save the query as **LatestEmployees**. (4mks)

(g) Create, a, Report that displays the Employee Name, Job title Department name and Salary, grouped according to location.
Save the report as EmployeeReport. (4mks)

(h) (a) Create a query to display the employees and their job description.
Save it as EMPTYPE. (4mks)

(b) Create a pie chart based on the query in h(a) above to display the proportions of employees in various job descriptions.
Save the report as CHART. (4mks)

(i) Print:
(i) Employees and Department table designs.
(ii) Employee and Department forms.
(iii) LatestEmployees Query.
(iv) EmployeesReport.
(v) The Chart

313/1
CHRISTIAN RELIGIOUS EDUCATION
PAPER 1
TIME: 2½ HOURS

Kenya Certificate of Secondary Education

CHRISTIAN RELIGIOUS EDUCATION
PAPER 1
TIME: 2½ HOURS

INSTRUCTIONS TO CANDIDATES:

(a) This paper consists of **six** questions.
(b) Answer any **five** question on the answer booklet provided.

1. (a) Identify **eight** activities performed by God in the second account of creation (Gen 2:4 – 25). (8mks)

   (b) Outline similarities between traditional African view of evil and the Biblical concept of sin. (7mks)

   (c) State **five** consequences of evil in the society today. (5mks)

2. (a) Explain the significance of the night of Exodus to the Israelites. (7mks)

   (b) State **seven** circumstances under which covenants were made in the Africa traditional societies. (7mks)

   (c) Give **six** importances of the Ten Commandments today. (6mks)

3. (a) Explain **four** ways in which King Solomon fulfilled Samuel's prophecy about kingship in Israel. (8mks)

   (b) Outline God's promises to King David through Prophet Nathan. (6mks)

   (c) Give **six** ways in which Christians can deal with challenges they face in modern day society. (6mks)

4. (a) Identify **six** categories of prophets. (6mks)

   (b) Explain **four** reasons why God was to pass judgment on Israel and other nations. (8mks)

   (c) Give ways through which Christians fight hypocrisy in the church. (6mks)

5. (a) Outline the message of Jeremiah in his letter to the exiles Jer.29:1 – 14. (7mks)

   (b) Identify **four** similarities in the life and experience of Nehemiah and Jesus. (8mks)

   (c) Give **five** reasons why it is difficult to have reforms in Kenya. (5mks)

6. (a) Outline **four** duties of healers as counsellors in traditional African communities. (8mks)

   (b) State **six** ways in which people show their appreciation to God as the source of life in traditional African communities. (6mks)

   (c) State **six** factors which have led to decline of observance of taboos in traditional African communities. (6mks)

313/2
CHRISTIAN RELIGIOUS EDUCATION
PAPER 2
TIME: 2½ HOURS

Kenya Certificate of Secondary Education

CHRISTIAN RELIGIOUS EDUCATION
PAPER 2
TIME: 2½ HOURS

INSTRUCTIONS TO CANDIDATES:

(a) This paper consists of **six** questions.
(b) Answer any **five** question on the answer booklet provided.

1. (a) Identify **seven** similarities between the annunciation of the birth of John the Baptist and that of Jesus. (7mks)

   (b) Describe the events that took place after the birth of John the Baptist Luke 1: 57 - 67. (8mks)

   (c) What lessons do Christian learn from the story of shepherds during the birth of Jesus Christ. (5mks)

2. (a) Describe the call of Levi in Luke 5: 27 – 32. (6mks)

   (b) Give reasons why Jesus appointed the twelve apostles. (8mks)

   (c) Give reasons why a person should be converted to Christianity. (6mks)

3. (a) Explain the significance of miracles in the ministry of Jesus. (8mks)

   (b) Give reasons why Jesus was not anxious to disclose his messiah ship. (6mks)

   (c) Identify instances when Jesus was tempted during his life. (6mks)

4. (a) As a gift of the Holy Spirit, identify the components of love in 1 Cor 13. (7mks)

   (b) State **six** Christian criteria for discerning the gifts of the Holy Spirit. (6mks)

   (c) What are the causes of disunity in the church today. (7mks)

5. (a) Explain the traditional understanding of marriage. (8mks)

   (b) Identify **six** forms of irresponsible sexual behaviour in the society today. (6mks)

   (c) State **six** ways in which the church can help single parents. (6mks)

6. (a) Identify **six** practices that promote law and order in traditional African communities. (6mks)

   (b) Explain how science and technology has helped in evangelization. (7mks)

   (c) Show how Christians contribute to the conservation of the environment. (7mks)

449/1
DRAWING AND DESIGN
PAPER 1
TIME: 2½ HOURS

Kenya Certificate of Secondary Education
DRAWING AND DESIGN
PAPER 1
TIME: 2½ HOURS

INSTRUCTIO NS TO THE CANDIDATES:

(a) You should have the following:
- Drawing instruments.
- Drawing papers size A_3.
- Scale rule.

(b) This paper consists of three Sections; **A**, **B** and **C**.

(c) Answer all questions in Sections **A** and **B** and any **two** questions from Section **C**.

(d) All dimensions are in millimeters.

(e) Candidates should check the question paper to ascertain that there are no missing questions.

SECTION A: (50 MARKS)

1. (a) Why are drawing boards always inclined at a small angle? (1mk)

   (b) What is a two dimensional drawing? State three examples. (2mks)

2. Using a ruler and a pair of compass only, construct.
   (a) A regular pentagon whose sides are 30mm long. (3mks)

   (b) The template shown in figure **1 below**. (2mks)

Fig.1

3. (a) Sketch each of the following lines. (2mks)
   (i) Hidden details.
   (ii) Centre line.
   (iii) Construction line.
   (iv) Dimension line.

   (b) State the meaning of the following: (2mks)

   (i)

   (ii)

   (iii)

   (iv)

4. (a) State **two** advantages of using computers in drawing. (1mk)

   (b) With reference to sheet metal, explain the term galvanizing. (2mks)

5. Construct a diagonal scale of 1: 5 to measure to an accuracy of 5mm up to 800mm. Show a reading of 615mm on the scale. (4mks)

6. Figure **2 below** shows the elevation of a truncated right square pyramid project the plan. (5mks)

7. (a) Gas welding consists of two gas cylinders. State the type of gas in each of the cylinders and the standard colour painted on the gas cylinder for each. (2mks)

   (b) Using a cube, show the three types of pictorial drawings. (3mks)

8. Views of a shaped block are shown in figure **3 below** in first angle orthographic projection. Sketch in good proportion the oblique view of the block. (3mks)

9. (a) Views of a shaped block are shown in figure **4** in first angle projection. Sketch a two point perspective view of the block. (3mks)

(b) Using the concentric circle method, construct an ellipse of major and minor axis as 85 and 45mm respectively. (5mks)

10. A wheel 55mm diameter rolls without slipping on a straight line. Plot the locus of point P for one complete revolution. (10mks)

SECTION B:(20 MARKS)

11. Details of a heavy duty trolley wheel are shown in the figure below.
Assemble all the parts and draw:
(i) Front elevation as seen along length □120.
(ii) End elevation.
(iii) Include a parts list and angle of projection used.

SECTION C: (30 MARKS)

Attempt any **two** questions from this section.

12. The figure shows a line diagram a slider crank mechanism. The slider is constrained to move along the groove XY, while the crank OB rotates about centre O. Plot the locus of point P on the connecting rod. (15mks)

AB = 90
OB = 25
AP = PB

13. The figure shows an incomplete front elevation of a truncated hexagonal pyramid with a hollow triangular prism joining it. (15mks)

Draw:

(i) A complete front elevation.

(ii) End elevation in the direction of arrow K.

(iii) Plan.

14. The figure **below** shows an elevation and an incomplete plan of a square pyramid truncated along XX and YY. (15mks)

(a) Copy the given views and complete the plan.

(b) Draw the end elevation in the direction of arrow K. (15mks)

449/2
DRAWING AND DESIGN
PAPER 2
TIME: 2½ HOURS

Kenya Certificate of Secondary Education

DRAWING AND DESIGN
PAPER 2
TIME: 2½ HOURS

INSTRUCTIONS TO THE CANDIDATES:

1. This paper has **ONE COMPILSORY** question.
2. The paper is to be issued to the candidates 30 minutes before the exam starts.
3. Candidates are advised to spend this time understanding the design problem and planning the work.

FOR EXAMINER'S USE ONLY:

QUESTION	SECTION	MAXIMUM SCORE	CANDIDATES SCORE
DESIGN PROBLEM	a	6	
	b (i)	11	
	b (ii)	16	
	c (i)	4	
	(ii)	3	
TOTAL SCORE			

DESIGN PROBLEM: (40 MARKS)

Design a 3 leg painter's ladder.

Considering that:

1. It should have a flat top for the painter to place the paints.

2. It should be possible to raise and lower the height to the convenient of the painter.

3. When not in use it should be stored in a narrow space.

4. At least two different materials to be used in the design.

REQUIREMENTS:

(a) Make rough sketches of two possible designs of the finished ladder. (6mks)

(b) (i) Make a pictorial sketch of the selected design. (11mks)

(ii) Sketch the design details of the mechanisms to allow for consideration 2 and 3 above. (16mks)

(c) (i) List materials selected for the design and give a reason for the choice of each. (4mks)

(ii) State the method used for joining the parts. (3mks)

312/1
GEOGRAPHY
PAPER 1
TIME: 2¾ HOURS

Kenya Certificate of Secondary Education
GEOGRAPHY
PAPER 1
TIME: 2¾ HOURS

INSTRUCTIONS TO CANDIDATES:

(a) This paper has **two** Sections **A** and **B**.
(b) Answer all the questions in Section **A**.
(c) Answer question **6** and any other **two** questions from Section **B**.
(d) All answers must be written in the answer booklet provided.
(e) Candidates should check the question paper to ascertain that all the papers are printed as indicated and no questions are missing.

SECTION A:

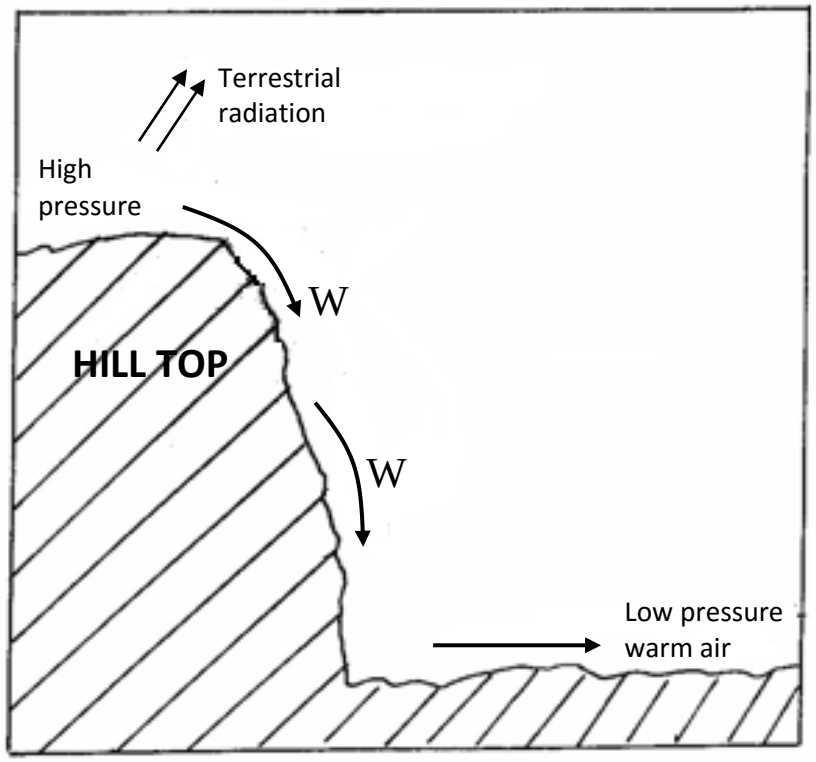
Answer **all** questions from this section in the spaces provided.

1. (a) Give **three** heavenly bodies. (3mks)

   (b) Distinguish between equinox and solstice. (2mks)

2. (a) What are harmattan winds. (2mks)

   (b) The diagram **below** shows a type of wind.



   (i) Identify the type of wind marked **W**. (1mk)

   (ii) List **two** characteristics of the type of the wind marked **W**. (2mks)

3. (a) What is a mineral? (2mks)

   (b) Name **two** metallic minerals? (2mks)

4. (a) What is climate? (2mks)

   (b) Explain **two** effects of climate change on the physical environment. (4mks)

5. (a) What is a karst scenery/ (2mks)

   (b) Give **three** factors that influence the development of karst scenery. (3mks)

SECTION B:

Answer question **6** and any other **two** questions

6. Study the map of Kitale 1:50,000 (Sheet 75/3) provided and answer the following questions.

(a) (i) Give the longitudinal extent of the area covered by the map. (2mks)

(ii) Identify the settlement patterns found on the Northern area covered by the map. (3mks)

(b) (i) Measure the distance of the Kitale Municipality boundary. Give your answer in kilometers. (2mks)

(ii) What is the bearing of the Air photo principal point on the grid square 2912 from the Air photo principal point on grid square 3516. (2mks)

(c) (i) Draw a rectangle 15cm by 9cm to represent the area East of Easting 40 and North of Northing 20. (1mk)

(ii) On the rectangle mark and name.

- Road C640. (1mk)
- River Kapsara. (1mk)
- Rogurr hill. (1mk)
- District boundary. (1mk)

(iii) Calculate the area to the East of the District boundary and to the South of Northing 23. (2mks)

(d) (i) Identify **two** types of vegetation found in the area covered by the map. (2mks)

(ii) Describe the drainage of the area covered by the map. (5mks)

7. (a) What is a rock? (2mks)

(b) (i) Classify rocks according to their mode of formation. (3mks)

(ii) Identify **two** classes of rocks mentioned in (i) above that are formed from the already existing rocks. (2mks)

(iii) List **two** characteristics of rocks. (2mks)

(c) (i) List **two** main types of rocks dominant in Kenya. (2mks)

(ii) Explain the importance of studying rocks. (6mks)

(d) Explain **four** benefits of rocks to the economy of a country. (8mks)

8. (a) (i) What is mass movement? (2mks)

(ii) List the **two** broad categories of mass wasting. (2mks)

(b) (i) What is soil creep? (2mks)

(ii) Describe the factors that cause soil creep. (5mks)

(c) Differentiate between soils creeps and rock slide. (6mks)

(d) Explain the negative effects of mass wasting on physical and human environment. (8mks)

9. (a) Differentiate between a ocean and a sea. (2mks)

(b) (i) Identify the **main** cause of water movement in the ocean. (2mks)

(ii) Identify the **two** main water movements in the oceans. (2mks)

(c) List **three** processes through which erosion occurs along the Coasts. (3mks)

(d) Using a well labeled diagram describe the formation of a spit. (5mks)

(e) Describe the **three** types of coasts. (6mks)

(f) Explain how oceans currents influence the climate of the surroundings. (5mks)

10. (a) (i) What is ice? (1mk)

(ii) Differentiate between glacier and avalanche. (2mks)

(b) (i) Identify the **two** main glacier erosion processes. (2mks)

(ii) Describe the factors that influence glacier erosion. (6mks)

(c) Explain **four** effects of glaciations on human activities. (8mks)

(d) Students from Neive School are planning to carry out a field study of a glaciated area.

(i) State **two** objectives of their study. (2mks)

(ii) State **two** ways they would prepare for the study. (2mks)

(iii) Give **two** methods they would use to collect information. (2mks)

312/2
GEOGRAPHY
PAPER 2
TIME: 2¾ HOURS

Kenya Certificate of Secondary Education
GEOGRAPHY
PAPER 2
TIME: 2¾ HOURS

INSTRUCTIONS TO CANDIDATES:

(a) This paper has **two** Sections **A** and **B**.
(b) Answer all the questions in Section **A**.
(c) Answer question **6** and any other **two** questions from Section **B**.
(d) All answers must be written in the answer booklet provided.
(e) Candidates should check the question paper to ascertain that all the papers are printed as indicated and no questions are missing.

SECTION A:

Answer **all** questions from this section in the spaces provided.

1. (a) Apart from tsetse fly control mention **two** other methods which are used to reclaim land in Kenya. (2mks)

   (b) State **three** control measures applied to eliminate tsetse flies in Kenya. (3mks)

2. (a) Name **two** types of coal. (2mks)

   (b) State **three** factors that have contributed to the declining use of coal. (3mks)

3. (a) Stat **two** advantages of using rail transport in Kenya. (2mks)

   (b) Give **three** reasons why road transport is used more than air transport in East Africa. (3mks)

4. (a) Define the following terms:-
   (i) Sanctuary. (1mk)
   (ii) Game ranch. (1mk)

   (b) Name **one** sanctuary in Kenya. (1mk)

   (c) List down **two** factors that favour wildlife conservation. (2mks)

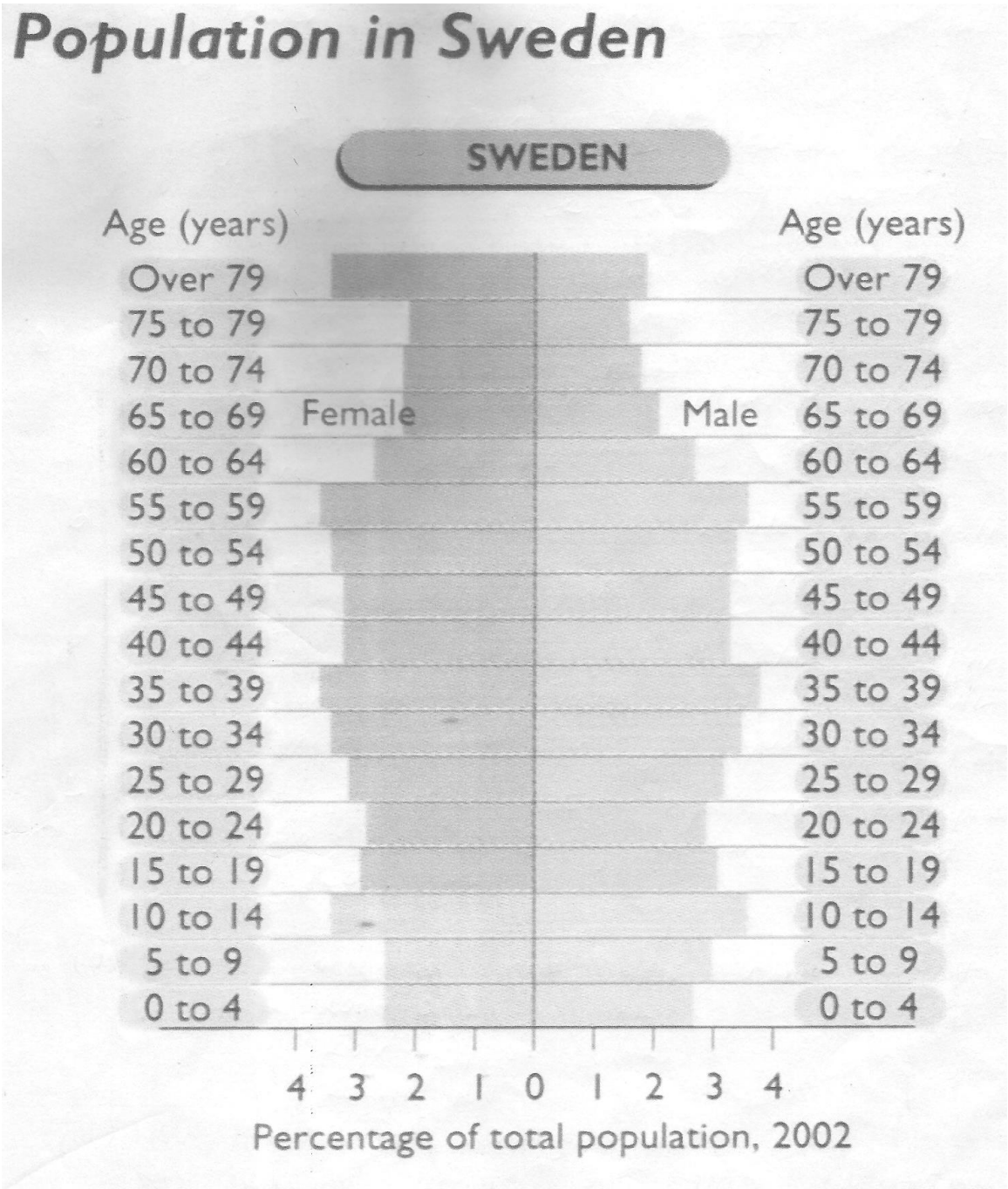
5. (a) Name **three** functional zonal of a town. (3mks)

   (b) State **two** benefits of urbanization. (2mks)

SECTION B:

Answer question **6** and any other **two** questions

6. Use the population pyramid **below** to answer the questions that follow:



(a) (i) Briefly describe the population structure represented by the age-sex pyramid above. (4mks)

(ii) State any **two** advantages of the method of data representation shown above. (2mks)

(iii) List any **three** methods that could have been used to acquire the data above. (3mks)

(iv) State **two** implications of such a structure to the country's economy. (2mks)

(b) (i) What is population explosion? (1mk)

(ii) Explain **three** effects of rural-urban migration in East Africa. (6mks)

(iii) List **three** factors that influence population distribution in Kenya. (3mks)

(iv) State **four** factors leading to the reduction of fertility rate in Kenya. (4mks)

7. (a) (i) State **three** characteristics of intensive farming. (3mks)

(ii) Outline **four** factors that have led Kenya to change from subsistence farming to commercial farming. (4mks)

(b) (i) Name **three** districts in Kenya where maize is grown on a large scale. (3mks)

(ii) State **four** physical requirements for growing maize in Kenya. (4mks)

(iii) Explain **four** problems facing maize farming in Kenya. (8mks)

(iv) State **three** ways in which maize contributes to the economy of Kenya. (3mks)

8. (a) Define the following:
(i) Internal trade. (1mk)
(ii) International trade. (1mk)

(b) State **three** problems face by Kenya in international trade. (3mks)

(c) (i) Identify **three** major exports from Kenya. (3mks)

(ii) Give **three** reasons why Kenya should protect her local industries. (3mks)

	(d)	(i)	What is unfavourable balance of trade?	(2mks)
		(ii)	Explain **three** reasons why Kenya experiences unfavourable balance of trade.	(6mks)
		(iii)	Explain **three** measures taken by the Kenyan government to reduce her unfavourable balance of trade.	(6mks)
9.	(a)	(i)	Apart from flooding name **two** other natural hazards experienced in Kenya.	(2mks)
		(ii)	Give **three** areas in Kenya where flooding is common.	(3mks)
	(b)	(i)	Identify **three** ways through which water is polluted.	(3mks)
		(ii)	Explain **three** effects of air pollution on the environment.	(6mks)
	(c)	(i)	Define desertification.	(2mks)
		(ii)	Explain **three** causes of desertification.	(6mks)
		(iii)	State **three** effects of desertification.	(3mks)
10.	(a)	(i)	What is industrial inertia?	(2mks)
		(ii)	List **three** factors that influence industrial location in Kenya.	(3mks)
	(b)	(i)	Name **two** non-agricultural manufacturing industries in Kenya.	(2mks)
		(ii)	Give **three** examples of cottage industries in Kenya.	(3mks)
		(iii)	Explain **four** reasons why Kenya government encourages the development of Jua Kali.	(8mks)
	(c)	(i)	Apart from industry, name **three** other pillars of vision 2030.	(3mks)
		(ii)	Explain **two** ways through which industries will contribute to the achievement of vision 2030.	(4mks)

311/1
HISTORY AND GOVERNMENT
PAPER 1
TIME: 2½ HOURS

Kenya Certificate of Secondary Education

HISTORY AND GOVERNMENT
PAPER 1
TIME: 2½ HOURS

INSTRUCTIONS TO CANDIDATES:

*(a) This paper consists of **three** Section **A**, **B** and **C**.*
*(b) Answer **ALL** questions in Section **A** and **three** questions from Section **B** and **two** questions in Section **C**.*
(c) Answers to all the questions must be written in the answer booklet provided.
(d) Candidates should check the question paper to ascertain that no questions are missing.

SECTION A: (25 MARKS)

Answer all questions in this section in the answer booklet provided.

1. Identify **two** sources of Kenyan history. (2mks)

2. Give **two** species of the early man whose remains were discovered in Kenya. (2mks)

3. Name **one** community in Kenya that belongs to the Eastern Cushites. (1mk)

4. State **two** duties of the Orkoyot among the Nandi. (2mks)

5. Give the **main** reason why the early visitors from Arabia came to the Kenyan Coast before 1500AD. (1mk)

6. Give **two** factors which influenced said Seyyid to develop Agriculture in Zanzibar in the 19th century. (2mks)

7. Identify **one** condition when one may be denied the right to life. (1mk)

8. Identify **one** community which resisted the British occupation of Kenya to the West of the Rift Valley. (1mk)

9. State **two** problems which the Imperial British East Africa Company (IBEA) faced in the administration of Kenya during the colonial period. (2mks)

10. Which was the **main** reason that enabled the British to conquer Kenya? (1mk)

11. State two ways through which European settlers in Kenya were able to get labour force during colonial period. (2mks)

12. Give **one** philosophy adopted at independence to promote social justice in Kenya. (1mk)

13. State **two** economic challenges that Kenya experienced after independence. (2mks)

14. Identify the section of constitution which was repealed to give way to the introduction of political pluralism in Kenya. (1mk)

15. What is the **main** role of Kenya anti-corruption commission? (2mks)

16. Give the **main** challenge facing the implementation of free primary education in Kenya. (1mk)

17. Identify **two** types of direct taxes which the government uses to raise revenue. (1mk)

SECTION B: (45 MARKS)

Answer any three questions from this section in the answer booklet provided.

18. (a) Name **three** similarities in the social organization of the Agikuyu and Luo during the pre-colonial period. (3mks)

(b) Describe the social-political organization of the Mijikenda during the pre-colonial period. (12mks)

19. (a) Give **three** sources of information about the East Coast of Africa before the 7th century AD. (3mks)

(b) Explain **six** impacts of the Indian Ocean trade on the Kenyan Coast people. (12mks)

20. (a) Give **three** ordinances that were passed by the colonial government between 1896 – 1902. (3mks)

(b) Explain **six** consequences of the colonial land policies in Kenya during the colonial period. (12mks)

21. (a) Identify **five** factors that facilitated industrial development in Kenya. (5mks)

(b) Explain **five** steps that the Kenya government has undertaken to boost industrial growth since independence. (10mks)

SECTION C: (30 MARKS)

Answer any two questions in this section in the answer booklet provided.

22. (a) State **three** main methods of conflict resolution in Kenya. (3mks)

(b) Explain **six** ways in which the government of Kenya promotes the Bill of Rights. (12mks)

23. (a) Identify **five** requirements in the constitution making process. (5mks)

(b) Describe **five** features of the independence constitution of Kenya. (10mks)

24. (a) Give **five** members of the county government in Kenya in the new constitution. (5mks)

(b) Explain **five** challenges that are likely to be faced by the county governments. (10mks)

311/2
HISTORY AND GOVERNMENT
PAPER 2
TIME: 2½ HOURS

Kenya Certificate of Secondary Education

HISTORY AND GOVERNMENT
PAPER 2
TIME: 2½ HOURS

INSTRUCTIONS TO CANDIDATES:

*(a) This paper consists of **three** Section **A**, **B** and **C**.*
*(b) Answer **ALL** questions in Section **A** and **three** questions from Section **B** and **two** questions in Section **C**.*
(c) Answers to all the questions must be written in the answer booklet provided.
(d) Candidates should check the question paper to ascertain that no questions are missing.

SECTION A: (25 MARKS)

Answer all questions in this section in the answer booklet provided.

1. Give **two** methods used by archaeologists to determine the age of fossils. (2mks)

2. Give **one** reason why early people moved from forests to settle in grasslands. (1mk)

3. Give the **main** reason why early agriculture developed in Egypt. (1mk)

4. Name **two** main methods of trade. (2mks)

5. Identify **one** invention that revolutionized food preservation during the 19^{th} century. (1mk)

6. Who are credited with the first use of iron? (1mk)

7. Give **two** reasons that led to the decline of meroe as an early urban centre. (2mks)

8. State the role of 'golden stool' in the Asante Kingdom during the 19^{th} century. (1mk)

9. Name **two** African countries that were not colonized. (2mks)

10. Who was the first Senegalese deputy to the French chamber of deputies? (1mk)

11. State **two** objectives of African national congress. (2mks)

12. What was the immediate cause of Britain entry into the First World War? (1mk)

13. What is the main duty of the United nations General Assembly? (1mk)

14. Apart from political instability in Uganda during the reign of Idd Amin, state **two** other reasons for the collapse of the East African community in 1977. (2mks)

15. State **two** achievements of the organization of African unity. (2mks)

16. Which are the **two** major national political parties in the United States of America? (2mks)

17. Who is the head of government in India? (1mk)

SECTION B: (45 MARKS)

Answer any **three** questions in this section in the answer booklet provided.

18. (a) State **three** ways in which the development of agriculture contributed to the establishment of government. (3mks)

    (b) Explain **six** effects of the Agrarian revolution in Britain. (12mks)

19. (a) Identify **three** ways in which water was used in industries during the 19th century. (3mks)

    (b) Explain **six** social effects of the industrial revolution in Europe during the 18th century. (12mks)

20. (a) State **five** factors that led to the emergence of trade. (5mks)

    (b) Explain **five** challenges faced by the Trans-Saharan traders. (10mks)

21. (a) Give **three** duties of the native affairs department in Southern Rhodesia during the colonial period. (3mks)

    (b) Explain **six** consequences of the land apportionment act of 1930 in Zimbabwe. (12mks)

SECTION A: (30 MARKS)

Answer any **two** questions in this section in the answer booklet provided.

22. (a) Give **five** achievements of the league of nations between 1919 and 1939. (5mks)

    (b) Explain **five** reasons why the league of nations failed to maintain world peace. (10mks)

23. (a) State **five** aims of Pan-Africanism. (5mks)

    (b) Explain **five** reasons why Pan-African Movement had not established itself on the African continent before 1945. (10mks)

24. (a) Give **three** political changes introduced by Mobutu Sese Seko which led to dictatorship in the democratic republic of Congo. (3mks)

    (b) Explain **six** economic problems faced by the democratic republic of Congo since independence. (12mks)

NAME…… **INDEX NUMBER……..…**

SCHOOL…… **CANDIDATE'S SIGNATURE……**

DATE……

121/1
MATHEMATICS
PAPER 1
TIME: 2½ HOURS

Kenya Certificate of Secondary Education
MATHEMATICS
PAPER 1
TIME: 2½ HRS.

INSTRUCTION TO CANDIDATE'S:

1. Write your **name**, **index number** and **school** in the spaces provided above.
2. **Sign** and write the **date** of examination in spaces provided.
3. This paper consists of **two** Sections; Section **I** and Section **II**.
4. Answer all the questions in Section **I** and any **five** questions from Section **II**.
5. All answers and working must be written on the question paper in the spaces provided **below** each question.
6. Show all the steps in your calculation, giving your answer at each stage in the spaces provided **below** each question.
7. Marks may be given for correct working even if the answer is wrong.
8. Non-programmable silent electronic calculators and KNEC Mathematical tables **may be** used, except where stated otherwise.
9. Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

FOR EXAMINER'S USE ONLY:

SECTION I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL

SECTION II

17	18	19	20	21	22	23	24	TOTAL

GRAND TOTAL

SECTION I: (50 MARKS)

Answer all the question in this section in the spaces provided:

1. Evaluate:

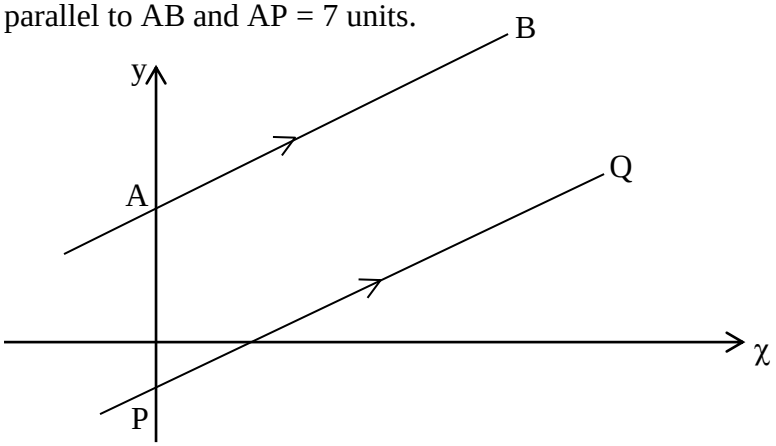
$$\frac{\sqrt{1/4}\ of\ 3\frac{1}{2} + \frac{3}{2}\left(\frac{5}{2} - \frac{2}{3}\right)}{\frac{3}{4}\ of\ 2\frac{1}{2} \div \frac{1}{4}}$$

(3mks)

2. The average lap time for 3 athletes in a long distance race is 36 seconds, 40 seconds and 48 seconds respectively. If they all start the race at the same time, find the number of times the slowest runner will have been overlapped by the fastest at the time they all cross the starting point together again. (3mks)

3. Kamau toured Switerland from Germany. In Switzerland he bought his wife a present worth 72 Deutsche marks. Find the value of the present in
   (a) Swiss Francs.
   (b) Kenya shillings correct to the nearest sh, if
   1 Swiss Franc = 1.25 Deutsche marks
   1 Swiss Franc = 48.2 Kenya shillings (3mks)

4. The equation of line AB in the figure below is $y = 3\chi + 5$ and A is the point (0, a). Line PQ is parallel to AB and AP = 7 units.



(i) Find the value of a. (1mk)

(ii) Write down the equation of PQ. (2mks)

5. Solve the equation $2\chi^2 + 3\chi = 5$ by completing the square method.. (3mks)

6. Given that $\frac{3}{2-\sqrt{18}} + \frac{5}{2+\sqrt{18}} = a + b\sqrt{c}$. Find the values of a, b and c. (3mks)

7. The mean of five numbers is 20. The mean of the first three numbers is 16. The fifth number is greater than the fourth by 8. Find the fifth number. (3mks)

8. Show that the points P(3, 4), Q(4, 3) and R(1, 6) are collinear. (3mks)

9. Solve the inequalities $x \leq 2x + 7 \leq -\frac{1}{3}x + 14$ hence represent the solution on a number line. (3mks)

10. Use the tables of squares, square roots and reciprocals only to find the value of

$$(0.0546)^{\frac{1}{2}} + \left(\frac{1}{4.327}\right)^2$$

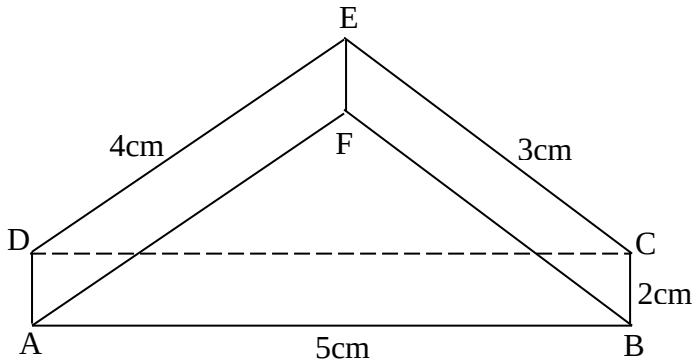
(3mks)

11. A circle of radius 7 units has it's centre at the point of intersection between the lines $\chi + 2y + 1 = 0$ and $2\chi + 3y - 3 = 0$. Find the equation of the circle expressing it in the form $\chi^2 + y^2 + y\chi + fy + c = 0$. (3mks)

12. The gradient of a curve at any point (χ, y) is given by $3\chi^2 + 2\chi$. If the curve passes through the point (-2, 1). Find its equation. (3mks)

13. A solid metal cylinder with radius 7cm and height 5cm is melted down and recast into a spherical ball. Calculate to 1 decimal place the surface area of this ball. (4mks)

14. Sketch and label the net of the prism shown **below**.



15. The volume of two similar solid spheres are 4752cm³ and 1408cm³. If the surface area of the small sphere is 352cm², find the surface area of the larger sphere. (3mks)

16. A carpenter constructed a closed wooden box with internal measurements 1.5 metres long, 0.8 metres wide and 0.4 metres high. The wood used in constructing the box was 1.0cm thick and has a density of 0.6g/cm³.
Determine the:
(i) volume in cm³ of the wood used in constructing the box. (3mks)

(ii) mass of the box in kilograms correct to 1 decimal place. (1mk)

SECTION II: (50 MARKS)

Answer any **five** questions from this section in the spaces provided:

17. Two aeroplanes, T and S leave an airport A at the same time. S flies on a bearing of 060° at 750km/h while T flies on a bearing of 210° at 900 km/h.

(a) Use a suitable scale, to draw a diagram showing the relative position of the aeroplanes after two hours. (3mks)

(b) Use your diagram to determine:

(i) the distance between the two aeroplanes. (2mks)

(ii) the bearing of T from S. (1mk)

(c) Aeroplane T later flew to the East at the same speed for one hour. Show its final position on the diagram in (a) above.

Determine:

(i) Its final distance from A. (2mks)

(ii) Its final bearing from S. (1mk)

18. The table **below** shows the income tax rates for a certain year.

Taxable pay per month (Ksh)	Tax rates
1 – 9,680	10%
9,681 – 18,800	15%
18,801 – 27,920	20%
27,921 – 37.040	25%
37,040 and above	30%

That year Kazembe paid net tax of Ksh.5,512 per month. His total monthly taxable allowances amounted to Ksh.15,220 and he was entitled to a monthly personal relief of Ksh.1,162.
Every month the following deductions were made:

- NHIF – Ksh. 320
- Union dues – Ksh.200
- Co-operative shares – Ksh.7,500

(a) Calculate Kazembe's monthly basic salary in Ksh. (7mks)

(b) Calculate his monthly net salary. (3mks)

19. (a) On the grid provided **below**, draw the graph of $y = (\chi + 4)(1 - 2\chi)$ for the range $-5 \leq \chi \leq 2$. (4mks)

(b) On the same grid draw the line $y + 3\chi = 2$. (2mks)

(c) Use your graph to solve the equations:

(i) $(\chi + 4)(1 - 2\chi) = -5$ (2mks)

(ii) $-2 - 4\chi - 2\chi^2 = 0$ (2mks)

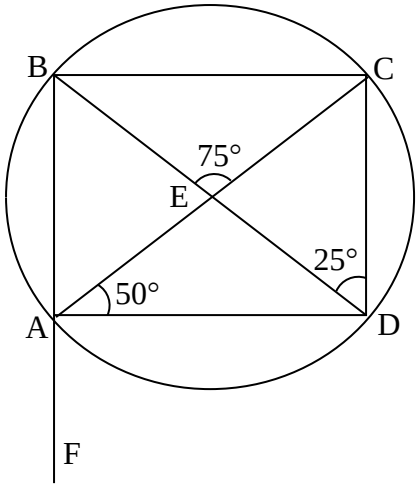
20. A tetrahedron has equilateral triangular base ABC of side 10cm. The vertex V is such that VA = VB = VC = 8cm. Calculate.

(a) The angle between the planes ABC and BCV. (5mks)

(b) The vertical height of the vertex V above the base ABC. (2mks)

(c) Volume of the tetrahedron. (3mks)

21. In the given figure, ∠CAD = 50°, ∠BEC = 75° and ∠BDC = 25°. BAF is a straight line.



Giving reasons where necessary, calculate the size of:-

(i) ∠ABC. (2mks)

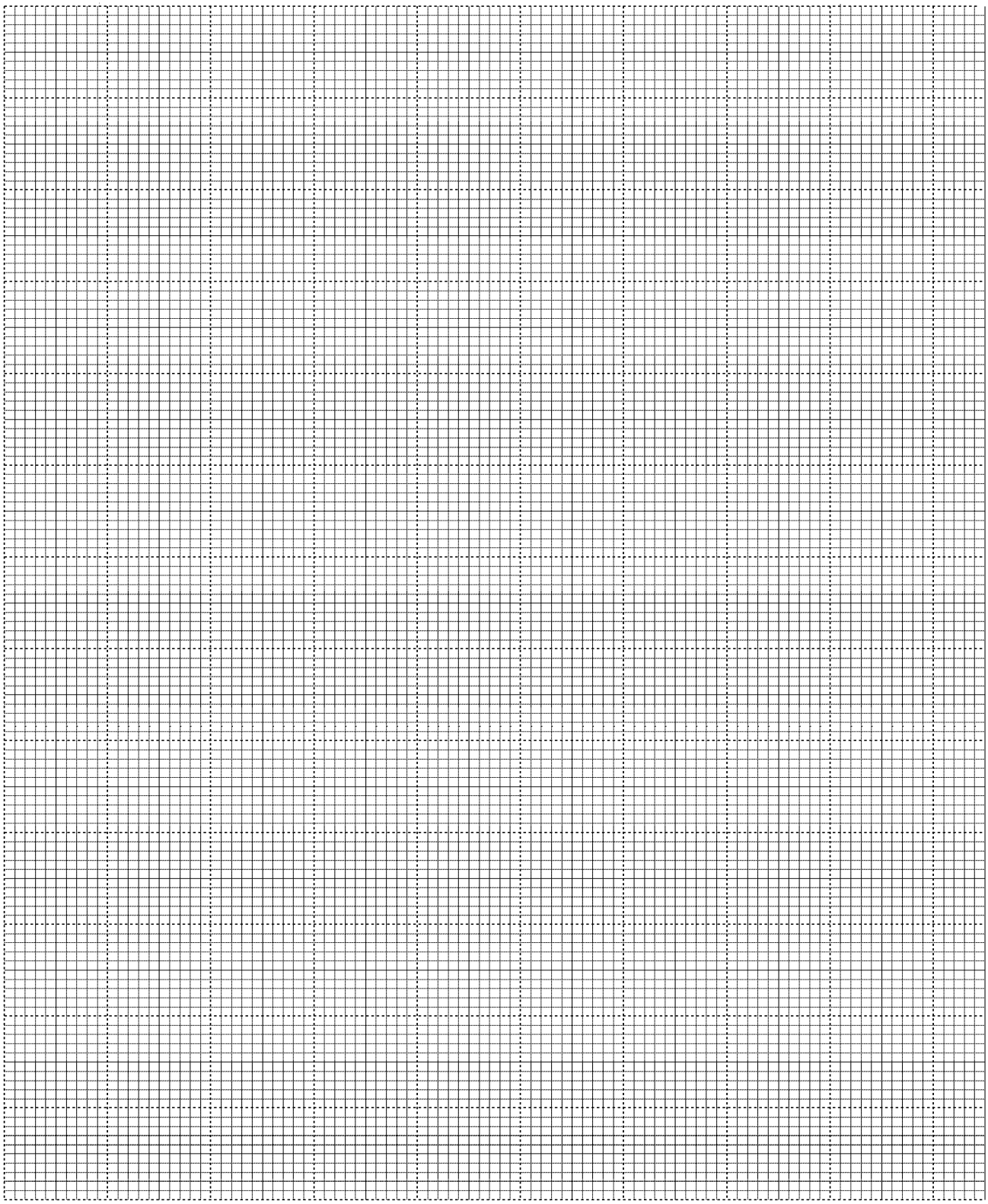
(ii) ∠DEC. (2mks)

(iii) ∠ABD. (3mks)

(iv) ∠DAF. (3mks)

22. A bag contains 5 red, 4 white and 3 blue beads. Two beads are selected at random one after another without replacement.

(a) Draw a tree diagram and show the probability space. (2mks)



(b) From the tree diagram, find the probability that:

(i) The last bead selected is red. (3mks)

(ii) The beads selected were of the same colour. (2mks)

(iii) At least one of selected beads is blue. (3mks)

23. A transformation represented by the matrix $\begin{pmatrix} 2 & 1 \\ 1 & -2 \end{pmatrix}$ maps the points A(0, 0), B(2, 0), C(2, 3) and D(0, 3) of the quad ABCD onto $A^1B^1C^1D^1$ respectively.

(a) Draw the quadrilateral ABCD and its image $A^1B^1C^1D^1$. (3mks)

(b) Hence or otherwise determine the area of $A^1B^1C^1D^1$. (2mks)

(c) Another transformation $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$ maps $A^1B^1C^1D^1$ onto $A^{11}B^{11}C^{11}D^{11}$.
Draw the image $A^{11}B^{11}C^{11}D^{11}$. (2mks)

(d) Determine the single matrix which maps $A^{11}B^{11}C^{11}D^{11}$ back to ABCD. (3mks)

24. The distance from town A to town B is 360km. A bus left town A and traveled towards town B at an average speed of 60km/h. After 1½ hours, a car left town A and traveled along the same road at an average speed of 100km/h.

(a) (Determine

(i) The distance of the bus from town A when the car took off. (2mks)

(ii) The distance the car traveled to catch up with the bus. (4mks)

(b) The distance from P to Q is 160km. If an express train was 16km/h slower it would take 20 minutes longer on the journey. Find the average speed of the express train. (4mks)

NAME…… **INDEX NUMBER……..…**

SCHOOL…… **CANDIDATE'S SIGNATURE……**

DATE……

121/2
MATHEMATICS
PAPER 2
TIME: 2½ HOURS

Kenya Certificate of Secondary Education
MATHEMATICS
PAPER 2
TIME: 2½ HRS.

INSTRUCTION TO CANDIDATE'S:

1. Write your **name**, **index number** and **school** in the spaces provided above.
2. **Sign** and write the **date** of examination in spaces provided.
3. This paper consists of **two** Sections; Section **I** and Section **II**.
4. Answer all the questions in Section **I** and any **five** questions from Section **II**.
5. All answers and working must be written on the question paper in the spaces provided **below** each question.
6. Show all the steps in your calculation, giving your answer at each stage in the spaces provided **below** each question.
7. Marks may be given for correct working even if the answer is wrong.
8. Non-programmable silent electronic calculators and KNEC Mathematical tables **may be** used, except where stated otherwise.
9. Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

FOR EXAMINER'S USE ONLY:

SECTION I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL

SECTION II

17	18	19	20	21	22	23	24	TOTAL

GRAND TOTAL

SECTION I: (50 MARKS)

Answer all the question in this section in the spaces provided:

1. Use a tables to find the value of χ if $2^{\chi} = 3$. Give your answer correct to 4sf. (3mks)

2. Make χ the subject of the formula:

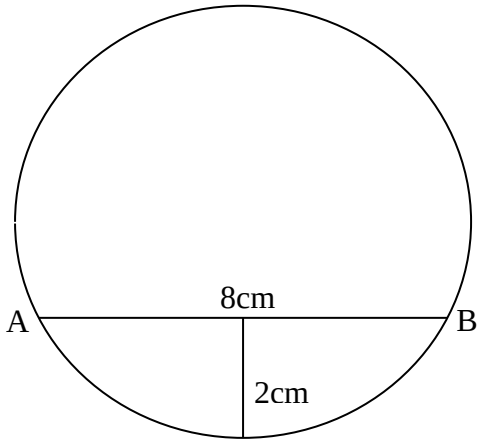
$$A = \sqrt{\frac{3 + 2\chi}{5 - 4\chi}}$$

(3mks)

3. It would take 18 men 12 days to dig a piece of land. If they work for 8 hours a day, how long will it take 24 men if they work 12 hours to cultivate three quarters of the same land. (3mks)

4. Kinyua bought soya and millet at sh.65 per kg and sh.40 per kg respectively. He then mixed them and sold the mixture at sh.60 per kg making a profit of 20%. Determine the ratio of soya to millet in mixture. (3mks)

5. Chord AB is of length 8cm and the maximum distance between chord and lower part of circle is 2cm. Determine the radius of the circle. (3mks)



6. Use the inverse matrix method rule to solve simultaneous equations.
$2\chi + y = 10$ (3mks)
$2\chi + 2y = 14$

7. Solve $\log_2 (x+7) - \log_2 (x-7) = 3$ (4mks)

8. Construct a circle centre K and radius 2.5cm. Construct a tangent from a point Q which is 6cm from K to touch the circle at M. Measure the length QM. (3mks)

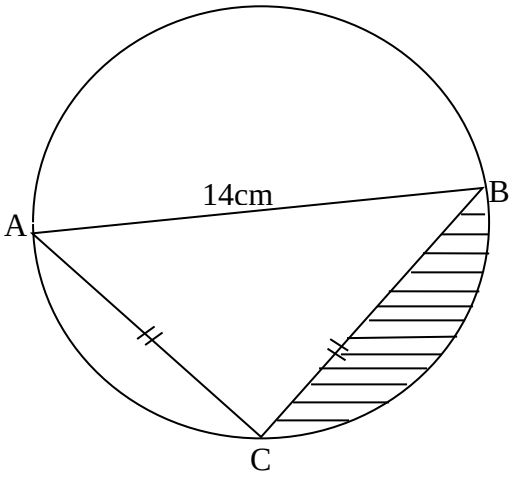
9. Given 4.6 ÷ 2.0 find

(a) the absolute error in the quotient. (2mks)

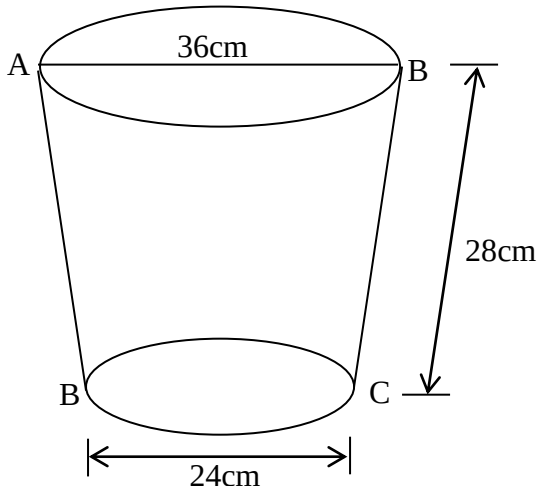
(b) the percentage error in the quotient correct to four significant figures. (1mk)

10. A variable P varies jointly with the square of R and inversely with the square root of Q. If R is increased by 10% and Q decreased by 20%, what is the percentage change in the value of P. (3mks)

11. The figure below shows a circle with segments cut off by a triangle whose longest side AB is the largest possible chord of a circle. Determine the area shaded given that AB = 14cm and AC = BC. (3mks)



12. A bucket in the shape of a frustrum as shown in the diagram. It has diameters of 36cm and 24cm. Calculate the volume of the bucket. (4mks)

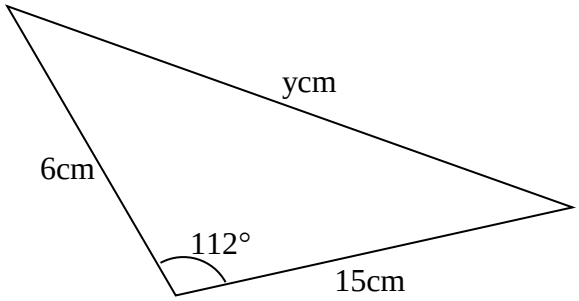


13. Without using a Mathematical tables or a calculator, evaluate.

$$\frac{2.7 \times 2.04}{300 \times 0.054}$$

(2mks)

14. Find the length represented by y in the figure **below**. (3mks)



15. (a) Expand $(1 + 2\chi)^8$ in ascending powers of χ up to and including the term χ^3. (1mk)

(b) Hence evaluate $(1.02)^8$ to 3d.p. (2mks)

16. The difference between the exterior and interior angle of a regular polygon is 100°. Determine the number of sides of the polygon. (3mks)

SECTION II: (50 MARKS)

Answer any **five** questions from this section in the spaces provided:

17. (a) Fill the table below for the curves given by $y = 3 \sin (2\chi + 30°)$ and $y = \text{Cos } 2\chi$ for χ values in the range $O \leq \chi \leq 180°$. (2mks)

χ	0°	15°	30°	45°	60	75°	90°	120°	150°	180°
$y = 3 \text{ Sin } (2\chi + 30°)$										
$y = \text{Cos } 2\chi$										

(b) Draw the graphs of $y = 3 \text{ Sin } (2\chi + 30°) = \text{Cos } 2\chi$ on same axes. (2mks)

(c) Use your graph to solve the equation $y = 3 \sin (2\chi + 30°)$ and $y = \cos 2\chi$. (2mks)

(d) Determine the following from your graph:

(i) Amplitude of $y = 3 \sin (2\chi + 30°)$. (1mk)

(ii) Period of $y = 3 \sin (2\chi + 30°)$. (2mks)

(iii) Phase difference for $y = 3 \sin (2\chi + 30°)$. (1mk)

18. OAB is a triangle in which $\underset{\sim}{OA} = \underset{\sim}{a}$ and $\underset{\sim}{OB} = \underset{\sim}{b}$. M is a point on OA such that OM: MA = 2: 3 and N is another point on AB such that AN: NB = 1: 2. Lines ON and MB intercept at X.

(a) Express the following vectors in terms of $\underset{\sim}{a}$ and $\underset{\sim}{b}$.

(i) $\underset{\sim}{AB}$ (1mk)

(ii) $\underset{\sim}{ON}$ (1mk)

(iii) $\underset{\sim}{BM}$ (1mk)

(b) If $\underset{\sim}{OX} = K\underset{\sim}{ON}$ and $\underset{\sim}{BX} = h\underset{\sim}{BM}$ express $\underset{\sim}{OX}$ in two different ways. Hence or otherwise find the values of h and K. (6mks)

(c) Determine the ratio OX: XN. (1mk)

19. (a) Using only a ruler and a pair of compasses draw a line AB of length 8cm long.
Hence draw the locus of all points P such that angle APB = 52.5°. (5mks)

(b) If the region above represents a map of an estate drawn to a scale of 1cm representing 1km.
Show the region to be fenced if AMB ≤ 90° by shading the unwanted region. (3mks)

(c) Find the area of this region. (2mks)

20. The data **below** is a daily record of sugar sold in one of the supermarkets in Kerugoya town which sells any proportion in kg of sugar.

Kg of sugar	Number of people
0.5 – 0.9	22
1.0 – 1.4	38
1.5 – 1.9	14
2.0 – 2.4	12
2.5 – 2.9	10
3.0 – 3.4	4

(a) How many people bought sugar from this supermarket on that day. (1mk)

(b) Calculate mean of sugar bought that day. Calculate also the standard deviation from this data. (4mks)

(c) Draw a cumulative frequency curve of the data above and determine the number of people who bought sugar between 1.2 and 1.9kg. (5mks)

21. A plane take of f from airport P at (0°, 40°W) and flies 1800 nautical rules due East to Q then 1800 nautical rules due South to R and finally 1800 nautical rules due West before landing at S.

(a) Find to the nearest degree the latitudes and longitudes of Q, R and S. (4mks)

(b) If the total flight time is 16 hours, find the average speed in knots for the whole journey. (3mks)

(c) Find the time taken to fly from R to S, given that this was two hours shorter than the time taken from P to Q to R. (2mks)

22. The 2^{nd} and 5^{th} terms of an arithmetic progression are 8 and 17 respectively. The 2^{nd}, 10^{th} and 42^{nd} terms of the A.P. form the first three terms of a geometric progression. Find

(a) the 1^{st} term and the common difference. (3mks)

(b) the first three terms of the G.P and the 10^{th} term of the G.P. (4mks)

(c) The sum of the first 10 terms of the G.P. (3mks)

23. (a) The acceleration of a particle t seconds after passing a fixed point P is given by $a = 3t - 3$. Given that the velocity of the particle when $t = 2$ is 5m/s, find

(i) its velocity when $t = 4$ seconds. (3mks)

(ii) its displacement at this time. (3mks)

(b) Find the exact area bounded by the graph $\chi = 9y - y^3$ and the Y-axis. (4mks)

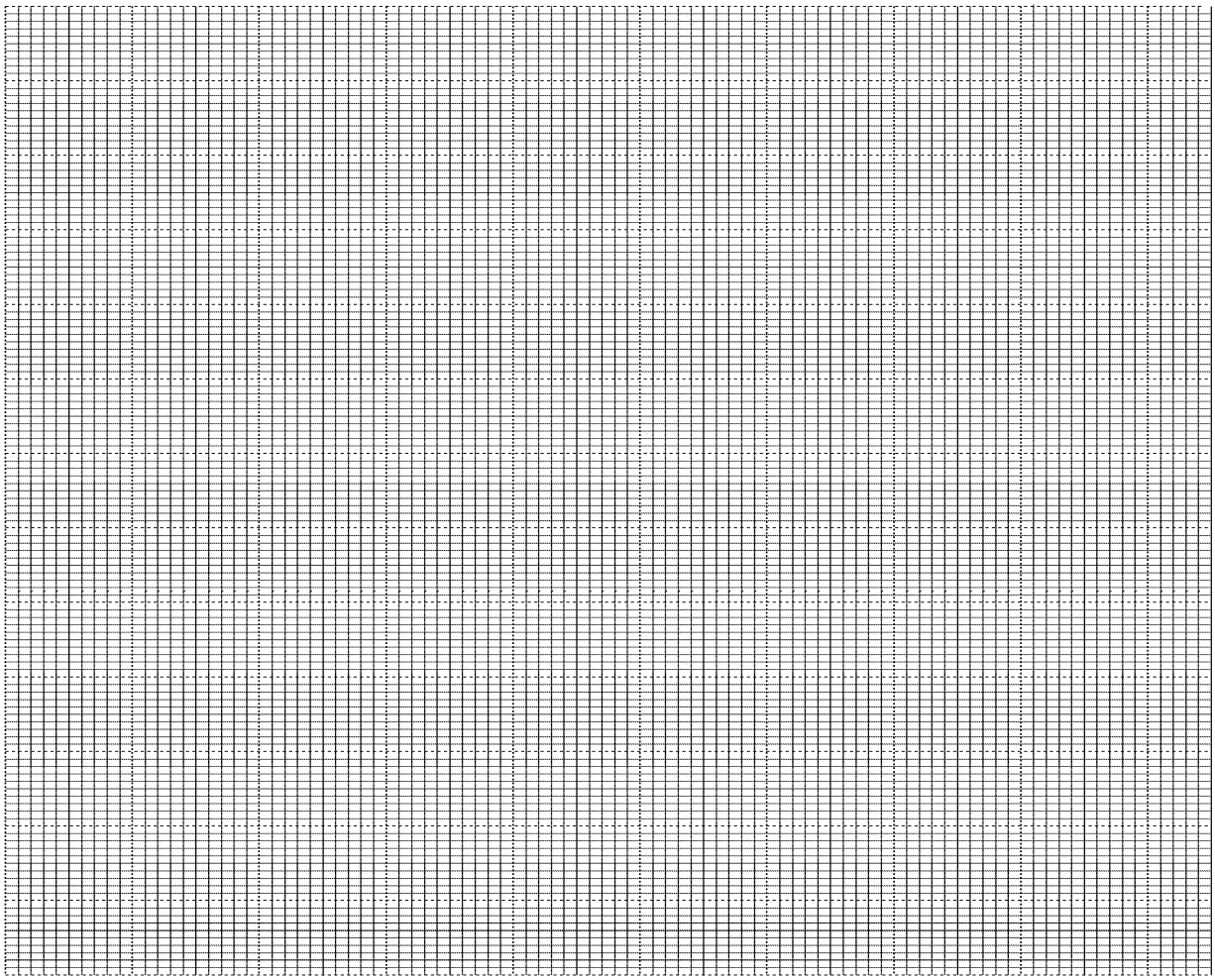
24. A girl's school has a store a far off distance for food. It has 20 sacks of rice and 35 sacks of maize. The weight, volume and number of meal rations for each sack are as follows.

Sack of	Weight in kg	Volume (m^3)	No of meals
Rice	25	0.05	800
Maize	10	0.05	160

A delivery van is to carry the largest possible total number of meals. It can carry up to 600kg in weight and $2m^3$ in volume.

(a) If a load is made up of χ sacks of rice and y sacks of maize, write four inequalities other than $\chi \geq 0$, $y \geq 0$ which satisfy these conditions. (3mks)

(b) Illustrated these inequalities graphically by shading unwanted region. (4mks)



(b) Write down an expression for the number of meals that can be provided from χ sacks of rice and y-sacks of maize. Use your graph to find best values to take for χ and y. (3mks)

NAME……..…… **INDEX NO**…….....……..…..

SCHOOL…… **CANDIDATE'S SIGNATURE**……..…..

DATE……..……..

232/1
PHYSICS
PAPER 1
(THEORY)
TIME: 2 HOURS

Kenya Certificate of Secondary Education
PHYSICS
PAPER 1
(THEORY)
TIME: 2 HOURS

INSTRUCTIONS TO THE CANDIDATE:

*(a) Write your **name** and **index number** in the spaces provided above.*
*(b) **Sign** and write the **date** of examination in the spaces provided above.*
*(c) This paper consists of **two** Sections **A** and **B**.*
*(d) Answer **all** the questions in sections **A** and **B** in the spaces provided.*
*(e) All working **must** be clearly shown in the spaces provided.*
*(f) Non-programmable silent electronic calculators and KNEC Mathematical tables **may be** used.*

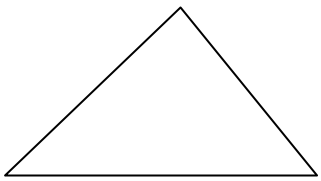
FOR EXAMINER'S USE ONLY:

Section	Question	Maximum Score	Candidate's Score
A	1 – 14	25	
B	15	9	
	16	11	
	17	10	
	18	11	
	19	14	
Total Score		80	

SECTION A: (25 MARKS)

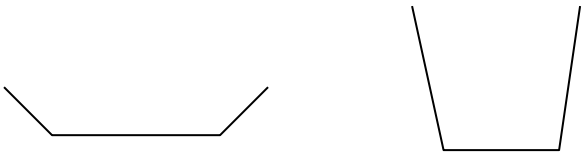
Answer **all** questions in this section in the spaces provided:

1. The figure **below** shows a uniform triangular lamina.



Locate the centre of gravity of lamina. (2mks)

2. The figure **below** shows two containers of equal volume but of different diameters.



Equal volume of hot water was put in both containers. Explain why it cools faster in the wider container than in the narrower one. (1mk)

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3. State **one** advantage of hydraulic brakes over mechanical brakes. (1mk)

_____

_____

_____

4. A body in a uniform circular motion experiences acceleration despite moving at a constant speed. Explain. (1mk)

_____

_____

_____

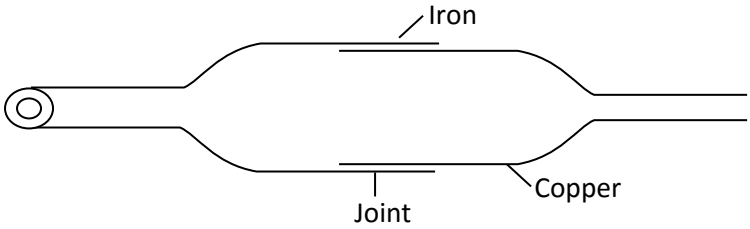
Use the information below to answer question **5** and **6**:

In an experiment to determine the density of a liquid, the following readings were made.
Mass of empty density bottle = 20g
Mass of bottle filled with water = 70g
Mass of bottle filled with a liquid = 695g

5. Find the density of the liquid, given that density of water is $1000kgm^{-3}$. (3mks)

6. Find the mass of the liquid. (3mks)

7. The diagram **below** shows a metal tube made of iron and copper. The joint is tight at room temperature.



Explain how you would separate the two by changing the temperature given that copper expands more than iron for some change in temperature. (2mks)

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8. State **one** assumption made when estimating the size of an oil molecule in the oil drop experiment. (1mk)

_____

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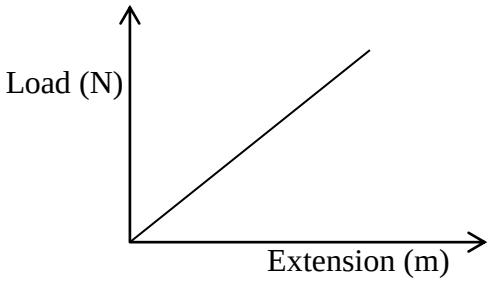
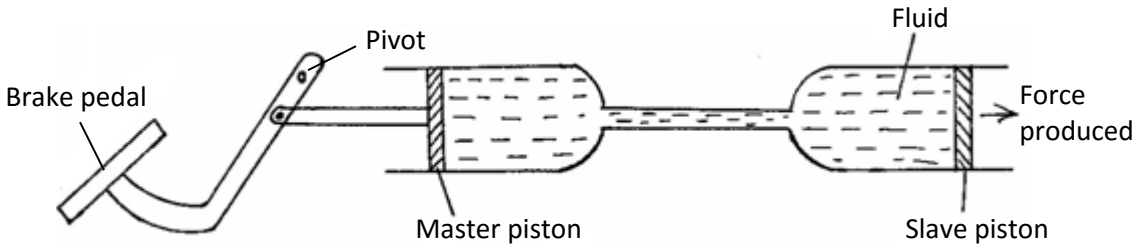
9. The figure **below** shows a load-extension graph for various loads hung from a single spring.



On the same axes sketch a graph for a spring double the diameter and half the length of the first one. (1mk)

Use the information **below** which represents hydraulic braking system to answer questions **10** and **11**.



10. State **one** property the fluid should have. (1mk)

_____

11. Explain briefly how the system operates. (3mks)

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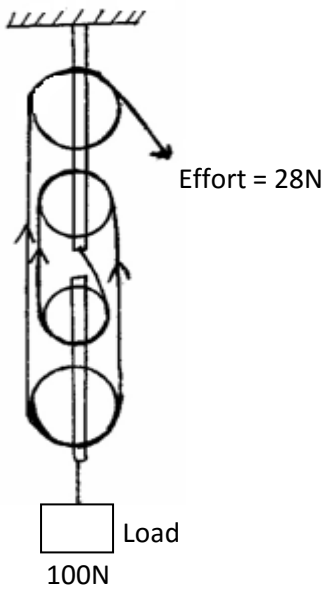
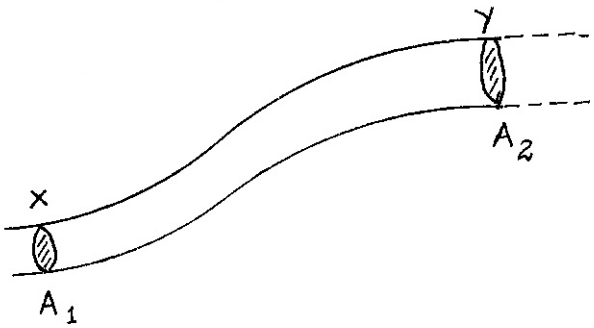
12. Figure **below** shows a pulley system being used to raise a load.



If the effort applied is 28N and the load lifted is 100N, determine the efficiency of the system. (3mks)

13. Figure **below** shows a section of a pipe XY. A constant pressure difference maintains a streamline flow of a liquid in the pipe.



If the cross-sectional area A_1 at X is less than A_2 ay Y, state how the liquid velocity V_2 at Y compares with V_1 at X. (1mk)

_____

14. Explain the cause of random motion of smoke particles as observed in Brownian motion experiment using a smoke cell. (2mks)

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SECTION B: (55 MARKS)

Answer question in this section in the spaces provided.

15. (a) State what is meant by centripetal acceleration. (1mk)

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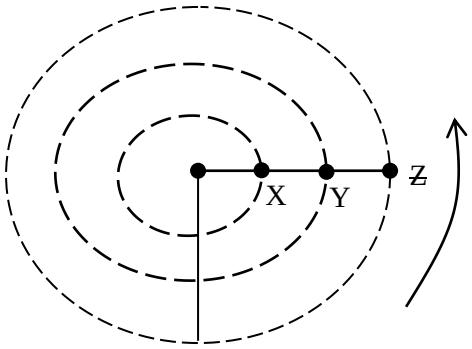
_____

(b) The figure shows masses **X**, **Y** and **Z** placed at different points on a turn table. The turn table is rotated at different angular velocities.



(i) State **two** factors that would cause the masses to slide. (2mks)

_____

_____

(ii) At the time that start sliding off, state the mass with the highest angular velocity, give reason for your answer. (2mks)

_____

_____

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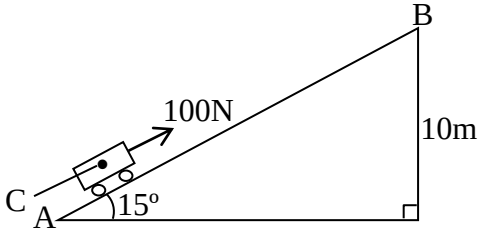
_____

(c) (i) If the centripetal for is 2N and the mass and radius of the path for mass Y are 100g and 0,03m respectively. Calculate the angular velocity of the mass when the system is in equilibrium. (3mks)

(ii) Indicate on the same diagram the direction of velocity of mass Z at that position. (1mk)

16. The figure **below** shows an inclined plane, a trolley of mass 30kg is pulled up a slope by a force of 100N, parallel to the slope. The trolley moves so that the centre of mass C travels from points A to B.



(i) What is the work done on the trolley against the gravitational force in moving from **A** to **B**.? (2mks)

_____

_____

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_____

(ii) Determine the work done by the force in moving the trolley from **A** to **B**. (2mks)

(iii) Determine the efficiency of the system. (3mks)

(iv) Determine the work done in overcoming the frictional force. (1mk)

(v) Determine the mechanical advantage of the system. (3mks)

17. The graph represents displacement-time graph for a car moving with uniform acceleration along a straight horizontal road.

From the graph determine:

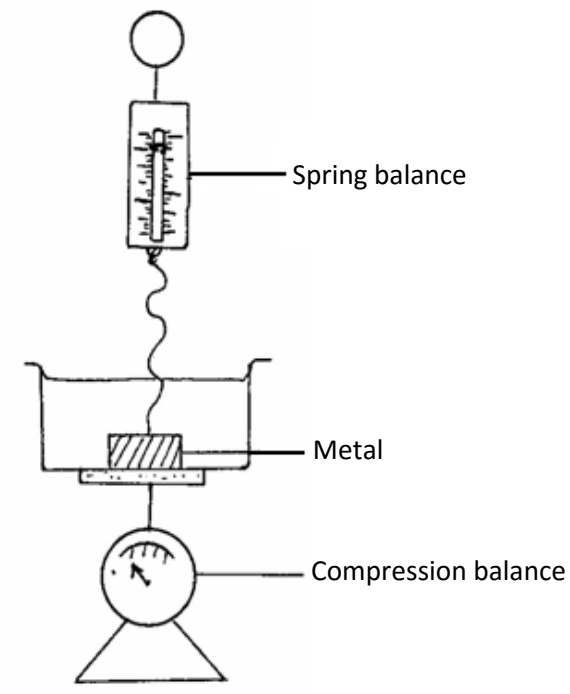
(i) the velocity of the car at the 20^{th} second. (2mks)

(ii) the velocity at the 50^{th} second. (2mks)

(iii) the acceleration of the car between the 20^{th} second and 50^{th} second. (3mks)

(b) A bullet is fired horizontally from a storey building 15m high. If the initial speed is $350ms^{-1}$, determine the maximum horizontal distance covered by the bullet. (3mks)

18. (a) A cylindrical block of metal of mass 500g and density $5.0 \times 10^3 kg/m^3$ rests on the bottom of a beaker containing a liquid of density $2.5 \times 10^3 kgm^{-3}$, standing on a compression balance. The metal is attached to a spring balance by a light inextensible string and to begin with the string is slack as shown in the figure **below**.



The metal is slowly raised by raising the spring balance vertically until the metal is well above the surface of the liquid. The mass of the beaker and liquid, without the metal is 1.5kg. Determine the readings, in Newton's, that will be recorded on each of the balances when

(i) the string is slack as shown the diagram. (3mks)

_____

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_____

(ii) the string is taut with the metal fully immersed in the liquid. (5mks)

(b) The weight of a stone in air is 7.5N. When fully immersed in paraffin of density 0.8g/cm³ its weight is 6.3N. Determine the;

(i) up thrust in the paraffin. (1mk)

(ii) volume of the stone. (2mks)

19. (a) What is meant by specific latent heat of vaporization of a substance? (1mk)

(b) In an experiment to determine the specific latent heat of vaporization of water, steam at 100ºC was passed into water contained in a well-lagged copper calorimeter. The following measurements were made:

- Mass of calorimeter = 55g
- Initial mass of water = 75g
- Final mass of calorimeter + water + condensed steam = 133g
- Final temperature of the mixture = 30ºC

[Specific heat capacity of water = 4200JKg^{-1}k^{-1} and specific heat capacity of copper = 390JKg^{-1}k^{-1}]

Determine the

(i) mass of condensed steam. (1mk)

(ii) heat gained by the calorimeter and water if the initial temperature of the calorimeter + water = 20ºC. (2mks)

(iii) given that L is the specific latent heat of vaporization of steam,

(I) Write an expression for the heat given out by steam. (2mks)

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

(c) (i) In verifying the Charles' law of gases, the volume and the temperature of a gas are varied at constant pressure, State the condition necessary for the law to hold. (1mk)

(ii) With an aid of a labeled diagram, describe an experiment to verify Charles' law. (5mks)

NAME……..…… INDEX NO…….....……..…..

SCHOOL……. CANDIDATE'S SIGNATURE……..…..

DATE……..……..

232/2
PHYSICS
(THEORY)
PAPER 2
TIME: 2 HOURS

Kenya Certificate of Secondary Education
PHYSICS
PAPER 2
(THEORY)
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

*(a) Write your **Name** and **Index Number** in the spaces provided **above**.*
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*(d) Answer **ALL** the questions in sections **A** and **B** in the spaces provided.*
(e) All workings must be clearly shown.
*(f) Non-programmable silent electronic calculators and KNEC Mathematical tables **may be** used.*

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FOR EXAMINER'S USE ONLY:

Section	Question	Maximum Score	Candidate's Score
A	1 – 13	25	
B	14	10	
	15	13	
	16	12	
	17	8	
	18	12	
Total Score		80	

SECTION A: (25 MARKS)

Answer **all** questions in this section in the spaces provided:

1. State t**wo** conditions under which a pinhole camera may form an image on its screen which has the same size as the object. (2mks)

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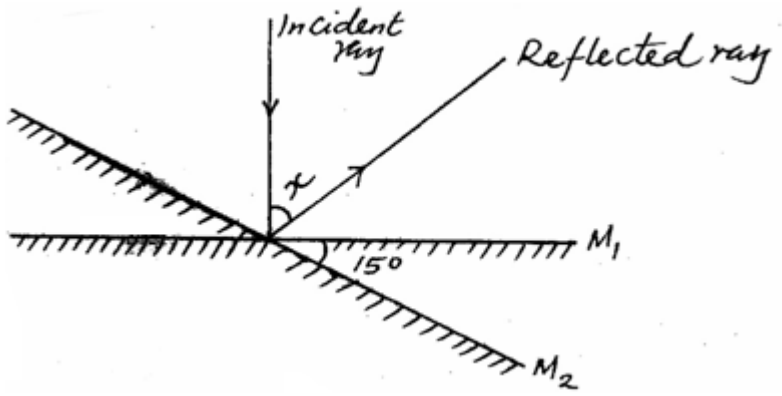
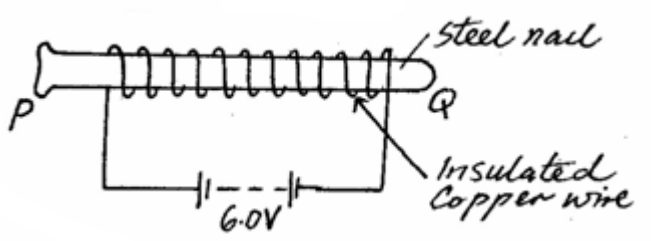
_____

2. The figure shows a ray of light incident along the normal. The mirror is rotated at an angle of 15º in a clockwise direction without changing the position of the incident ray,



Determine the angle between the reflection ray and the incident ray. (2mks)

3. A steel is to be magnetized by electrical method as shown below. Identify the pole **P** and **Q** of the resulting magnet. (1mk)



P: _____

Q: _____

4. A small chain is often seen hanging at the back of a petrol carrying lorry. State and explain its significance. (2mks)

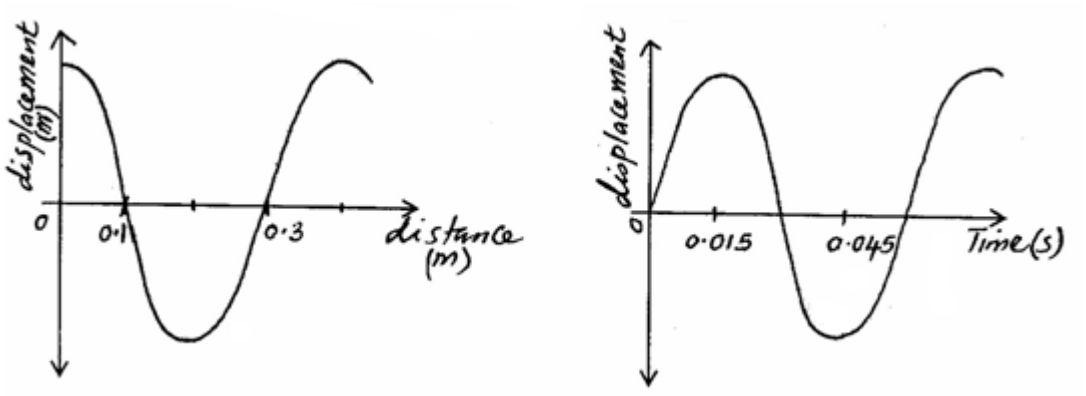
_____

_____

_____

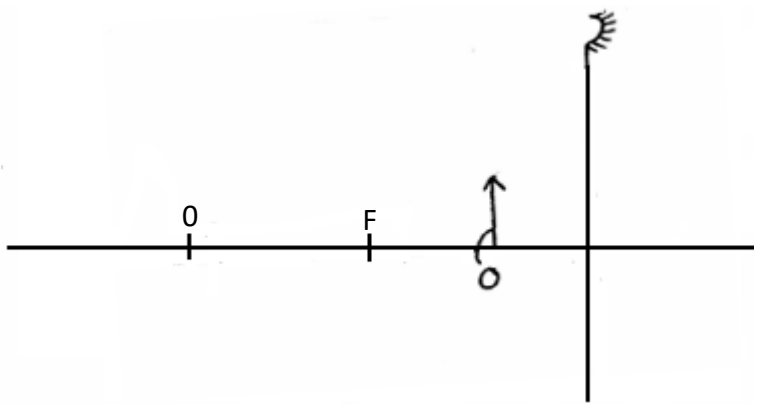
_____

5. The figure **below** shows two waveforms representing the same wave motion.



Determine the velocity of the wave. (3mks)

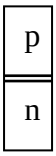
6. An object O is placed in front of a concave mirror and on the principal axis, as shown in the figure **below**. Complete the light ray diagram to locate the position of the image. (3mks)



7. Arrange the following radiations in order of increasing wavelengths. (1mk)
Infrared, blue light, ultraviolet, radiowaves, χ-rays.

_____

8. The figure **below** shows a block diagram of a p-n junction diode.



On the same diagram, show how a cell may be connected so that it is reverse biased. (1mk)

9. A girl standing at a distance claps her hands and hears an echo from a tall building 2 seconds later. If the speed of sound in air is 340m/s, determine how far the building is. (3mks)

10. What do you understand by polarization as used in a simple cell? (1mk)

_____

_____

_____

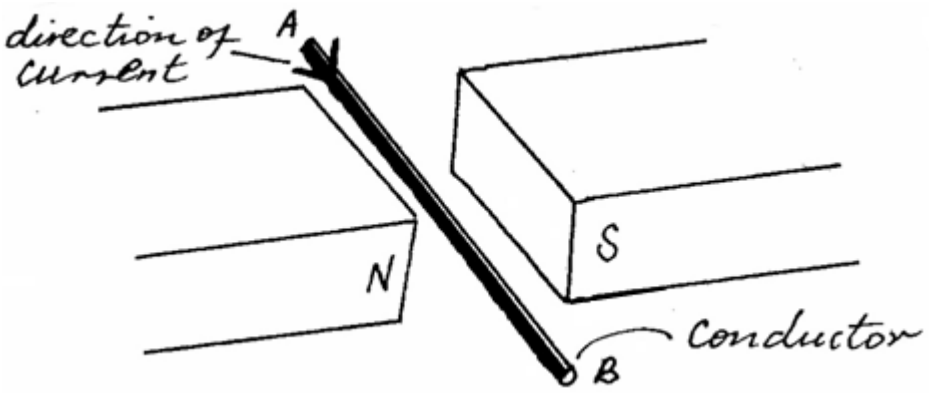
11. State how the defect mentioned in question 10 above is minimized in a simple cell. (1mk)

_____

_____

_____

12. A current-carrying conductor **AB** is in a magnetic field as shown in the figure **below**.



(a) Indicate the direction of force F acting on the conductor. (1mk)

(b) State **two** factors that determine the direction of the force F. (2mks)

_____

_____

_____

_____

13. You are given three resistors of values 5Ω, 8Ω and 12Ω. Show in a circuit diagram how you would connect them so as to give:

(a) an effective resistance of 9.8Ω. (2mks)

(b) the least effective resistance. (1mk)

SECTION B: (55 MARKS)

Answer question in this section in the spaces provided.

14. (a) Define refractive index. (1mk)

_____

_____

_____

(b) The critical angle of a certain material medium is 43.2°. Determine the refractive index of the material. (2mks)

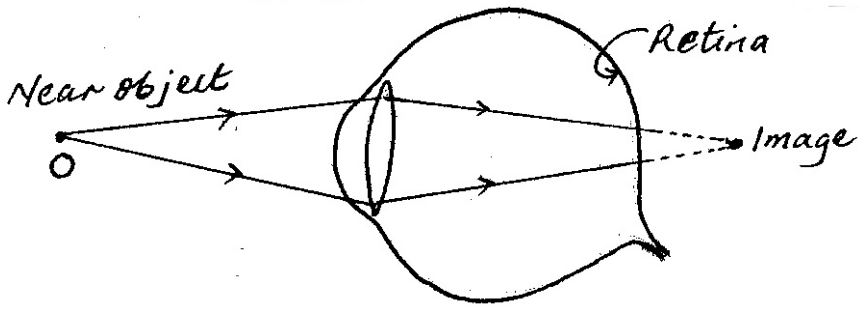
(c) (i) What do you understand by the term accommodation? (1mk)

_____

_____

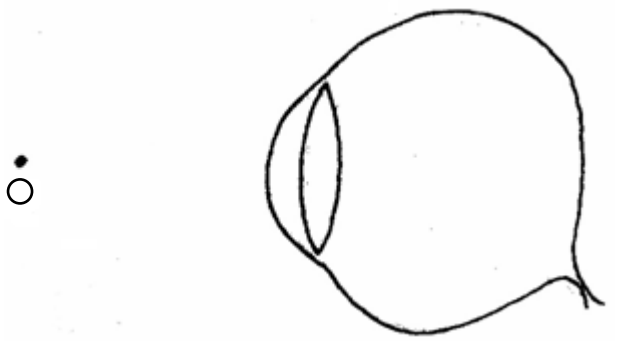
_____

(ii) The diagram **below** shows a certain defect of vision. Name the defect. (1mk)



_____

(iii) On the figure **below** show how the defect can be corrected. (2mks)



(d) An object is placed 40cm in front of a concave lens of focal length 20cm; determine the position of the image. (3mks)

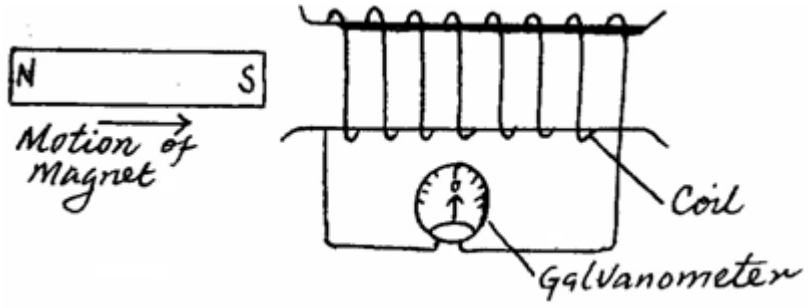
15. (a) (i) State Lenz's a law of electromagnetic induction. (1mk)

_____

_____

_____

(ii) A bar magnet is moved into a coil of insulated copper wire connected to a centre-zero galvanometer, as shown in the figure **below**.



(i) Show on the diagram the direction of induced current in the coil. (1mk)

(ii) State and explain clearly what is observed on the galvanometer when the S-pole of the magnet is moved into and then withdrawn from the coil. (4mks)

_____

_____

_____

_____

(b) A transformer has 800 turns in the primary and 40 turns in the secondary winding. The alternating e.m.f connected to the primary is 240V and the current is 0.5A.

(i) Determine

I the secondary e.m.f (2mks)

II the power in the secondary if the transformer is 95% efficient. (2mks)

(ii) Explain how energy losses in a transformer are reduced by having:

I a soft-iron core. (2mks)

II a laminated core. (1mk)

16. (a) (i) Distinguish between thermionic emission and photoelectric emission. (2mks)

(ii) State **one** factor which affects the rate of each of the above types of emission.

Thermionic emission. (1mk)

Photoelectric emission. (1mk)

(b) Sodium has a work function of 2.3eV. Given that: Planck's constant h = 6.63×10^{-34}JS, velocity of light in vacuum, C = 3.0×10^{8}m/s, 1 electron-volt (1eV) = 1.6×10^{-19} C and mass of an electron, $m_e = 9.1 \times 10^{-31}$kg, calculate:

(i) its threshold frequency. (2mks)

(ii) the maximum velocity of the photoelectrons produced when the sodium is illuminated by light of wavelength 5.0×10^{-7}m. (4mks)

(iii) the stopping potential V, with the light of this wavelength. (2mks)

17. (a) State **two** advantages of using a Cathode Ray Oscilloscope (C.R.O) as a voltmeter over the ordinary voltmeter. (2mks)

_____

_____

_____

_____

(b) An X-ray operates at 30000V and the current through it is 2mA. Given that the charge of an electron is 1.6×10^{-19}C, h = 6.63×10^{-34}JS, speed of light, C = 3.0×10^{8}m/s, calculate:-

(i) the maximum kinetic energy of the electrons when hitting the target. (2mks)

(ii) the number of electrons hitting the target per second. (2mks)

(iii) the minimum wavelength of the X-rays emitted. (2mks)

18. (a) A radioactive carbon-14 decays to nitrogen by beta particles as shown **below**.

$$^{14}_{6}C = {}^{\chi}_{7}N + {}^{0}_{y}e$$

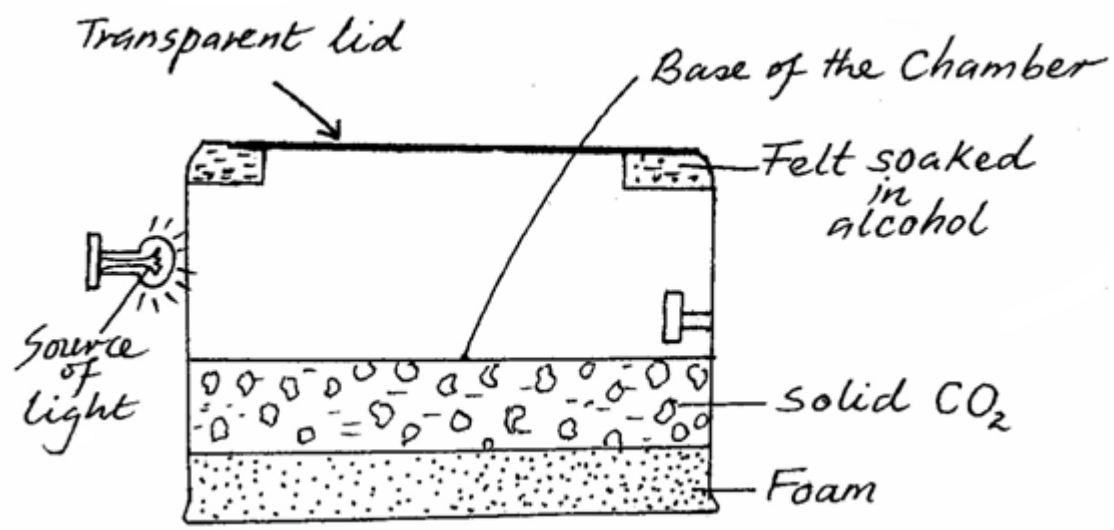
Determine the values of χ and y. (2mks)

(b) The graph **below** shows the activity (disintegrations per minute) of a sample of carbon-14 against the time in years.

(i) From the graph determine the half-life of carbon-14. (2mks)

(ii) A mass of 100g of carbon-14 decays and the mass taken after 15000 years. Determine the mass that remains. (3mks)

(c) The figure **below** shows the cross-section of a diffusion cloud chamber used to detect radiation from radioactive sources.



(i) State the function of the following:

I Alcohol. (1mk)

II Solid CO_2. (1mk)

(ii) Explain briefly how the diffusion cloud chamber can be used to detect and identify alpha particles. (3mks)

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DATE……

231/3
PHYSICS
PAPER 3
(PRACTICAL)
TIME: 2½ HOURS

Kenya Certificate of Secondary Education
PHYSICS
PAPER 3
(PRACTICAL)
TIME: 2½ HOURS

Instructions to candidates:

1. *Write your **name** and **index number** in spaces provided **above**.*
2. ***Sign** and write the date of examination in spaces provided **above**.*
3. *Answer **all** the questions in spaces provided in the question paper.*
4. *You are **NOT** allowed to spend the first 15 minutes of 2½ hours allowed for this paper reading the whole paper carefully before commencing the work.*
5. *Marks are given for clear record of the observations actually made, their suitability, accuracy and the use made of them.*
6. *Candidates are advised to record their observations as soon as they are made.*
7. *Non-programmable silent electronic calculators and KNEC Mathematical table may be used.*

FOR EXAMINER'S USE ONLY

Question 1	a	c	f(i)	f(ii)	f(iii)		**Total**	**20**
Maximum Score	1	8	5	3	3			
Candidate's Score								

Question 2	c(i)	c(i)	c(ii)	c(iii)	c(iv)	Part II b(i)	b(ii)	**Total**	**20**
Maximum Score	1	2	5	2	1	2	2		
Candidate's Score									

Grand Total

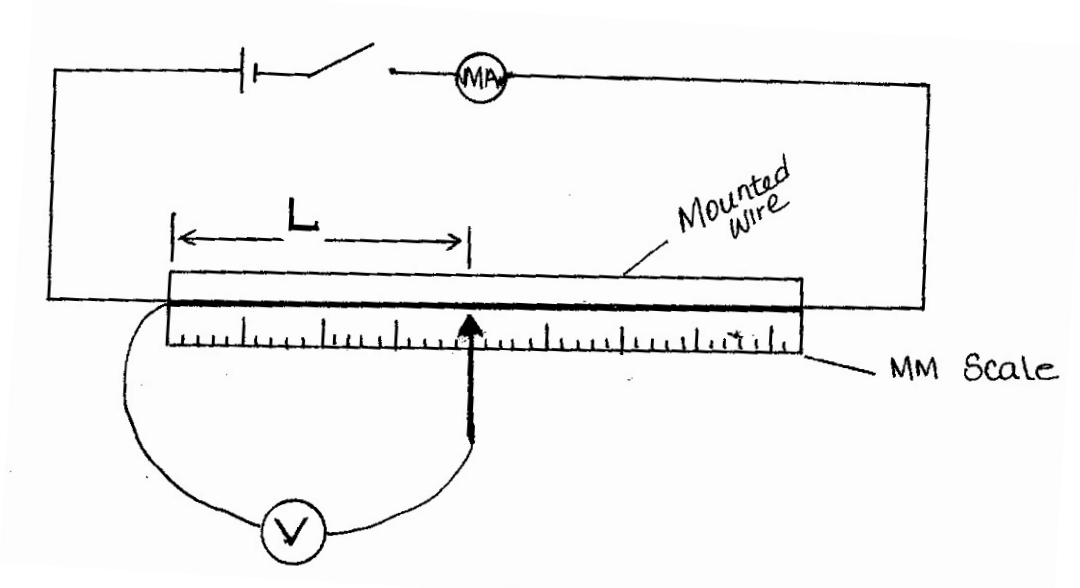
1. You are provided with the following.
   - A millammeter.
   - A voltmeter.
   - A wire mounted on a mm scale.
   - A switch.
   - A long wire with a crocodile clip at one and (crocodile clip to be used as a slider or jockey).
   - A new dry cell (size D) and a cell holder.
   - A micrometer screw gauge (may be shared).
   - 5 connecting wires, two with crocodile clips at the end.

Proceed as follows:

(a) Measure the diameter, d of the mounted at three different points.

Average diameter d = _____mm (1mk)

(b) Set up the apparatus as shown in the circuit diagram in the figure **below**.



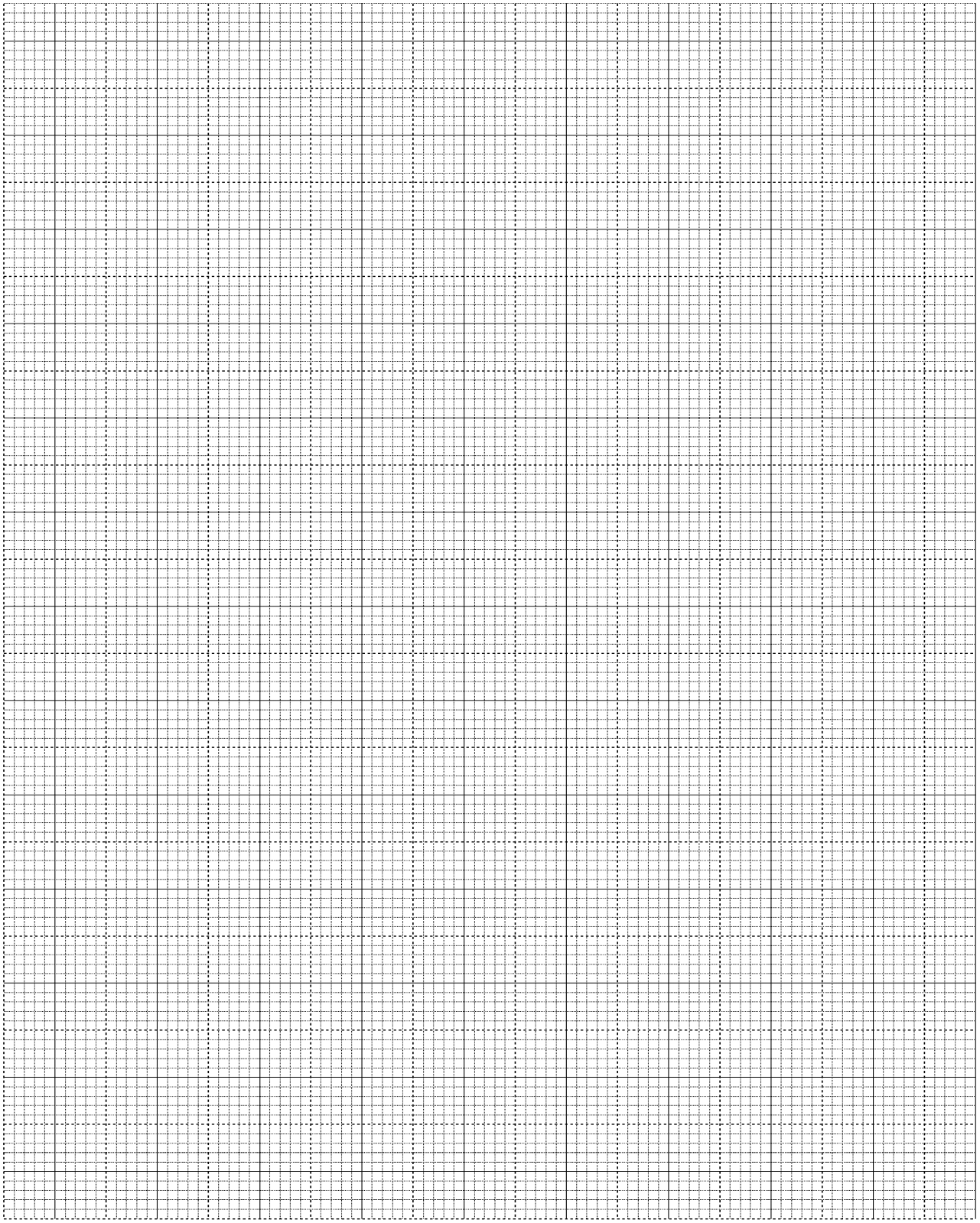
(c) Close the switch and tap the mounted wire with the crocodile clip as shown in the circuit. Ensure that both meters show positive deflection. Open the switch.

(d) Tap the wire at L = 20cm. Close the switch read and record in the time provided the milliammeter and voltmeter reading.

(e) Repeat the procedure in (c) for other values of L, shown in the table below and complete the table. (8mks)

L(cm)	L(m)	V (Volts)	I MA	Amps	$R = V/I$
20					
30					
40					
50					
60					
80					

(f) (i) Plot the graph of R (Y-axis) against L(m). (5mks)



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

(iii) Given that $R = PL/A$ were A is the cross-sectional area of the wire and P is a constant for the material of the wire, determine the value of the constant P. (3mks)

2. You are provided with the following:

- A marble with a piece of thread attached.
- Two wooden blocks.
- Clamp, boss and retort stand.
- Meter rule.
- $1/2$ metre rule attached to a wooden block.
- Cello tape (2 pieces of about 10cm long)
- Stop watch.

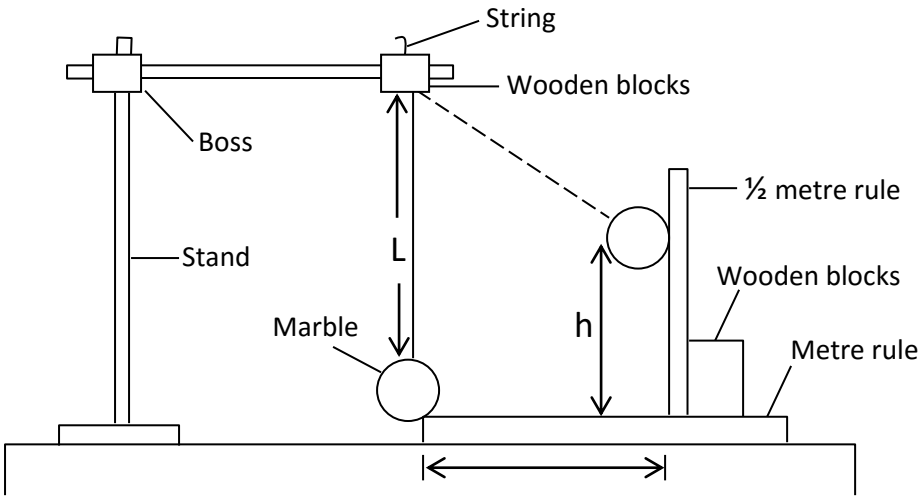
Proceed as follows:

(a) Fix the thread between the two wooden blocks and fasten the clamp.

(b) Adjust the thread so that the length L shown in figure 1 is 50.0cm.
Fix the metre rule horizontally to the bench using the cello tape provided.

(c) Adjust the clamp so that the marble is next to the end of the metre rule as shown.

Fig.1

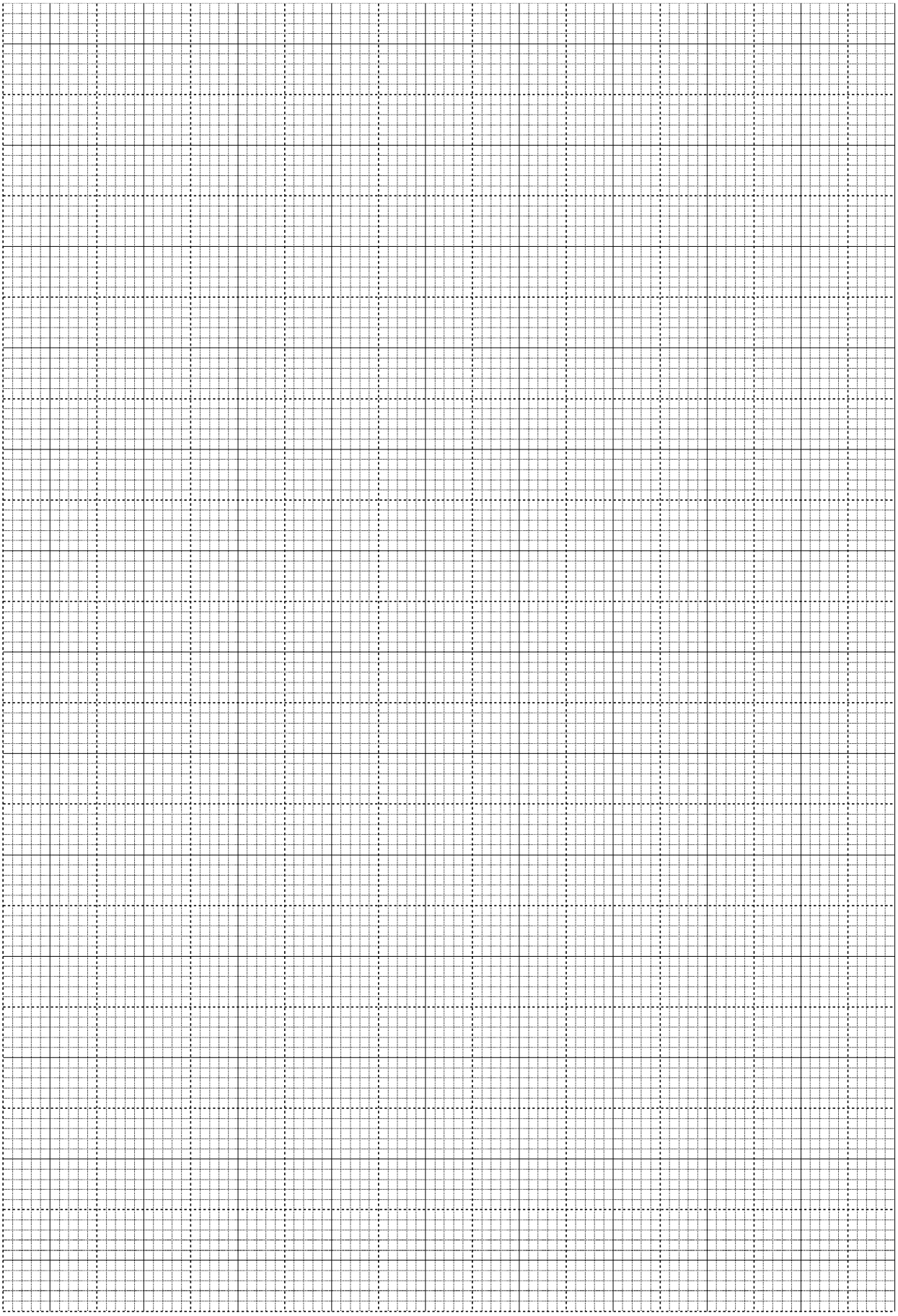


(i) Displace the marble by a horizontal distance X = 20cm and measure the corresponding vertical.
Displacement h = _____ cm (1mk)

(ii) Repeat the experiment to find h for each of the following values in the table. (Complete the table). (2mks)

χ(cm)	h(cm)	χ^2(cm^2)	χ^2/h(cm)
20		200	
25		625	
30		900	
35		1225	
40		1600	
45		2025	

(iii) Plot the graph of $\frac{x^2}{h}$ (y-axis against h. Draw the best through the points.(5mks)



(iv) Determine the slope of the graph. (2mks)

(v) From the graph, find the value of $\frac{x^2}{h}$ when h = 0. (1mk)

(b) Raise the clamp slightly without changing the length L so that the marble is free to swing. Determine the period, T, for one complete oscillation by timing ten oscillations.

Time for 10 oscillation = _____ (1mk)

Period T = _____ (1mk)

(c) Calculate the value of P from he following equation.

$T = 2\pi\sqrt{(P/g)}$ where g = 9.8ms^{-2} (2mks)

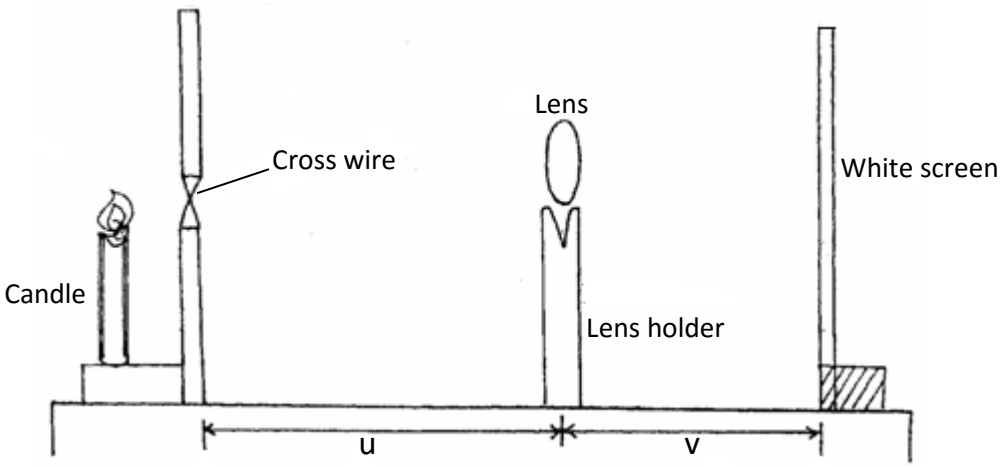
2. (b) You are provided with the following apparatus:

- Candle
- Lens
- Lens holder
- Metre rule
- Cross wire
- Screen
- Vernier calipers

Proceed as follows:

(i) Arrange the apparatus as shown in the figure **2 below**.

Fig.2



(ii) Place the cross-wire before the lens so that U = 28cm. The lit candle should be placed close to the cross-wire.

(iii) Adjust the position of the screen until a sharp image is cast on the screen.

(iv) Measure and record the value of image distance, V, in the table.

(v) Repeat the same procedure for the other values in the table.

Table 2

U(cm)	V(cm)	$M = \frac{V}{U}$
30		
36		

(2mks)

(vi) Given that the focal length f of the lens satisfies the equation $f = \frac{V}{1 + M}$

determine average value of the focal length, f. (3mks)

NAME……..…… INDEX NO…….....……..…..

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DATE……..……...

443/1
AGRICULTURE
PAPER 1
TIME: 2 HOURS

Kenya Certificate of Secondary Education
AGRICULTURE
PAPER 1
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

- Write your name and index number in the spaces provided above.
- Sign and write the date of examination in the spaces provided above.
- This paper consists of **THREE** Sections **A**, **B** and **C**.
- Answer all questions in Section **A** and **B**.
- Answer two questions in Section **C** in the spaces provided.

FOR EXAMINER'S USE ONLY

Section	Question	Maximum Score	Candidate's Score
A	**1 - 21**	**30**	
B	**22 - 26**	**20**	
C	**27 - 29**	**20**	
		20	
Total Score		**90**	

SECTION A: (30 MARKS)

Answer **ALL** questions in this section in the spaces provided.

1. Name **three** forms of horticulture farming. (1½mks)

_____

_____

_____

2. Name any **two** factors which influence soil colour. (1mk)

_____

_____

_____

3. Give **three** reasons why Agricultural produce should be processed. (1½mks)

_____

_____

_____

4. List **two** qualities that enable sorghum to be drought resistant. (1mk)

_____

_____

5. State **three** entries that are made in a journal. (1½mks)

_____

_____

_____

6. List **two** features of plastic pipes a farmer should consider before buying. (1mk)

_____

_____

_____

7. State **three** reasons for top dressing pasture. (1½mks)

_____

_____

_____

8. State **three** environmental conditions that may lead to low crop yields. (1½mks)

_____

_____

_____

9. Give **three** indicators of well decomposed manure. (1½mks)

_____

_____

_____

10. State **three** functions of plastic materials when used as mulch in crop production. (1½mks)

_____

_____

_____

11. Differentiate between gross domestic product and per capita income. (2mks)

(a) Gross domestic product._____

_____

(b) Per capita income. _____

_____

12. Give **two** reasons why bush burning is discouraged during land preparation. (1mk)

_____

_____

_____

13. State **three** causes of blossom end rot disease in tomato crop. (1½mks)

_____

_____

_____

14. State **three** desirable characteristics of agroforestry trees a farmer would consider before planting in the farm. (1½mks)

_____

_____

_____

15. Name **four** items that a maize farmer can enter into his consumable inventory records. (2mks)

_____

_____

_____

_____

16. State any **three** aims of land settlement programmes in Kenya. (1½mks)

_____

_____

_____

17. List **two** ways in which soil of P^H3 can be raised to P^H 6.5. (1mk)

_____

_____

18. Differentiate between hybrid and composite as used in crop breeding. (2mks)

(a) Hybrid._____

_____

(b) Composite_____

_____

19. State **two** possible causes of wilting in tomato plants despite adequate water supply. (1mk)

_____

_____

20. Name the form in which the following nutrients are absorbed by plants. (1½mks)

(i) Calcium _____

(ii) Sulphur _____

(iii) Molybdenum _____

21. List **three** farming practices done to reduce water stress in crop production. (1½mks)

_____

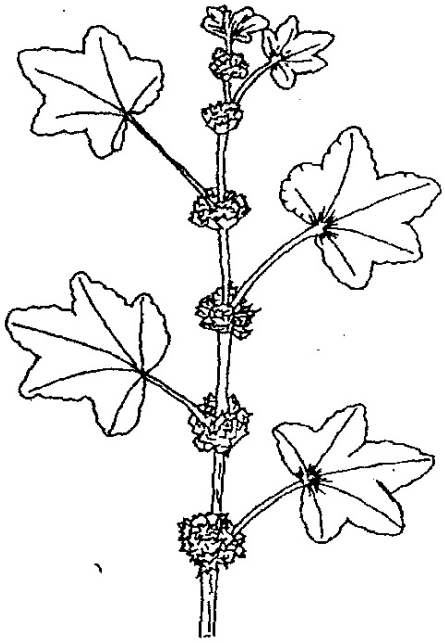
_____

_____

SECTION B: (20 MARKS)

Answer all the questions in this section in the spaces provided.

22. **Below** is a diagram of a Common East African Weed.



(i) Identify the weed illustrated above. (1mk)

_____

(ii) Give **one** harmful effect of the weed illustrated above to livestock. (1mk)

_____

_____

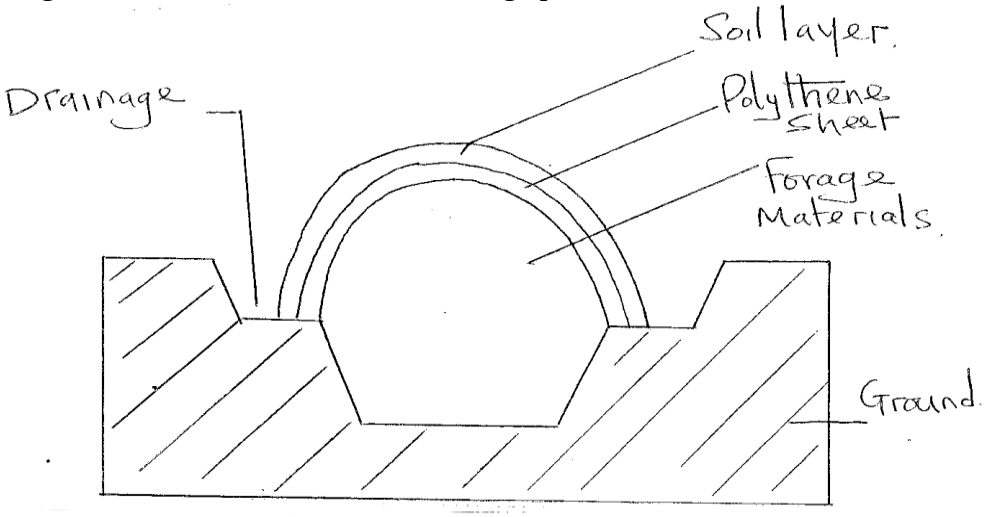
(iii) State **two** methods of controlling the weed illustrated above. (2mks)

_____

_____

_____

23. The diagram **below** shows a method of forage preservation.



(i) Identify the structure illustrated above. (1mk)

_____

(ii) State the form in which forage is conserved as illustrated above. (1mk)

_____

(iii) Give the role of the following in the structure above. (2mks)

(a) Polythene sheet.

_____

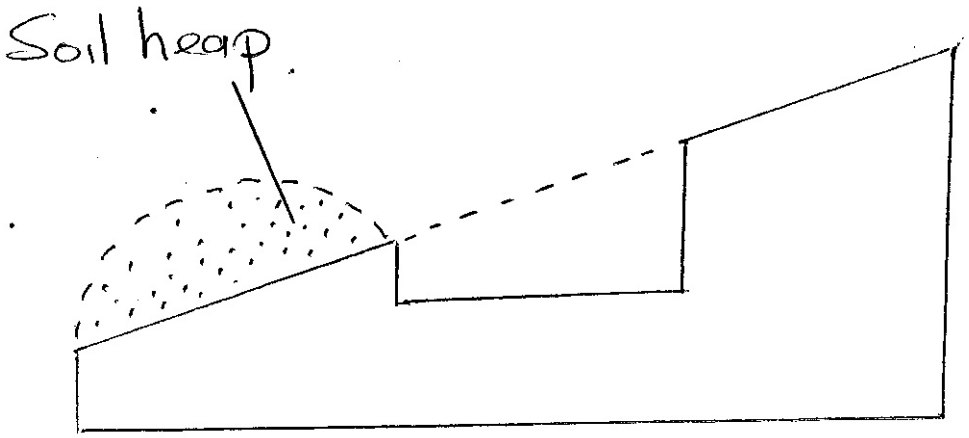
_____

(b) Drainage

_____

_____

24. The illustration **below** represents a form of physical measures in conservation soil and water. Study it carefully and answer the questions that follow.



(a) Identify the illustration above. (1mk)

_____

(b) Describe how the above physical measure conserves soil and water. (2mks)

_____

_____

_____

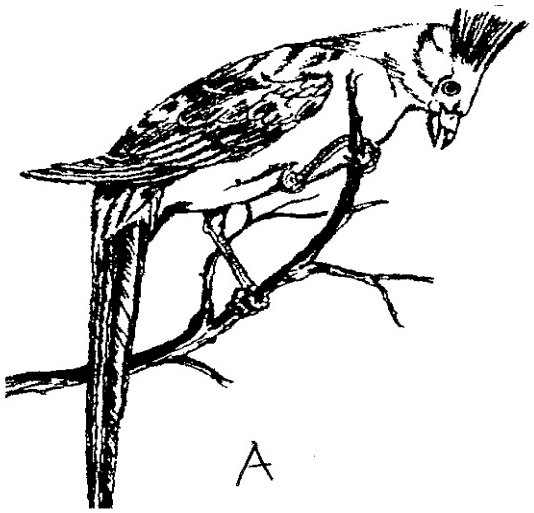
_____

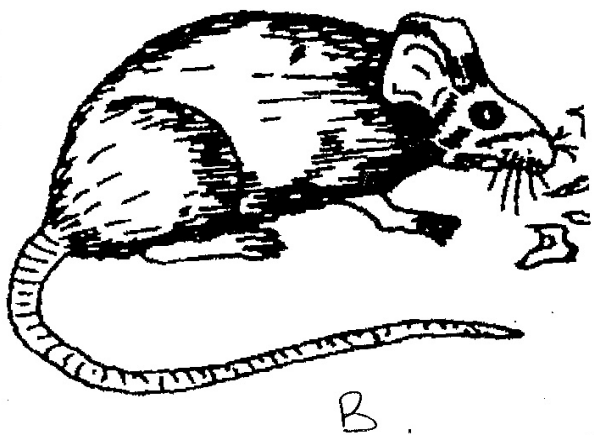
(c) Name **two** other physical measures that can be used to conserve water. (1mk)

_____

_____

25. Study the diagram **below** carefully and answer the questions that follow.





(a) Identify the field pest shown in the illustration **A** and **B** above. (2mks)

A - _____

B - _____

(b) State **two** effect the pest expressed in **A** above has on maize plant. (2mks)

_____

_____

_____

26. A livestock farmer in Kirinyaga can rear dairy cattle, beef cattle or sheep. If the farmer undertakes each of the enterprises at a time, he is likely to get returns as follows:

Dairy cattle	Kshs.70,000
Beef cattle	Kshs.65,000
Sheep farming	Kshs.75,000

(a) From the information given which enterprise the farmer should choose? (1mk)

_____

(b) Give a reason for your answer in **(a) above**. (1mk)

_____

_____

(c) What is the opportunity cost of undertaking the enterprise chosen in (a) above? (1mk)

_____

(d) What is the importance of scarcity in agricultural production? (1mk)

_____

_____

_____

SECTION C: (40 MARKS)

Answer any **two** questions from this section in the spaces provided after question **29**.

27. (a) The information below was extracted from the financial valuation of micro-farm at the end of the year 2007.

Item	Value in Ksh.
Dairy cattle	55,000.00
Maize in store	19,000.00
Buildings	126,000.00
Calves	5,000.00
Seven mature sheep	7,000.00
Land	260,000.00
Machinery	4,000.00
Cattle feed in store	4,000.00
Office equipments	1,400.00
Tools in store	10,000.00

On the same date the farm had Ksh.50,000/- in the bank. KCC owed the farm 5,000/- for milk delivered, owed KFS 4,500/- for fertilizers, 5,000/- to Unga Limited for feeds delivered and labourers wages 12,000/-.

(i) Draw up a balance sheet for the micro-farm as at 31st December 2007. (11mks)

(b) Is the farm solvent or insolvent? (1mk)

(ii) Describe the procedure of harvesting coffee. (4mks)

(iii) A farmer is supposed to apply a compound fertilizer 20:30:10 on a plot measuring 5m long and 4m wide at the rate of 200kg/ha.

(a) What do the figures 20:30 stand for? (2mks)

(b) Calculate the amount of fertilizer the farmer will require per plot. Show your working. (2mks)

28. (a) The table **below** shows the production of maize at various level of NPK fertilizer application. Study it carefully and answer the questions that follow.

Land size in ha	Variable input NPK in kg	Total product maize in 90kg bags	Marginal product maize in 90kg bags	Average product maize in 90kg bags
1	50	10	10	10
1	100	27	A	F
1	150	42	15	14
1	200	56	B	14
1	250	63	7	12.6
1	300	65	C	G
1	350	65	D	9.3
1	400	60	-5	7.5
1	450	52	E	H
1	500	42	-10	4.2

(i) Complete the above. (4mks)

(ii) Using the graph paper provided draw a graph of total product, marginal product and average product against variable input on the same axis and mark the three zones of production. (7mks)

(iii) With a reason identify the best zone of production. (2mks)

(b) Give **two** varieties of sorghum grown in Kenya. (2mks)

(c) Describe **five** effects of soil erosion. (5mks)

29. (a) Explain **seven** working principles of co-operative societies. (7mks)

(b) Describe the procedure of whip grafting in citrus propagation. (5mks)

(c) Describe **four** components of a well developed soil profile. (8mks)

NAME……..…… INDEX NO…….....……..…..

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DATE……..……...

443/2
AGRICULTURE
PAPER 2
TIME: 2 HOURS

Kenya Certificate of Secondary Education
AGRICULTURE
PAPER 2
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

- Write your name and index number in the spaces provided above.
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FOR EXAMINER'S USE ONLY

Section	Question	Maximum Score	Candidate's Score
A	**1 - 18**	**30**	
B	**19 - 21**	**20**	
C	**22 - 24**	**20**	
		20	
Total Score		**90**	

1. Give **two** notifiable diseases in cattle. (1mk)

2. List **four** characteristics of a non-layer in poultry. (2mks)

3. Differentiate between an Essex saddle back and Wessex saddle back. (1mk)

4. Give **two** functions of reticulum in the process of food digestion. (1mk)

5. State the function of a carburetor in fuel system. (1mk)

6. List **five** symptoms attack of livestock by roundworms (Ascaris). (2½mks)

7. Name the structure that is used to ensure that honeycomb and brood combs are found in different chambers in the hive. (1mk)

_____

8. Differentiate between in breeding and out breeding. (1mk)

_____

_____

_____

_____

9. Give **three** methods of harnessing tractor power. (1½mks)

_____

_____

_____

10. Distinguish the functional difference between across cut saw and a rip saw. (1mk)

_____

_____

_____

_____

11. Give **three** reasons why ewes disown lambs. (1½mks)

_____

_____

_____

12. Give four factors to consider when selecting goats for breeding. (2mks)

_____

_____

_____

_____

13. State **four** conditions that can make a cow to withhold milk during milking. (2mks)

14. List **six** management practices carried out on fish pond for optimum fish production. (3mks)

15. Give **five** predisposing factors of mastitis disease in cattle. (2½mks)

16. Give the function of the following parts of a reciprocating mower. (2mks)

(a) Pitman _____

(b) Shoe _____

(c) Swath board _____

(d) Cutter bar _____

17. A dairy cow under zero grazing system weighs 700kg. Calculate how much of dry matter it takes given that it take 2.5kg for every 100kg live weight. (2mks)

18. List **four** factors that influence the quality of honey. (2mks)

_____

_____

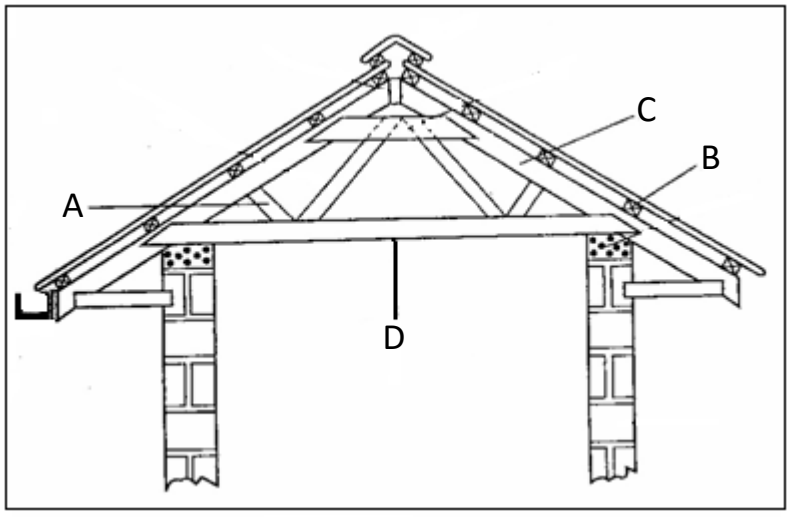
_____

_____

SECTION B: (20 MARKS)

Answer all the questions in this section in the spaces provided.

19. (a) The diagram **below** represents roof of a building.



(i) Identify the parts labeled **A**, **B**, **C**. (3mks)

A _____

B _____

C _____

(ii) Give **four** factors considered when sitting farm buildings and structures. (2mks)

_____

_____

_____

_____

(b) Explain **four** factors which would be considered in choosing materials for construction of farm building and structures. (2mks)

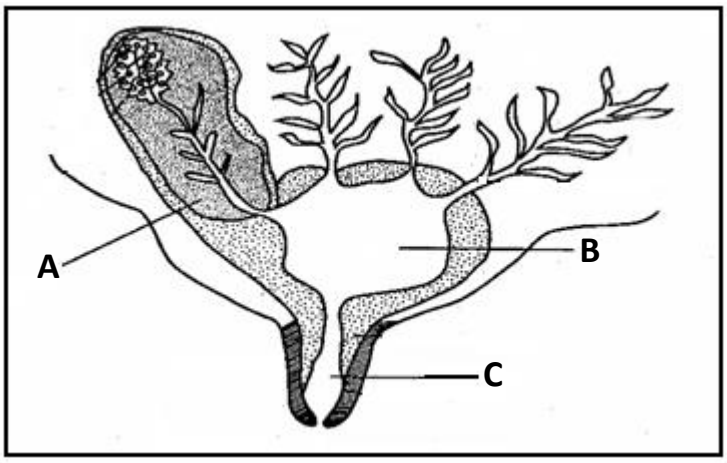
_____

_____

_____

_____

20. **Below** is the longitudinal section of a cow's udder.



(a) Identify the parts labeled **A**, **B**, **C**. (3mks)

A _____

B _____

C _____

(b) Give **four** pre-requisites of clean milk production. (2mks)

_____

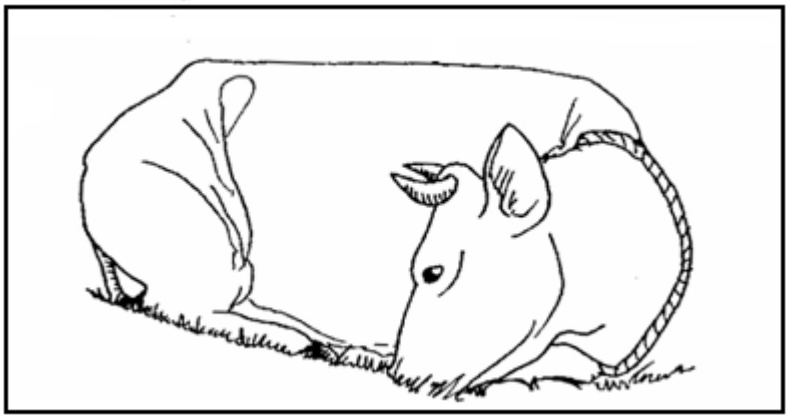
_____

_____

_____

(c) Describe the procedure of castration of a bull using a burdizzor. (2mks)

21. **Below** is a diagram of cow suffering from a deficient disease. Study it and answer the questions **below**.



(a) Identify the disease above animals is suffering from. (1mk)

(b) What stage or state of the body condition encourages the disease above? (1mk)

(c) List **two** symptoms of the above disease. (2mks)

(d) Give **two** control measures of the above identified disease. (2mks)

SECTION C: (40 MARKS)

Answer any **two** questions from this section in the spaces provided after question **22**.

22. (a) Describe the procedure of wool shearing in sheep. (10mks)

(b) Describe the working of four strokes cycle in a petrol engine. (10mks)

23. Give **ten** routine practices and explain an appropriate method of handling livestock during the routine practice. (20mks)

24. (a) Describe the digestion of grass in the rumen of a ruminant. (6mks)

(b) Describe the life cycle of a three host-tick. (7mks)

(c) Write short notes on Friesian breed of dairy cattle under the following sub headings: (7mks)
(i) Origin.
(ii) Characteristic.

NAME……..…… INDEX NO…….....……..…..

SCHOOL……. CANDIDATE'S SIGNATURE……..…...

DATE……..……...

443/1
AGRICULTURE
PAPER 1
TIME: 2 HOURS

Kenya Certificate of Secondary Education
AGRICULTURE
PAPER 1
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

- Write your name and index number in the spaces provided above.
- Sign and write the date of examination in the spaces provided above.
- This paper consists of **THREE** Sections **A**, **B** and **C**.
- Answer all questions in Section **A** and **B**.
- Answer two questions in Section **C** in the spaces provided.

FOR EXAMINER'S USE ONLY

Section	Question	Maximum Score	Candidate's Score
A	1 - 21	30	
B	22 - 26	20	
C	27 - 29	20	
		20	
Total Score		90	

SECTION A: (30 MARKS)

Answer **ALL** questions in this section in the spaces provided.

1. Name **three** forms of horticulture farming. (1½mks)

2. Name any **two** factors which influence soil colour. (1mk)

3. Give **three** reasons why Agricultural produce should be processed. (1½mks)

4. List **two** qualities that enable sorghum to be drought resistant. (1mk)

5. State **three** entries that are made in a journal. (1½mks)

6. List **two** features of plastic pipes a farmer should consider before buying. (1mk)

7. State **three** reasons for top dressing pasture. (1½mks)

8. State **three** environmental conditions that may lead to low crop yields. (1½mks)

_____

_____

_____

9. Give **three** indicators of well decomposed manure. (1½mks)

_____

_____

_____

10. State **three** functions of plastic materials when used as mulch in crop production. (1½mks)

_____

_____

_____

11. Differentiate between gross domestic product and per capita income. (2mks)

(a) Gross domestic product._____

_____

(b) Per capita income. _____

_____

12. Give **two** reasons why bush burning is discouraged during land preparation. (1mk)

_____

_____

_____

13. State **three** causes of blossom end rot disease in tomato crop. (1½mks)

_____

_____

_____

14. State **three** desirable characteristics of agroforestry trees a farmer would consider before planting in the farm. (1½mks)

_____

_____

_____

15. Name **four** items that a maize farmer can enter into his consumable inventory records. (2mks)

_____

_____

_____

_____

16. State any **three** aims of land settlement programmes in Kenya. (1½mks)

_____

_____

_____

17. List **two** ways in which soil of $P^H 3$ can be raised to P^H 6.5. (1mk)

_____

_____

18. Differentiate between hybrid and composite as used in crop breeding. (2mks)

(a) Hybrid._____

_____

(b) Composite_____

_____

19. State **two** possible causes of wilting in tomato plants despite adequate water supply. (1mk)

_____

_____

20. Name the form in which the following nutrients are absorbed by plants. (1½mks)

(i) Calcium _____

(ii) Sulphur _____

(iii) Molybdenum _____

21. List **three** farming practices done to reduce water stress in crop production. (1½mks)

_____

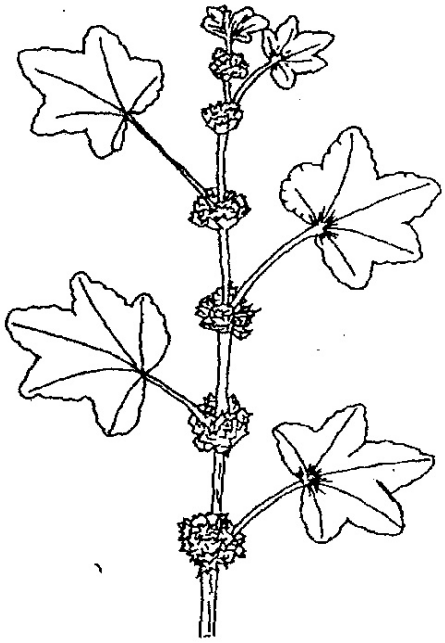
_____

_____

SECTION B: (20 MARKS)

Answer all the questions in this section in the spaces provided.

22. **Below** is a diagram of a Common East African Weed.



(i) Identify the weed illustrated above. (1mk)

_____

(ii) Give **one** harmful effect of the weed illustrated above to livestock. (1mk)

_____

_____

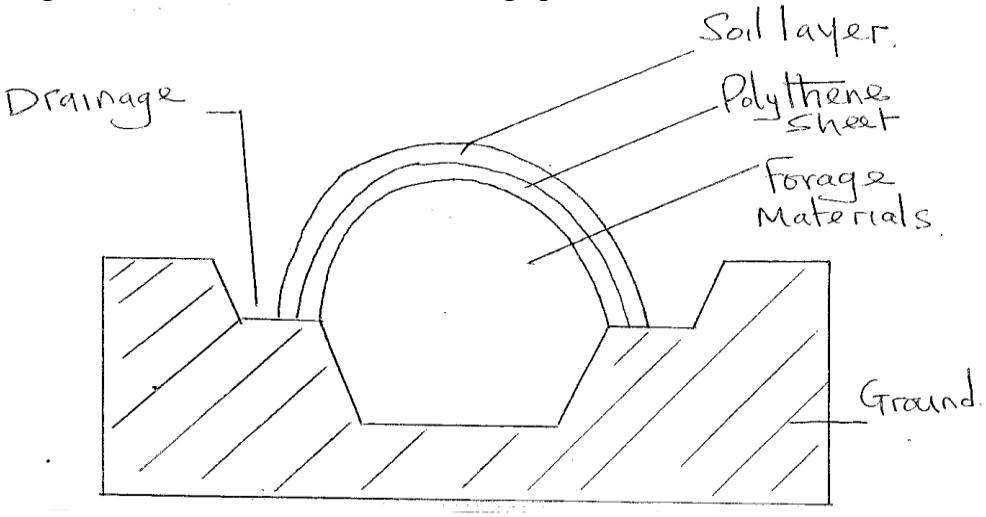
(iii) State **two** methods of controlling the weed illustrated above. (2mks)

_____

_____

_____

23. The diagram **below** shows a method of forage preservation.



(i) Identify the structure illustrated above. (1mk)

_____

(ii) State the form in which forage is conserved as illustrated above. (1mk)

_____

(iii) Give the role of the following in the structure above. (2mks)

(a) Polythene sheet.

_____

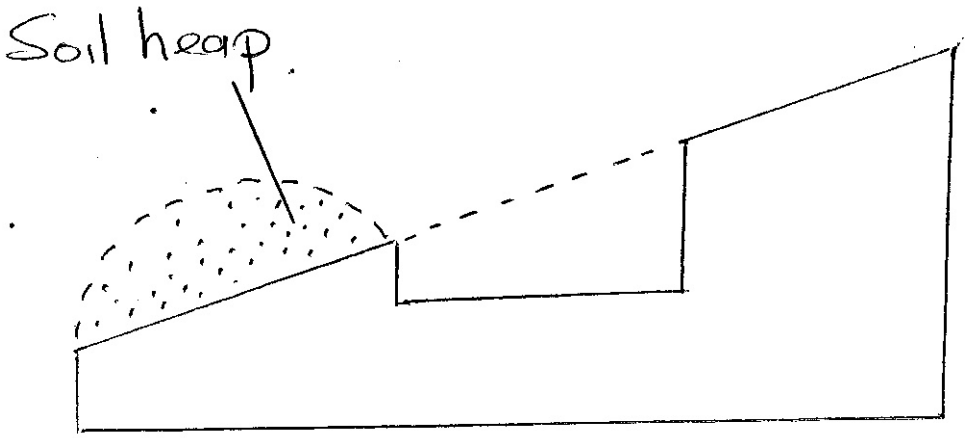
_____

(b) Drainage

_____

_____

24. The illustration **below** represents a form of physical measures in conservation soil and water. Study it carefully and answer the questions that follow.



(a) Identify the illustration above. (1mk)

_____

(b) Describe how the above physical measure conserves soil and water. (2mks)

_____

_____

_____

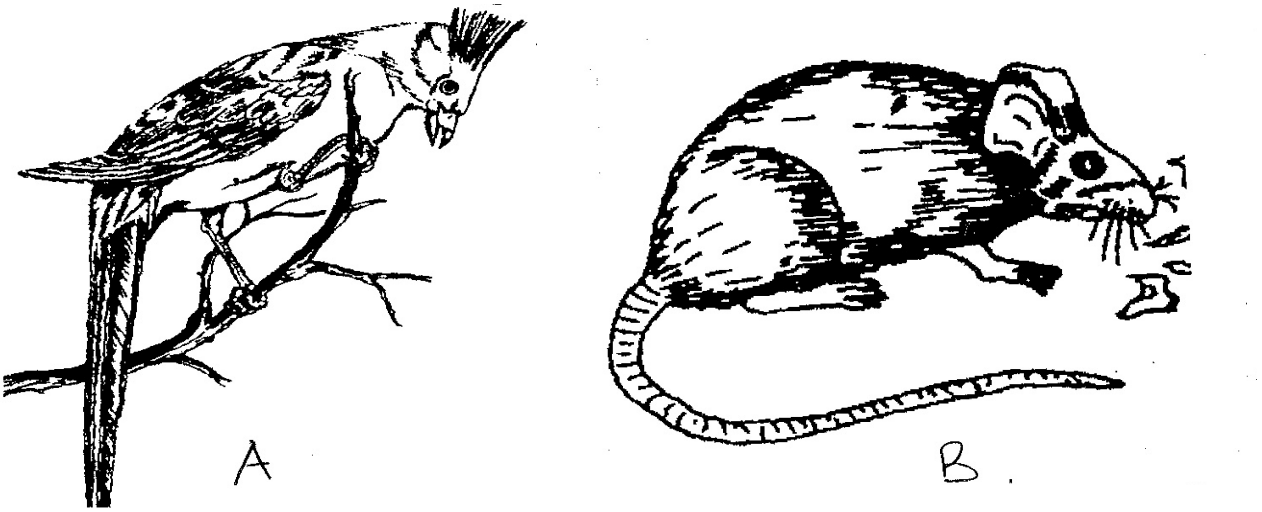
_____

(c) Name **two** other physical measures that can be used to conserve water. (1mk)

_____

_____

25. Study the diagram **below** carefully and answer the questions that follow.



(a) Identify the field pest shown in the illustration **A** and **B** above. (2mks)

A - _____

B - _____

(b) State **two** effect the pest expressed in **A** above has on maize plant. (2mks)

_____

_____

_____

26. A livestock farmer in Kirinyaga can rear dairy cattle, beef cattle or sheep. If the farmer undertakes each of the enterprises at a time, he is likely to get returns as follows:

Dairy cattle	Kshs.70,000
Beef cattle	Kshs.65,000
Sheep farming	Kshs.75,000

(a) From the information given which enterprise the farmer should choose? (1mk)

_____

(b) Give a reason for your answer in **(a) above**. (1mk)

_____

_____

(c) What is the opportunity cost of undertaking the enterprise chosen in (a) above? (1mk)

_____

(d) What is the importance of scarcity in agricultural production? (1mk)

_____

_____

_____

SECTION C: (40 MARKS)

Answer any **two** questions from this section in the spaces provided after question **29**.

27. (a) The information below was extracted from the financial valuation of micro-farm at the end of the year 2007.

Item	Value in Ksh.
Dairy cattle	55,000.00
Maize in store	19,000.00
Buildings	126,000.00
Calves	5,000.00
Seven mature sheep	7,000.00
Land	260,000.00
Machinery	4,000.00
Cattle feed in store	4,000.00
Office equipments	1,400.00
Tools in store	10,000.00

On the same date the farm had Ksh.50,000/- in the bank. KCC owed the farm 5,000/- for milk delivered, owed KFS 4,500/- for fertilizers, 5,000/- to Unga Limited for feeds delivered and labourers wages 12,000/-.

(i) Draw up a balance sheet for the micro-farm as at 31st December 2007. (11mks)

(b) Is the farm solvent or insolvent? (1mk)

(ii) Describe the procedure of harvesting coffee. (4mks)

(iii) A farmer is supposed to apply a compound fertilizer 20:30:10 on a plot measuring 5m long and 4m wide at the rate of 200kg/ha.

(a) What do the figures 20:30 stand for? (2mks)

(b) Calculate the amount of fertilizer the farmer will require per plot. Show your working. (2mks)

28. (a) The table **below** shows the production of maize at various level of NPK fertilizer application. Study it carefully and answer the questions that follow.

Land size in ha	Variable input NPK in kg	Total product maize in 90kg bags	Marginal product maize in 90kg bags	Average product maize in 90kg bags
1	50	10	10	10
1	100	27	A	F
1	150	42	15	14
1	200	56	B	14
1	250	63	7	12.6
1	300	65	C	G
1	350	65	D	9.3
1	400	60	-5	7.5
1	450	52	E	H
1	500	42	-10	4.2

(i) Complete the above. (4mks)

(ii) Using the graph paper provided draw a graph of total product, marginal product and average product against variable input on the same axis and mark the three zones of production. (7mks)

(iii) With a reason identify the best zone of production. (2mks)

(b) Give **two** varieties of sorghum grown in Kenya. (2mks)

(c) Describe **five** effects of soil erosion. (5mks)

29. (a) Explain **seven** working principles of co-operative societies. (7mks)

(b) Describe the procedure of whip grafting in citrus propagation. (5mks)

(c) Describe **four** components of a well developed soil profile. (8mks)

NAME……..…… INDEX NO…….....……..…..

SCHOOL…… CANDIDATE'S SIGNATURE……..…..

DATE……..……..

442/1
ART AND DESIGN
PAPER 1
TIME: 1½ HOURS

Kenya Certificate of Secondary Education
ART AND DESIGN
PAPER 1
TIME: 1½ HOURS

INSTRUCTIONS TO THE CANDIDATES:

(a) Write your **name** and **index number** in the spaces provided above.
(b) **Sign** and write the **date** of examination in the spaces provided above.
(c) This paper consists of **THREE** Sections **A, B** and **C**.
(d) Answer any **one** question from section **C**.
(e) Where drawings and diagrams are appropriate, they should be included within the text of your answers.

SECTION A: (20 MARKS)

Answer all the questions in the section in the spaces provided.

1. (a) The illustration **below** represent a sculptural form made out of wood state the technique used to make this sculpture and **two** main tools used. (3mks)

_____

_____

_____

(i) State **three** characteristics of this type of sculpture. (3mks)

_____

_____

_____

(b) Distinguish colour from a pigment. (1mk)

_____

_____

_____

(c) State **one** main function of rhythm and movement in a pictorial composition. (1mk)

_____

_____

(d) Name and explain the method in fabric decoration in which printing is done through a surface. (2mks)

_____

_____

_____

(e) Identify any two materials that can be used to stiffen clay. (2mks)

_____

_____

(f) Distinguish between the materials for making modeling sculpture from those of construction. (1mk)

_____

_____

_____

_____

(g) State **two** important characteristics of copper wire as a material for making ornaments. (2mks)

_____

_____

_____

_____

(h) (i) **Below** is a method of presenting works of Art and Design. State the method. (1mk)

(ii) Name **two** materials required in the making of the above work. (2mks)

_____

_____

(i) Explain the term warp faced plain weave as used in weaving. (1mk)

_____

_____

_____

(j) Identify the road sign illustrated **below**. (1mk)

_____

SECTION B: (25 MARKS)

Answer **ALL** the questions from this section in the spaces provided.

2. In the spaces provided **below** construct the word. Expanded in block letters to illustrate this concept. (5mks)

3. (i) Define the term glaze as used in pottery. (1mk)

_____

_____

_____

(ii) State **two** functions of glaze in pottery work. (2mks)

_____

_____

_____

_____

(iii) Explain **three** important points in the throwing technique. (3mks)

_____

_____

_____

_____

4. (i) Define the term mono print. (1mk)

_____

_____

_____

(ii) Give at least **two** examples of mono print works. (2mks)

_____

_____

_____

_____

(iii) Give **two** reasons why a flag is considered as a work of graphics. (2mks)

_____

_____

_____

_____

5. In the spaces provided **below** sketch an elderly male figure walking with the aid of a walking stick. (5mks)

6.

(i) State the type of pictorial composition illustration **above**.

_____

(ii) Identify **two** characteristics of the work. (2mks)

_____

_____

_____

_____

(iii) Identify **two** other works related to the work illustrated above. (2mks)

_____

_____

_____

_____

SECTION C: (15 MARKS)

Answer any **one** question in this section. Write your answer in the spaces provided after question.

7. (a) Differentiate an ornament from a jewellery. (1mk)

(b) State and explain **five** factors that should be considered in designing ornaments. (10mks)

(c) Define the following terms as used in ornament making. (2mks)
(i) Annealing.
(ii) Soldering.

(d) Explain **two** roles of ornaments in the African traditional society. (2mks)

8. (a) Identify **two** types of designs that can be produced in Batik. (2mks)

(b) State another technique related to batik and give a reason to your answer. (3mks)

(c) State and explain **three** importance of using a double container in batik. (6mks)

(d) Briefly explain how you would remove wax from a batik piece made for a blouse. (2mks)

(e) Explain how you would identify a batik piece work. (2mks)

9. (a) Define the term perspective. (2mks)

(b) Using birds eye view illustrate a traditional village. (3mks)

_____

_____

442/2
ART AND DESIGN
PAPER 2
TIME: 3 HOURS

Kenya Certificate of Secondary Education
ART AND DESIGN
PAPER 2
TIME: 3 HOURS

INSTRUCTIONS TO THE CANDIDATES:

This paper contains **two** alternatives **A** and **B**. Each alternative has **two** questions.
Choose only **ONE** question from any **ONE** alternative.
In alternative **A**: Choose either a drawing or a painting question.
This question paper will be given to you one hour before the start of the examination to enable you to make your choice from the alternative. During this one hour, you are allowed to make sketches on the A4 papers provided to help you decide on your choice.
The use of rulers and other mechanical means is forbidden in alternative **A** but is allowed in alternative **B** in this paper the candidate is reminded that emphasis should be laid on quality of imagination rather than literal interpretation of them.
At the end of the examination, pass your work and sketches to the supervisor without rolling or folding it.

Answer only **ONE** question from **EITHER** alternative **A** or alternative **B**.

ALTERNATIVE A: DRAWING OR PAINTING
You are instructed that the use of rulers and other mechanical devices is forbidden in this alternative.

EITHER

1. **DRAWING**:
In pencil or pen and ink make an imaginative composition of an elderly male figure talking to his grand children. The work measures 40cm by 35cm.

OR

2. **PAINTING**:
From memory or imagination make a painting of patients waiting in the out patient section as the doctors go on strike. The work measures 40cm by 35cm.

ALTERNATIVE B: GRAPHICS
You are instructed that the use of rulers and other mechanical devices as well as tracing paper is allowed.

The colour of the working surface will not be considered as one of the colours required in any question.

EITHER

3. Design a book cover which records Kenya's history since independence and the Hero who fought for independence. The book is authorized by Kamau S. Mukuhe and published by Suku Kenya Limited. Get an appropriate title for the book and a logo. The book measures 12cm by 20cm with a spine of 3cm.

OR

4. Graden Institute of Fine Art is a newly established college offering artistic training. Design a brochure for the college measuring 30cm by 20cm. The brochure should include illustrations text and be in three colours.
The following information should be depicted in the brochure and written in calligraphic form. The college offers a broad based art and design curriculum ensuring propagation of appropriate self employment for self betterment in the year 2020. The work measures 30cm by 20cm.

NAME…… **INDEX NO……..……**

SCHOOL…….. **CANDIDATE'S SIGNATURE……....**

DATE……..…

231/1
BIOLOGY
PAPER 1
(THEORY)
TIME: 2 HOURS

Kenya Certificate of Secondary Education
BIOLOGY
PAPER 1
(THEORY)
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

Write your **Name**, **Index Number** and **School** in the spaces provided above.
Sign and write the **date** of examination in the spaces provided above.
Answer **all** the questions in the spaces provided.

FOR EXAMINER'S USE ONLY:

Question	Maximum Score	Candidate's Score
1 - 22	80	

1. (a) Define the term 'parthenocarpy'. (1mk)

_____

_____

_____

(b) Name **two** plant growth hormones that promote parthenocarpy. (2mks)

_____

_____

2. Name the organelle that performs each of the following functions in a cell

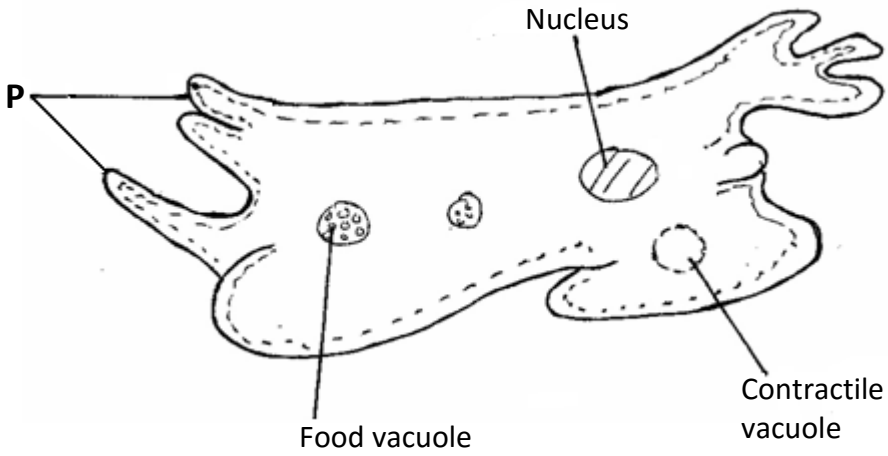
(i) Protein synthesis. (1mk)

_____

(ii) Transport of cell secretions. (1mk)

_____

3. The diagram **below** represents a certain organism.



(a) Identify the kingdom to which the organism belongs. (1mk)

_____

(b) Identify the part labeled **P**. (1mk)

_____

(c) What is the function of contractile vacuole? (1mk)

_____

_____

4. Other than carbon (IV) oxide, name other products of anaerobic respiration. (2mks)

_____

_____

5. (a) Name the fluid that is produced by sebaceous glands. (1mk)

_____

(b) State **two** functions of sweat on the human body. (2mks)

_____

_____

6. (a) State **two** characteristics that are used to divide the phylum arthropoda into classes. (2mks)

_____

_____

_____

_____

(b) Name the class with the largest number of individuals in the phylum arthropoda. (1mk)

_____

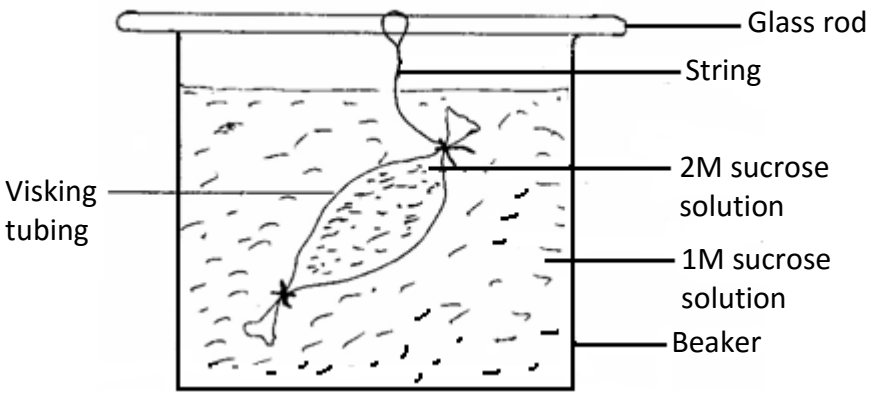
7. Why are people with blood group O referred to as universal donors? (1mk)

_____

_____

_____

8. An experiment was set up as shown in the diagram **below**.



(a) Which process is being investigated by the above experiment? (1mk)

_____

(b) State the expected results. (1mk)

_____

_____

_____

(c) Explain your answer in (b) above. (3mks)

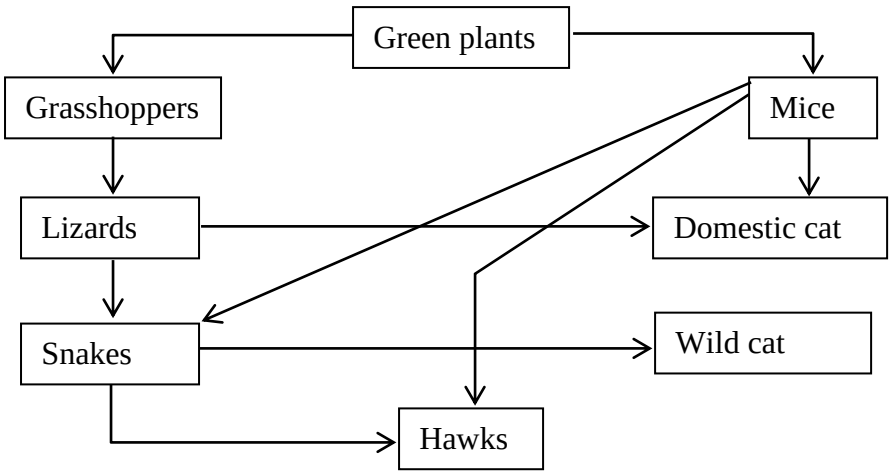
9. (a) What causes the following diseases?

(i) Diabetes mellitus. (1mk)

(ii) Diabetes insipidus. (1mk)

(b) How would you test that someone is a victim of diabetes mellitus in the laboratory. (3mks)

10. The following chart shows a feeding relationship in ecosystem.



(a) Construct **two** food chains ending with a tertiary consumer in each case. (2mks)

(b) Which organism has the largest variety of predator in food web? (1mk)

(c) Suggest **three** ways in which the ecosystem would be affected if there was prolonged drought. (3mks)

_____

_____

_____

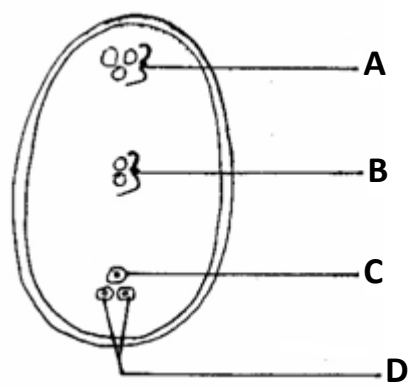
11. A man of blood group A and a woman of blood group B get married.

(a) Using a punnet square show the possible blood groups of their offspring's if both of them are heterozygous for their blood groups. (4mks)

(b) What is the probability that one of the children will be blood group O? (1mk)

_____

12. The diagram **below** shows a mature embryo sac of a flowering plant.



(a) Name the parts labeled **A** and **D**. (2mks)

A _____

B _____

(b) What is the function of the structure labeled B. (1mk)

_____

_____

_____

13. (a) Name the tissues that transport water in plants. (1mk)

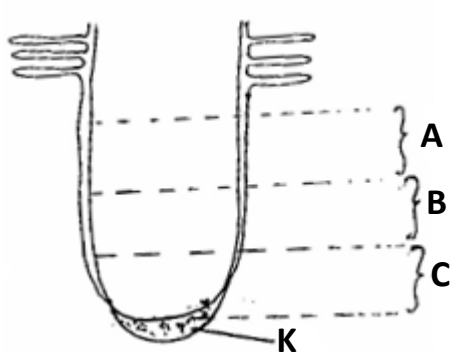
_____

(b) How is the tissue you named in **(a) above** strengthened? (1mk)

_____

_____

14. The diagram **below** shows regions of growth in a root. Study it and answer the questions that follow.



(a) Name the zones labeled.

A _____ (1mk)

B _____ (1mk)

C _____ (1mk)

(b) State the function of part **K**. (1mk)

_____

15. The enzymes pepsin and trypsin are secreted in their inactive forms.

(a) Give the names of these inactive forms. (2mks)

_____

_____

(b) Why are they secreted in an inactive form? (1mk)

_____

_____

_____

16. (a) Define the following terms:

(i) Evolution. (1mk)

_____

_____

_____

(ii) Analogous structures. (1mk)

_____

_____

_____

(b) Describe the importance of comparative embryology as evidence of evolution. (3mks)

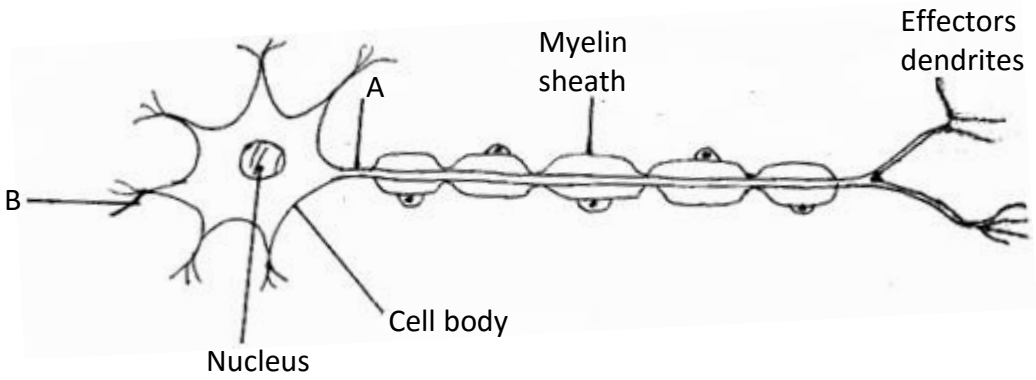
_____

_____

_____

_____

17. Study the diagram **below** of a neurone in human being.



(a) Identify the neurone. (1mk)

_____

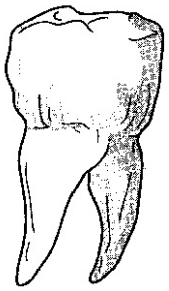
(b) Name the parts labeled.

A _____ (1mk)

B _____ (1mk)

(c) Using an arrow indicate the direction of movement of a nerve impulse along the neurone (1mk)

18. Study the diagram of the mammalian tooth **below** and answer the questions that follow.



(a) Identify the tooth. (1mk)

_____

(b) Give a reason for your answer in (a) above. (1mk)

_____

_____

_____

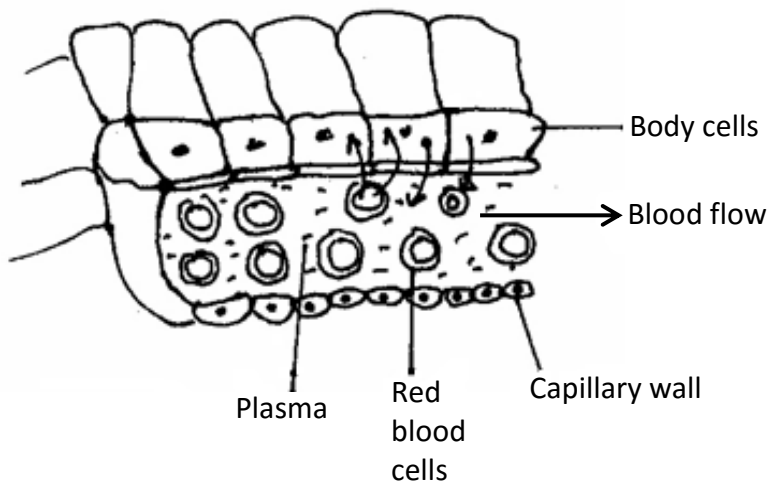
(c) State **one** adaptation of the tooth to its function. (1mk)

_____

_____

_____

19. The diagram **below** shows gaseous exchange in tissues.



(a) (i) Name the gas that diffuses.

I To the body cells _____ (1mk)

II From body cells _____ (1mk)

(b) Which compound dissociates to release the gas named in **(a)(i) above**. (1mk)

_____

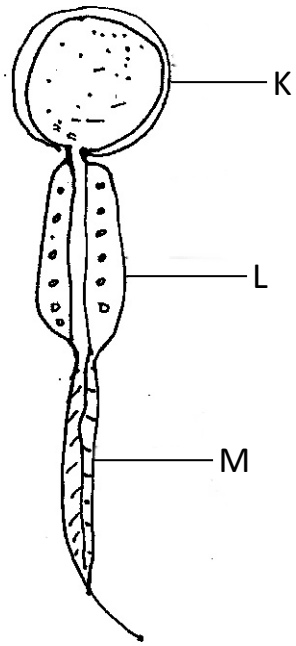
(c) What is tissue fluid? (1mk)

_____

_____

_____

20. The diagram **below** represents one of the specialized cells found in the human body.



(a) Identify the cell. (1mk)

_____

(b) What is the function of the cell? (2mks)

_____

_____

_____

_____

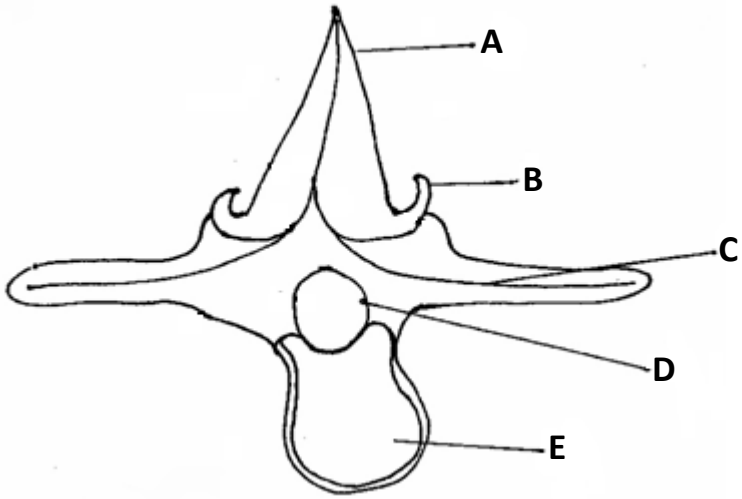
(d) Name the parts labeled.

K _____ (1mk)

L _____ (1mk)

M _____ (1mk)

21. The diagram **below** represents the anterior view of a certain vertebra shown **below**.



(a) With a reason, identify the type of vertebra shown **above**. (2mks)

_____

_____

_____

_____

(b) Name the parts labeled.

(i) **A** _____ (1mk)

(ii) **D** _____ (1mk)

(c) State the function of part **E**. (1mk)

_____

_____

22. Complete the table **below** on mineral nutrition in plants.

Mineral element	Function	Deficiency symptoms
	Synthesis of proteins and protoplasm	Stunted growth and yellowing of leaves
Calcium		
	Forms part of chlorophyll	Yellowing of leaves

(4mks)

NAME …… INDEX NO……..……..…

SCHOOL …… CANDIDATE'S SIGNATURE……...

DATE……

231/2
BIOLOGY
PAPER 2
(THEORY)
TIME: 2 HOURS

Kenya Certificate of Secondary Education
BIOLOGY
PAPER 2
(THEORY)
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES

- *Write your name, school and index number in the spaces provided above.*
- *This paper consist of **TWO** sections; **A** and **B**.*
- *Answer **all** the questions in the section **A** in the spaces provided.*
- *In section **B** answer Question **6 (compulsory)** and either question **7** or **8** in the space provided after question **8**.*
- *Check to ascertain that all pages are printed and that no questions are missing.*

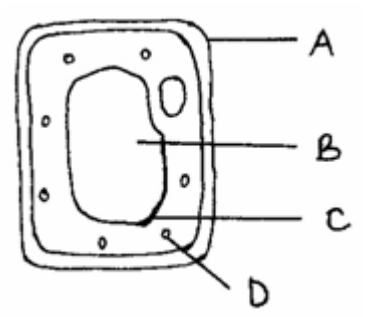
FOR EXAMINER'S USE ONLY

Section	Question	Maximum Score	Candidates Score
A	1	8	
	2	8	
	3	8	
	4	8	
	5	8	
B	6	20	
	7	20	
	8	20	
Total Score		80	

SECTION A: (40 MARKS)

Answer **ALL** the questions in this section in the spaces provided.

1. Examine the diagram **below** and use it to answer the questions that follow.



(a) Name the parts labeled. (3mks)

B _____

C _____

D _____

(b) What is substance which makes up part labeled **A**? (1mk)

_____

(c) Name the process by which mineral salts move into structure **B**. (1mk)

_____

(d) Explain what happens when a red blood cell is put in distilled water. (3mks)

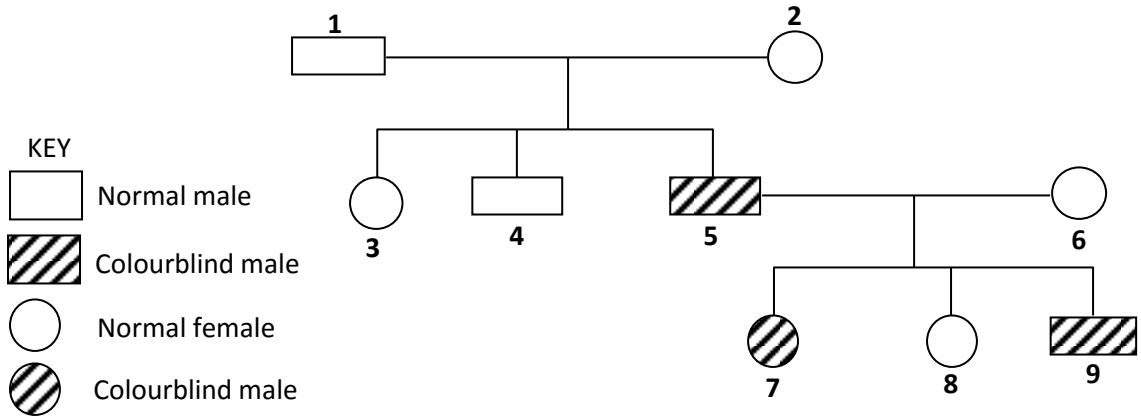
_____

_____

_____

_____

2. The figure **below** is a pedigree showing the inheritance of colourblindness, a disease transmitted through a recessive gene located on the X-chromosome.



(a) Using the symbol N for normal gene and n for colourblind gene, write down the genotypes of parents **1** and **2**. (2mks)

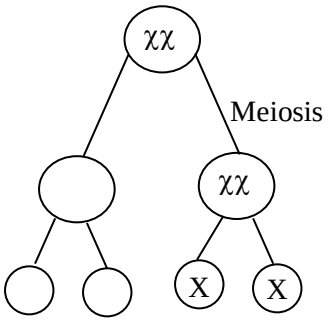
_____

_____

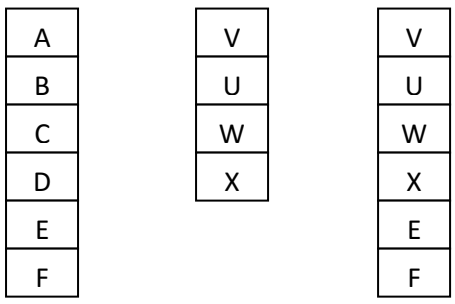
(b) Work out the possible genotypes of the children **3**, **4** and **5**. (4mks)

(c) The diagrams **below** illustrate some chromosome mutations.

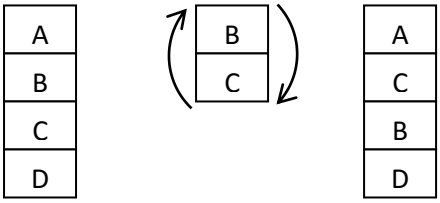
A



B



C



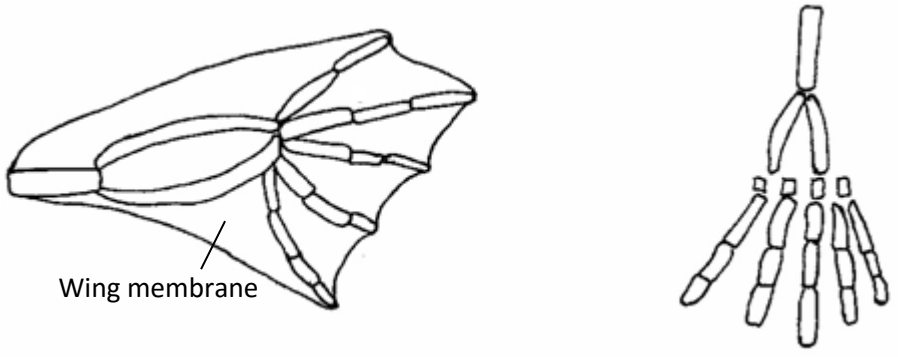
Identify the mutations. (3mks)

A _____

B _____

C _____

3. The diagram **below** shows structures of the bat wing and human arm.



(a) These structures are thought to have same ancestral origin. State **one** structural similarity and **one** adaptational difference between the two.

(i) Structural similarity. (1mk)

_____

(ii) Adaptational difference. (2mks)

_____

_____

_____

_____

(b) Give **two** other examples of structures in nature that show the type of evolution as in (a) above. (2mks)

_____

_____

(c) Distinguish between the terms 'chemical evolution' and 'organic evolution'. (2mks)

_____

_____

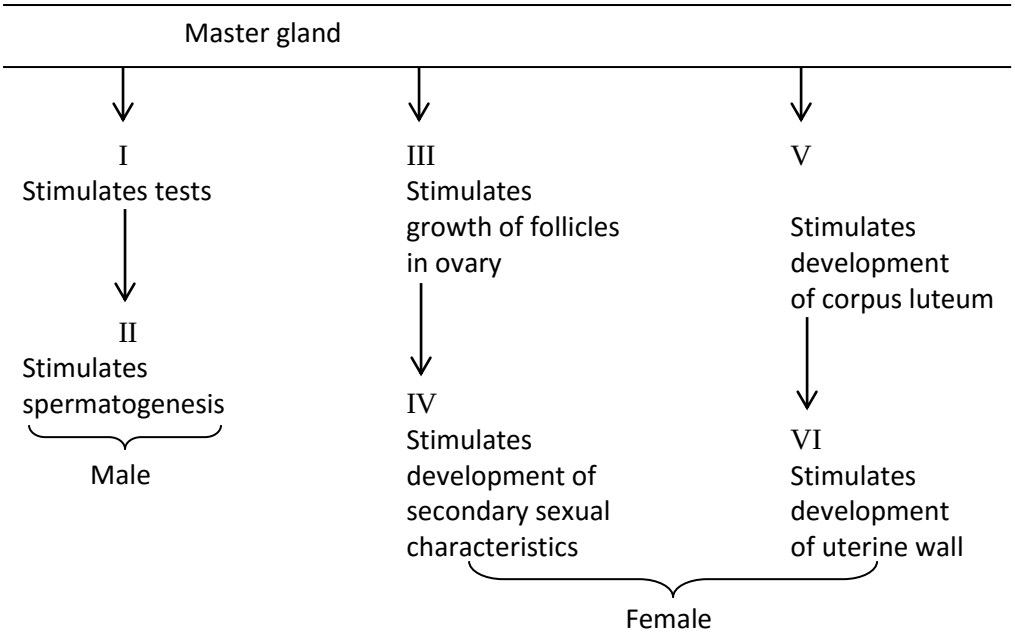
_____

_____

(d) What is the study of fossils called? (1mk)

_____

4. The diagram **below** represents some hormones, their sources and functions in a mammal.



(a) Identify the gland described as master gland. (1mk)

_____

(b) Name the hormones:- (4mks)

II _____

III _____

V _____

VI _____

(c) Describe the consequences of deficiency of hormone **II** in man. (2mks)

_____

_____

_____

_____

(d) Other than stimulate development of uterine wall, suggest two other functions of hormone **VI**. (2mks)

_____

_____

_____

_____

5. Ascaris lumbricoides is an endoparasite.

(a) Name the genus to which it belongs. (1mk)

_____

(b) State the habitat of the organism. (1mk)

_____

(c) State **three** ways in which the organism is adapted to living in its habitat. (3mks)

_____

_____

_____

_____

(d) Mention **three** ways of preventing spread of the parasite. (3mks)

_____

_____

_____

_____

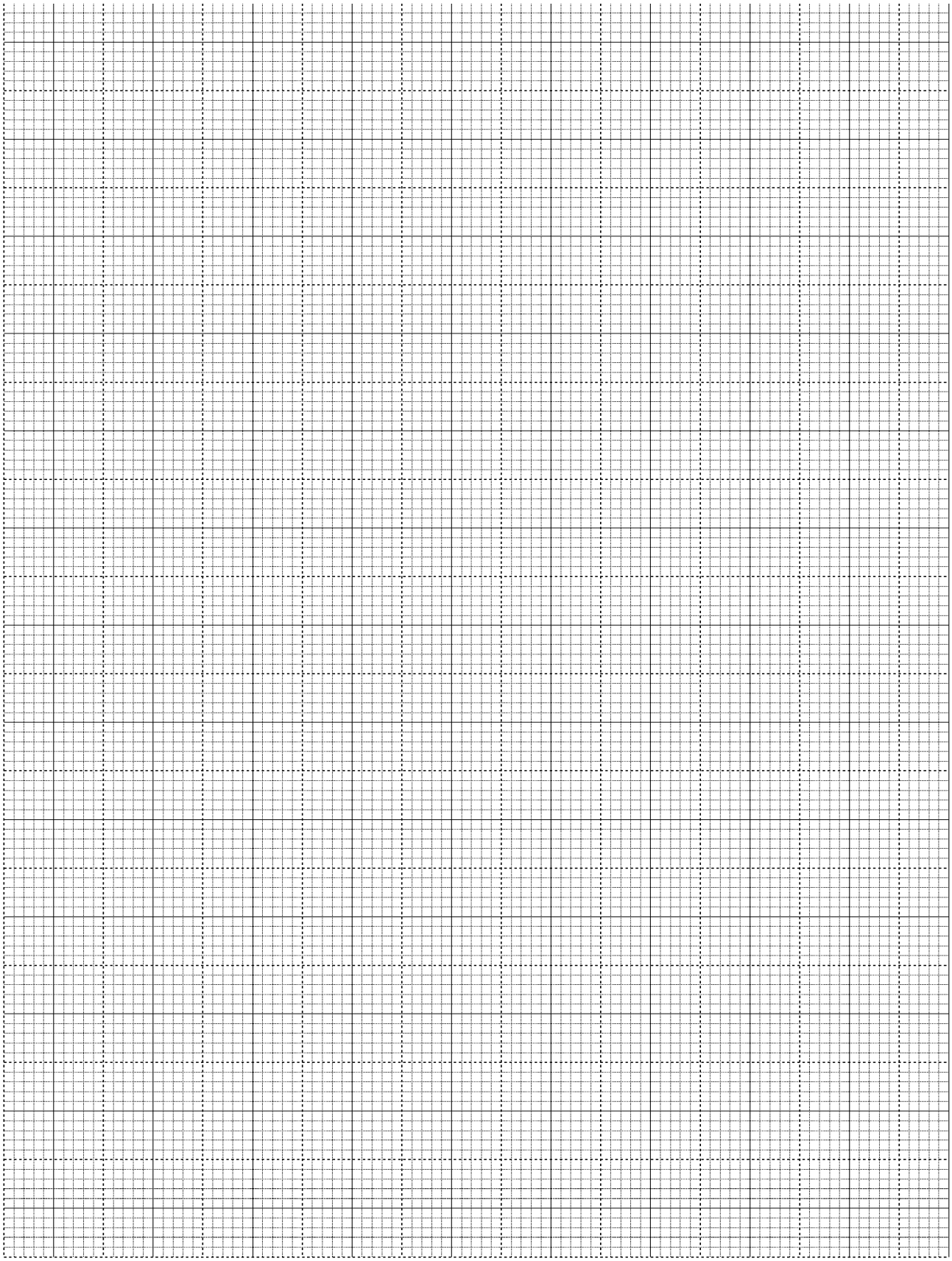
SECTION B: (40 MARKS)

Answer question **6 (compulsory)** and EITHER question **7** or **8** in the spaces provided after question **8**.

6. The table **below** shows how the quantities of sweat and urine vary with external temperature.

External temperature °C	Urine cm^3/hr	Sweat cm^3/hr
0	100	5
5	90	6
10	80	10
15	70	20
20	60	30
25	50	60
30	40	120
35	30	200

(a) On the same graph, plot the quantities of urine and sweat produced against the external temperature. (7mks)



(b) At what temperature are the amounts of sweat and urine produced equal? (1mk)

_____

_____

(c) What happens to the amount of sweat produced as the temperature rises? Explain the observation. (3mks)

(d) Explain the observation made on the amount of urine produced as the temperature increases. (3mks)

(e) How is the skin adapted for temperature regulation? (6mks)

7. Describe the structural adaptations of the mammalian heart to its function. (20mks)

8. Describe how water moves from the soil to the leaves in a tree. (20mks)

NAME …… INDEX NO……..……..…..……

SCHOOL …….. CANDIDATE'S SIGNATURE……..……

DATE……

231/3
BIOLOGY
PAPER 3
(PRACTICAL)
TIME: 1¾ HOURS

Kenya Certificate of Secondary Education
BIOLOGY
PAPER 3
(PRACTICAL)
TIME: 1¾ HOURS

Instructions to candidates

(a) Write your name and index number in the spaces provided above.
(b) Sign and write the date of examination in the spaces provided above.
(c) Answer all the questions in the spaces provided.
(d) You are required to spend the first 15 minutes of the 1¾ hours allowed for this paper reading the whole paper carefully before commencing your work.
(e) Additional papers must not be inserted.
(f) This paper has **three** questions and **6** pages.
(g) Students should check the question paper to ascertain that all the papers are printed as indicated and that no questions are missing.

For Examiner's Use Only

Question	Maximum Score	Candidate's Score
1	12	
2	14	
3	14	
Total score	40	

1. You are provided with a specimen labeled K. With the help of a hand lens examine the specimen.

(a) (i) State the phylum to which the specimen belongs. (1mk)

_____

(ii) Using the observable features only, name the class to which the specimen belongs. (1mk)

_____

(iii) Give a reason for your answer in (a)(ii) above. (1mk)

_____

_____

_____

(b) Using the observable features only, state how the animal is adapted to living in its habitat. (3mks)

_____

_____

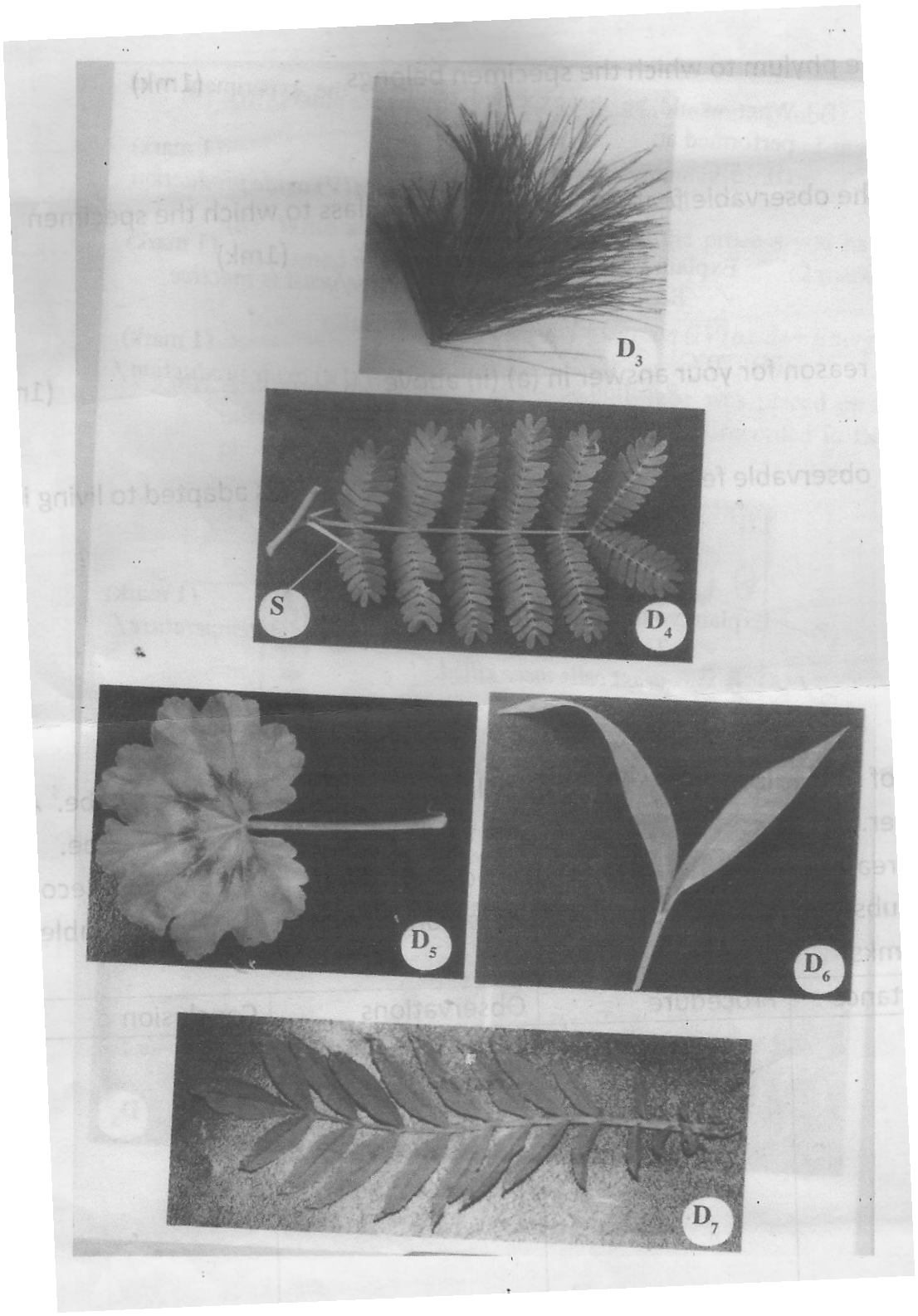
_____

_____

(c) Cut three of specimen K into tiny pieces. Place the pieces into a boiling tube. Add 5m of water. Boil for five minutes. Decant the extract into a clean test tube. Using the reagents provided, identify the food substances in the extract. Record the food substances being tested for observations and conclusions in the table below. (6mks)

Food substance	Procedure	Observations	Conclusion

2. You are provided with five photographs of plant specimens. They are labeled specimen D_3, D_4, D_5, D_6 and D_7. A dichotomous key is provided below the photographs.



1.	(a)	Leaves arranged in clusters on stem ……..	Pinaceae
	(b)	Leaves not arranged in clusters on stem ……	go to 2
2.	(a)	Leaves compound…….	go to 3
	(b)	Leaves simple……	go to 4
3.	(a)	Leaf pinnate……..	Rosaceae
	(b)	Leaf bipinnate……...	Mimosaceae
4.	(a)	Leaves parallel veined……..	Graminae
	(b)	Leaves net veined…….	Geranaceae

(a) Use the dichotomous key to identify the taxonomic group of each of the five specimens in photographs provided. (10mks)

Specimen	Steps followed	Identity

(b) (i) Suggest the possible habitat that specimen D_4 is adapted to. (1mk)

_____

(ii) Name **one** observable features that adapts specimen D4 to the habitat you have mentioned in (b)(i) above. (1mk)

_____

(iii) Give o**ne** reason for your answer in (b)(ii) above. (1mk)

_____

_____

_____

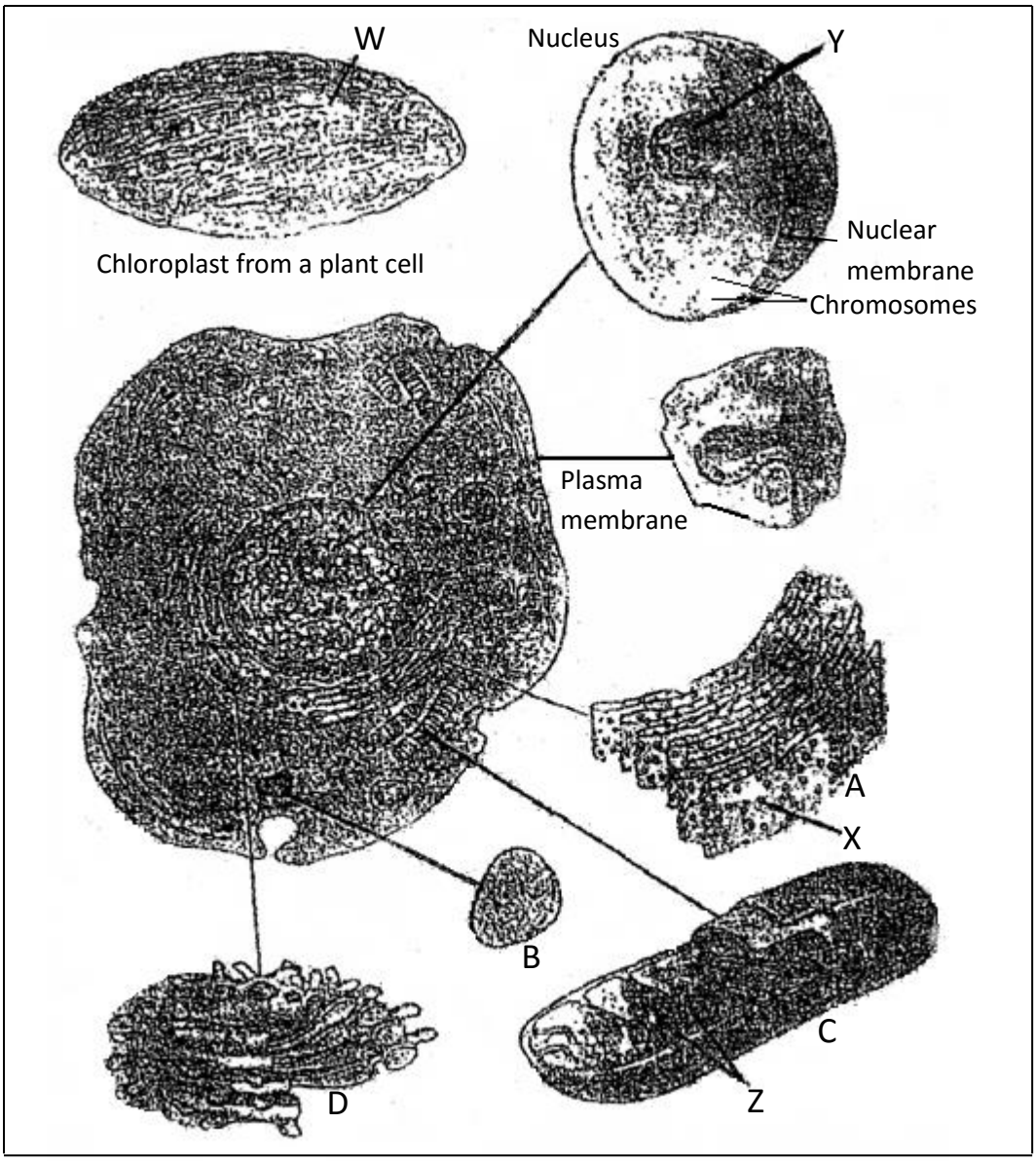
(iv) What is the importance of the structure marked S in specimen D_4? (1mk)

_____

_____

_____

3. You are provided with a photograph of a chloroplast and animal cell as seen under the electron microscope. Examine them and use them to answer the questions that follow.



(a) Name the organelles labeled: (4mks)

A _____

B _____

C _____

D _____

(b) State the functions of the structures labeled **W**, **X**, **Y** and **Z**. (4mks)

W _____

X _____

Y _____

Z _____

(c) In the photograph, label the following structures: (2mks)

(i) Vacuole.

(ii) Pinocytic vesicle.

(d) Relate the structure of the organelle labeled **C** to its function. (2mks)

_____

_____

_____

(e) State the functions of the structure labeled **D**. (2mks)

_____

_____

_____

_____

NAME……..…… INDEX NO…….....……..…..

SCHOOL……. CANDIDATE'S SIGNATURE……..…...

DATE……..……...

565/1
BUSINESS STDUIES
PAPER 1
TIME: 2 HOURS

Kenya Certificate of Secondary Education
BUSINESS STUDIES
PAPER 1
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

- Write your **name** and **index number** in the space provided above.
- **Sign** and write the **date** of the examination in the spaces provided above.
- Answer all the questions.
- All answers must be written in the spaces provided.

FOR EXAMINER'S USE ONLY

Questions	1	2	3	4	5	6	7	8	9	10	11	12	13
Marks													

Questions	14	15	16	17	18	19	20	21	22	23	24	25
Marks												

TOTAL MARKS

1. Give **four** features of departmental stores. (4mks)

(a) _____

(b) _____

(c) _____

(d) _____

2. Highlight **four** roles of an entrepreneur to the economy of a country. (4mks)

(a) _____

(b) _____

(c) _____

(d) _____

3. Give **four** reasons why a manufacturer may offer after-sales services to his customers. (4mks)

(a) _____

(b) _____

(c) _____

(d) _____

4. Outline **four** circumstances under which it would be appropriate to use signs to communicate. (4mks)

(a) _____

(b) _____

(c) _____

(d) _____

5. Highlight **four** measures taken by producers to ensure consumers are protected when using their products. (4mks)

(a) _____

(b) _____

(c) _____

(d) _____

6. List **four** disadvantages of using containers to transport goods. (4mks)

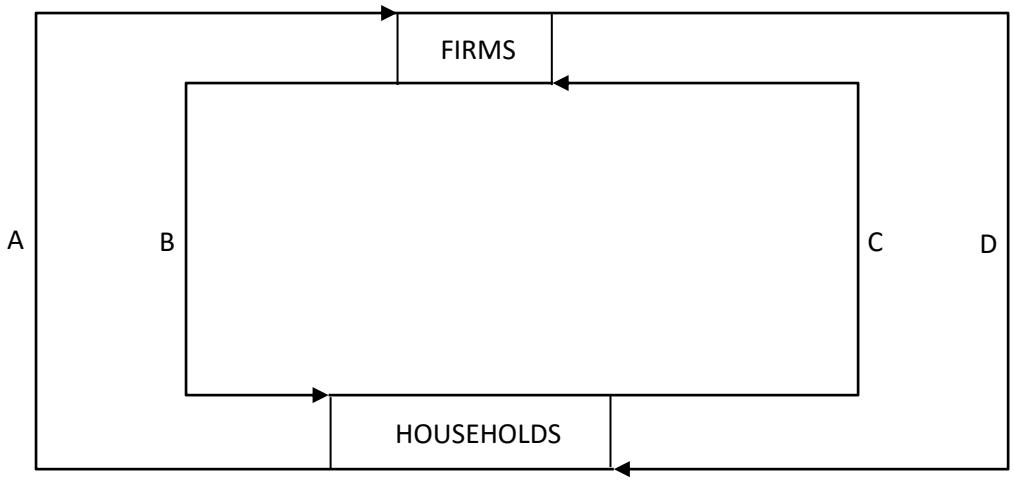
(a) _____

(b) _____

(c) _____

(d) _____

7. The diagram **below** shows the circular flow of income in a two sector economy.



Name the parts marked **A**, **B**, **C** and **D**. (4mks)

(a) _____

(b) _____

(c) _____

(d) _____

8. The table **below** shows the change in population size in a certain country between 1999 and 2001.

Year	Total population (millions)
1999	20
2000	25
2001	30

State **four** factors that may have contributed to the population trend shown above. (4mks)

(a) _____

(b) _____

(c) _____

(d) _____

9. State **four** uses of a trial balance to a business. (4mks)

(a) _____

(b) _____

(c) _____

(d) _____

10. State **four** principles of public expenditures. (4mks)

(a) _____

(b) _____

(c) _____

(d) _____

11. Highlight **four** conditions that a customer should satisfy before a bank can grant him a loan. (4mks)

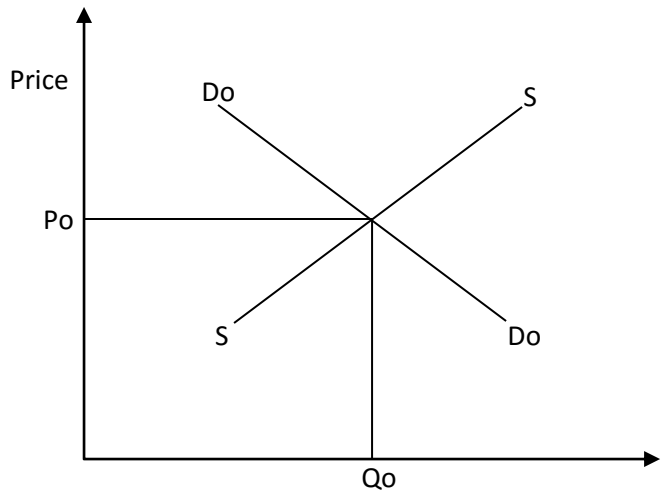
(a) _____

(b) _____

(c) _____

(d) _____

12. The diagram **below** shows the demand and supply curves of a certain commodity and corresponding equilibrium price (Po) and quantity (Qo). On the diagram, show the new equilibrium price and quantity as a result of an increase in the demand of the commodity. (4mks)



13. Identify the types of advertising described in the statements given **below**. (4mks)

(a) Create awareness about a product.

_____

(b) Promotes the name of the manufacturer.

_____

(c) Persuades potential customers to buy a particular brand of a product.

_____

(d) Promotes a particular brand of a product.

_____

14. Highlight **four** reasons why economic planning is important to a country. (4mks)

(a) _____

(b) _____

(c) _____

(d) _____

15. Outline **four** negative effects of inflation to an economy. (4mks)

(a) _____

(b) _____

(c) _____

(d) _____

16. A group of businessmen from a certain town have formed a cartel. State **four** reasons that could have led them to take such an action. (4mks)

(a) _____

(b) _____

(c) _____

(d) _____

17. Outline **four** benefits which may accrue to an organization which uses office machines in its operations. (4mks)

(a) _____

(b) _____

(c) _____

(d) _____

18. Otieno a trader had the following assets and liabilities on 1st March 2011.

	Ksh.
Capital	120,000
Machinery	80.000
Trade debtors	20,000
Trade creditors	10,000
Stock	25,000
Cash at bank	5,000

On March 2nd he had the following transactions:
- Purchased goods for Ksh.15,000 on credit.
- Received a cheque for Ksh.10,000 from a debtor.
- Sold the machinery for Ksh.90,000 in cash.

Prepare Otieno's balance sheet as at 2nd March 2011. (4mks)

19. Kobe insured his house against the risk of the fire. Six months later, the house was completely destroyed by fire. Outline the procedure that should be followed before he is compensated. (4mks)

(a) _____

(b) _____

(c) _____

(d) _____

20. The following information relates to Musiko Traders for the year ended 31st December 2011.

	Ksh.
Sales	800,000
General expenses	120,000
Carriage on sales	10,000
Commission income	40,000
Margin	20%

Prepare Musiko Traders profit and loss account for the year ending 31st December 2011. (4mks)

21. State **four** reasons why it may be necessary for the government to encourage new firms to be located in the rural areas. (4mks)

(a) _____

(b) _____

(c) _____

(d) _____

22. State **four** measures that Kenya may take to promote her exports. (4mks)

(a) _____

(b) _____

(c) _____

(d) _____

23. Name the factor of production that each of the following resources relate to. (4mks)

	Resource	Factor of production
(a)	Manager	
(b)	Equipments	
(c)	Raw materials	
(d)	Owner	

24. State **four** advantages of public warehouse to producers. (4mks)

(a) _____

(b) _____

(c) _____

(d) _____

25. Highlight **four** benefits that will accrue to a firm that expands its scale of operations. (4mks)

(a) _____

(b) _____

(c) _____

(d) _____

565/2
BUSINESS STUDIES
PAPER 2
TIME: 2½ HOURS

Kenya Certificate of Secondary Education
BUSINESS STUDIES
PAPER 2
TIME: 2½ HOURS

INSTRUCTIONS TO CANDIDATES:

1. This paper consists of **six** questions.
2. Answer any five questions.
3. All questions carry equal marks.
4. Candidates should check the question paper to ascertain that all the pages are printed and no questions are missing.

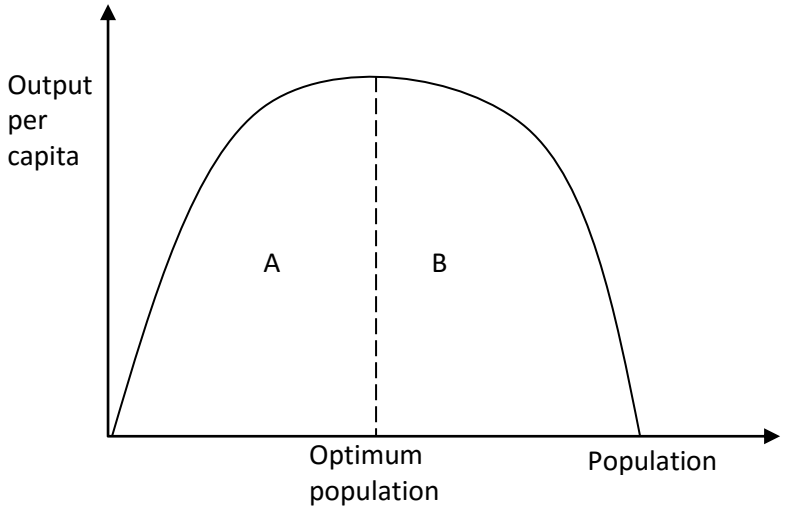
1. (a) Explain any **five** means of payment that are available to traders in Kenya. (10mks)

   (b) Suggest **five** measures that a country may take to ensure proper development planning. (10mks)

2. (a) Discuss **five** measures that a business may take to safeguard and control its property. (10mks)

   (b) The diagram **below** represents the population and output per capita of a certain country.

   Explain any **five** challenges to the country if her total population is found at the part marked **A**. (10mks)



3. (a) Explain **five** benefits to a business that adopts an enclosed office layout. (10mks)

   (b) Highlight any **five** negative effects of free trade to a country. (10mks)

4. (a) Outline **five** benefits of advertising to a consumer. (10mks)

   (b) The following information was obtained from the books of ocampo traders for the year ended 31st Dec. 2012.

	Shs.
Purchases for the year	400,000
Carriage inwards	50,000
Capital	1,000,000
Sales	800,000
Total expenses	195,000
Stock on 1st Jan 2012	40,000
Returns outwards	30,000
Stock on 31st Dec 2012	100,000
Total creditors	35,000
Debtors	30,000
Returns inwards	45,000

(a) Calculate the cost of goods sold. (2mks)
(b) Gross profit. (2mks)
(c) Margin %. (2mks)
(d) Rate of stock turn over. (2mks)
(e) Rate of return on capital. (2mks)

5. (a) Hassan is a trader at Kerugoya town. Explain **five** benefits he would enjoy when he opens a current account with a commercial bank. (10mks)

(b) Despite their poor performance, the government is still interested in operating public corporations in the country. Explain **five** reasons why this is so. (10mks)

6. (a) Describe **five** channels that a manufacturer could use to distribute exported goods. (10mks)

(b) The following information relates to odyssey enterprises for the month of June 2011.

1st June credit purchases from Kalembe received invoice no. 10 Shs.38000.
3rd June purchased goods on credit from Wetangula, Shs.60000 and received invoice no. 11.
5th June returned goods to Kalembe received credit note no. 24 Shs.5600.
20th June purchase returns to Wetangula, credit note no.42, Shs.10000.
30th June credit purchases from Wetangula, invoice no.18, Shs.5000

(i) Enter the information in the relevant journal(s). (5mks)
(ii) Post the information to the relevant ledger accounts in the ledgers. (5mks)

NAME……..…… **INDEX NO**…….....……..…..

SCHOOL……. **CANDIDATE'S SIGNATURE**……..…..

DATE……..……..

233/1
CHEMISTRY
(THEORY)
PAPER 1
TIME: 2 HOURS

Kenya Certificate of Secondary Education
CHEMISTRY
PAPER 1
(THEORY)
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

- *Write your **name** and **index number** in the spaces provided **above**.*
- ***Sign** and write the **date** of examination in the spaces provided **above**.*
- *Answer **all** the questions in the spaces provided.*
- *Mathematics tables and electronic calculators may be used.*
- *All working must be clearly shown where necessary.*

FOR EXAMINER'S USE ONLY:

Question	Maximum Score	Candidates Score
1 - 30	80	

*This paper consists of **12** printed pages.*
Candidates should check to ascertain that all the pages are printed as indicated and that no questions are missing.

1 A certain element Y has atomic number 15 and mass number of 31.

(a) Calculate the number of neutrons in the element. (1mk)

_____

(b) Write the electron arrangement of the ion formed by element Y. (1mk)

_____

(c) How would the atomic size of the above element compare with another atom X whose atomic number is 11 and mass number 23? Explain. (1mk)

_____

_____

_____

2. Explain why the pH of 1.0M hydrochloric acid is 1.0M while that of 1.0M ethanoic acid is 5.0. (2mks)

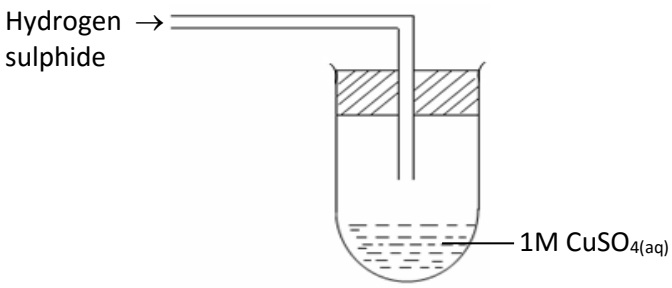
_____

_____

_____

_____

3. In an experiment hydrogen sulphide was passed through 1m $CuSO_{4(aq)}$ in a boiling tube as shown in the diagram.



(a) State the observation made in the boiling tube. (1mk)

_____

_____

(b) Write the ionic equation for the above reaction. (1mk)

(c) What precaution should be taken in carrying out this experiment? Give a reason? (1mk)

_____

_____

_____

4. $Na_{(g)}^{+} + Cl_{(g)}^{-} \rightarrow NaCl_{(s)} \quad \Delta H_1 = -781\ KJmol^{-1}$

$NaCl_{(s)} \xrightarrow{H_2O(l)} Na_{(aq)}^{+} + Cl_{(aq)}^{-} \quad \Delta H_2 = +7\ KJmol^{-1}$

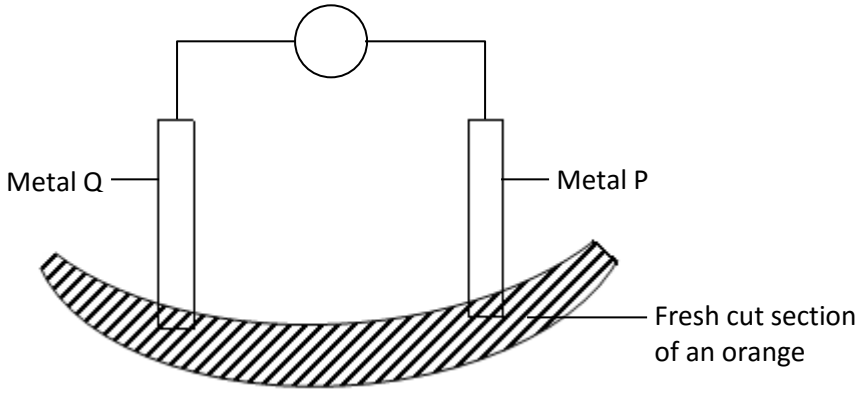
(a) What is the name of ΔH_1? (1mk)

_____

(b) Calculate the heat change for the process

$Na_{(aq)}^{+} + Cl_{(aq)}^{-} \xrightarrow{H_2O(l)} Na_{(aq)}^{+} + Cl_{(aq)}^{-}$ (2mks)

5. The set up **below** was used to show that metal **P** is more reactive than **Q**.



(a) Show the direction of flow of electrons on the diagram using an arrow. (1mk)

(b) Explain your answer in (a) above. (1mk)

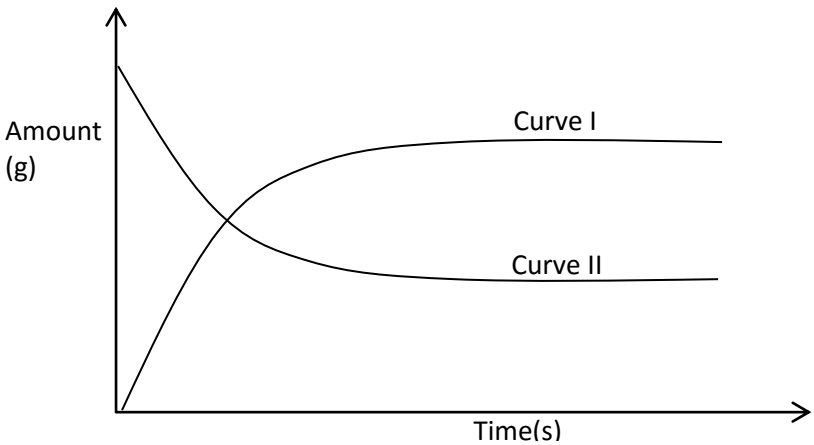
_____

_____

_____

6. The graph **below** shows the amount of calcium carbonate and calcium chloride varying with time in the reaction.

$CaCO_{3(s)} + 2HCl_{(aq)} \rightarrow CaCl_{2(aq)} + H_2O_{(l)} + CO_{2(g)}$



(a) Which curve shows the amount of calcium chloride varying with time? (1mk)

_____

(b) Explain why the two curves become horizontal after a given period of time. (1mk)

_____

_____

_____

(c) Sketch on the graph how curve II would appear if the experiment was repeated using a more dilute hydrochloric acid solution. (1mk)

7. The structure below represents two cleansing agents, L_1 and L_2.

$L_1 \rightarrow R - \underset{\underset{OSO_3Na^+}{|}}{CH_2 - CH_3}$

$L_2 \rightarrow R - COONa^+$

(i) Identify each of the two cleansing agents, L_1 and L_2.

L_1 _____ (½mk)

L_2 _____ (½mk)

(ii) State a disadvantage of each of the above cleansing agents.

L_1 _____ (1mk)

L_2 _____ (1mk)

8. 22.2cm³ of sodium hydroxide solution, containing 4.0g per litre of sodium hydroxide were required for complete neutralization of 0.1g of a dibasic acid. Calculate the relative formula mass of the dibasic acid (Na = 23.0, O = 16.0, H = 1.0). (3mks)

9. Magnesium was burnt in air forming a white residue T. When put in a boiling tube with water effervescence was noticed and a colouress gas D with a characteristic pungent smell was evolved. The gas turned a wet red litmus paper blue.

(a) Identify

(i) Residue T. (1mk)

_____

(ii) Gas D. (1mk)

_____

(b) Write an equation for the liberation of gas D. (1mk)

10. (a) Define half life of radioisotopes. (1mk)

_____

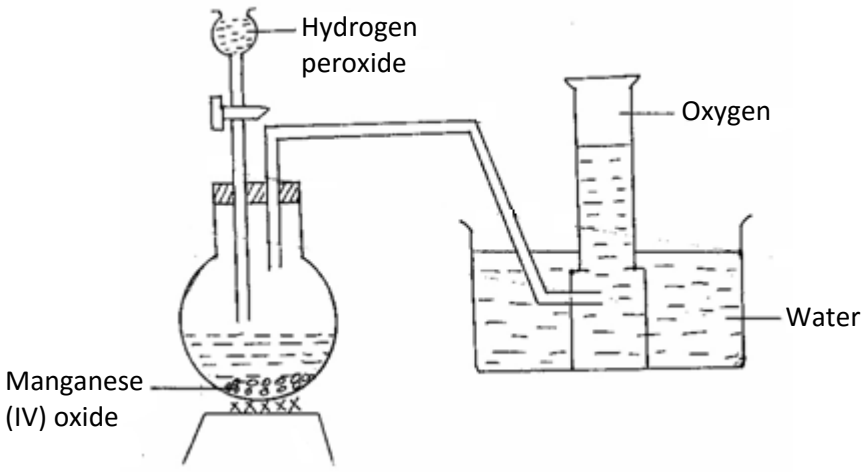
_____

_____

(b) X grammes of a radioactive isotope take 100 days to decay to 20g. If half life of the element is 25 days, calculate the initial mass X of the radioisotope. (2mks)

11. Element X contains isotopes with mass number 16 and 18 respectively existing in the ratio 1: 3, calculate the relative atomic mass of X. (2mks)

12. The diagram **below** represent a set up that can be used to prepare and collect oxygen gas.



(a) Write an equation for the reaction that takes place. (1mk)

(b) What property of oxygen makes it possible for its collection as indicated in the diagram. (1mk)

_____

(c) Explain why it is important not to collect any gas for the first few seconds of the experiment. (1mk)

_____

_____

_____

13. The reaction **below** refers to the preparation of lead (II) sulphate starting with lead metal.

Lead metal $\xrightarrow{\text{Reagent A}}$ Solution X $\xrightarrow[\text{solution}]{\text{Sodium sulphate}}$ Mixture Y $\longrightarrow$ Residue Z

(a) Name the type of reaction between solution X and sodium sulphate solution. (1mk)

_____

(b) Write an ionic equation for the reaction in (a) above. (1mk)

(c) Explain why it is not possible to prepare residue Z using lead metal and dilute sulphuric acid. (1mk)

_____

_____

_____

14. Consider the following reaction at equilibrium.

Complete the table **below** to show the effect of different factors on the position of equilibrium. (2mks)

	Factor	Effect on equilibrium position
(i)	Decrease in pressure	
(ii)	Removing chlorine	
(iii)	Adding helium to the mixture	

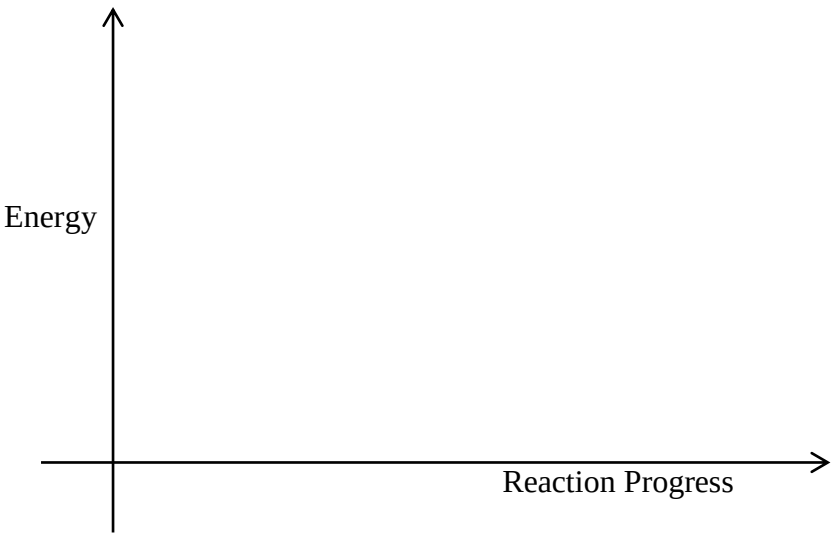
15. Study the information in the table below then answer the questions that follows.

Bond	Bond energy ($kJmol^{-1}$
H – H	435
Cl – Cl	243
H - Cl	431

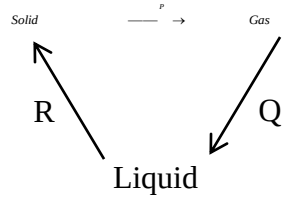
(a) Calculate the enthalpy change for the reaction.

 (2mks)

(b) On the axis given **below** draw an energy level diagram for the reaction above. (1mk)



16. Matter exists in three states which can be related as shown in the diagram **below**.



(a) Name processes:

P: _____ (1mk)

R: _____ (1mk)

(b) Explain whether process **Q** is exothermic or endothermic. (1mk)

_____

_____

_____

17. (a) State the Graham's law of diffusion. (1mk)

_____

_____

_____

(b) 200cm³ of nitrogen (I) oxide (N_2O) pass through a porous plug in 2 minutes 15 seconds. How long will it take the same volume of sulphur (IV) oxide (SO_2) gas to diffuse through the same plug under the same conditions. (N= 14, O = 16, S = 32). (3mks)

18. Write down the property of concentrated sulphuric (VI) acid shown in the following reactions. (2mks)

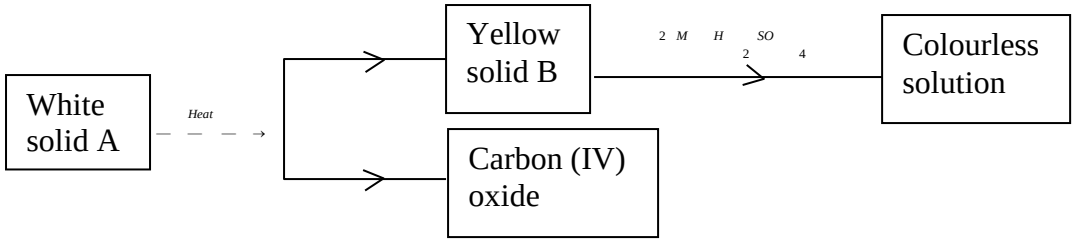
(a) $H_2C_2O_4.2H_2O_{(s)} \xrightarrow{H_2SO_{4(l)}} 2H_2O_{(l)} + CO_{2(g)} + CO_{(g)}$

Property _____ (1mk)

(b) $C_{(s)} + 2H_2SO_{4(l)} \rightarrow CO_{2(g)} + 2H_2O_{(l)} + 2SO_{2(g)}$

Property _____ (1mk)

19. The scheme **below** represents some reactions starting with a white solid A.



(a) Identify the solids **A** and **B**.

A _____ (1mk)

B _____ (1mk)

(b) Write an equation for the reaction between B and 2M sulphuric acid. (1mk)

20. Study the following redox potentials.

	E^{θ}
$Fe^{3+}_{(aq)} + e^{-} \rightarrow Fe^{2+}_{(aq)}$	+0.77V
$Br_{2(aq)} + 2e^{-} \rightarrow 2Br^{-}_{(aq)}$	+1.09V

Using the values given above, predict whether the following reaction is possible.

$2Fe^{3+}_{(aq)} + 2Br^{-}_{(aq)} \rightarrow 2Fe^{2+}_{(aq)} + Br_{2(aq)}$ (3mks)

21. (a) A saturated solution contains 7.5g of solute in 20cm³ of water. When the solution is cooled crystals begin to appear at 10°C. Calculate the solubility of the solute at 10°C. (2mks)

(b) What causes permanent water hardness? (1mk)

_____

_____

_____

22. When excess chlorine gas is bubbled through dilute sodium hydroxide solution, the resulting solution acts as a bleaching agent.

(a) Write an equation for the reaction between chlorine gas and sodium hydroxide solution. (1mk)

(b) Explain how the resulting solution acts as a bleaching agent. (2mks)

_____

_____

_____

_____

23. A, B, C, D are dyes present in a mixture C is more soluble than B, A is more soluble than C and D is the least soluble in a given solvent. Draw around-paper chromatogram showing how they would appear when separated using the solvent. (2mks)

24. **Below** are PH values of some solutions.

Solution	Z	Y	X	W
PH	6.5	13.5	2.2	7.2

(i) Which solution is likely to be

I Acidic rain _____ (½mk)

II Potassium hydroxide _____ (½mk)

(ii) A basic substance V reacted with both solutions Y and X. What is the nature of V.(1mk)

_____

(iii) Name **two** substances that show these characteristics in question (ii) above. (1mk)

_____

_____

25. Hydrogen gas was passed over hot copper (II) oxide in a combustion tube.

(a) Write an equation for the reaction which took place. (1mk)

(b) What observations were made in the combustion tube? (1mk)

_____

(c) Name any other gas which could be used to reduce copper (II) oxide. (1mk)

_____

26. (a) Element A and B have atomic numbers 6 and 1 respectively illustrate the type of bonding formed when the two elements combine. (2mks)

_____

_____

(b) Explain why solid sodium chloride does not conduct electricity while sodium chloride solution conducts. (1mk)

_____

_____

_____

27. 'Dry ice' is preferred to ordinary ice as a refrigerant. Explain. (2mks)

_____

_____

_____

_____

28. State **one** use of argon which is also a use of nitrogen gas. (1mk)

_____

_____

29. An element P has a relative atomic mass of 88 when a current of 0.5 ampheres was passed through the fused chloride for 32..16 minutues, 0.44g of P were deposited at the cathode. Determine the charge on an ion of P. (IF = 96500 coulombs). (3mks)

30. Consider the equation.

$$NH_{3(g)} + H_2O_{(l)} \rightarrow NH_{4(aq)}^{+} + OH_{(aq)}^{-}$$

(a) Identify the acid and base in the above equation using Bronsted Lowry theory. (3mks)

Acid _____ (1mk)

Base _____ (1mk)

Reason (1mk)

_____

_____

NAME……..…… **INDEX NO**…….....……..…..

SCHOOL…… **CANDIDATE'S SIGNATURE**……..…..

DATE……..……..

233/2
CHEMISTRY
(THEORY)
PAPER 2
TIME: 2 HOURS

Kenya Certificate of Secondary Education
CHEMISTRY
PAPER 2
(THEORY)
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

- Write your **name** and **index number** in the spaces provided **above**.
- **Sign** and write the **date** of examination in the spaces provided **above**.
- Answer **all** the questions in the spaces provided.
- Mathematics tables and electronic calculators may be used.
- All working **must** be clearly shown where necessary.

FOR EXAMINER'S USE ONLY:

Question	Maximum Score	Candidate's Score
1	12	
2	12	
3	12	
4	10	
5	11	
6	13	
7	10	
Total Score	80	

*This paper consists of **12** printed pages.*
Candidates should check to ascertain that all the pages are printed as indicated and that no questions are missing.

1. (a) The table **below** shows the ions of elements **W**, **X**, **Y**, **Z** and their electron arrangement. The letters do not represent the actual symbols of the element.

Ion	Electron configuration
W^-	2, 8, 8
X^{2+}	2, 8, 8
Y^{3+}	2, 8
Z^{2-}	2, 8

(i) Which **two** elements belong to the same period? Give a reason. (2mks)

(ii) In which group of the periodic table does Y belong? (1mk)

(iii) Write the formula of the compound formed between **W** and **X**. (1mk)

(iv) What type of bond is formed between **W** and **X**. Explain. (2mks)

(b) (i) What is a coordinate bond. (1mk)

(ii) Draw a dot (•) cross (X) diagram to show bonding in the hydroxonium. H_3O^+ ion (H = 1, O = 8). (2mks)

(c) Aluminium chloride and sodium chloride are both chlorides of period 3 elements. Use this information to explain the following observations.

I A solution of $AlCl_3$ in water turns blue litmus paper red while that of sodium chloride does hot. (1½mks)

_____

_____

_____

II The melting point of sodium chloride (801°C) is higher than that of $AlCl_3$ (180°C). (1½mks)

_____

_____

_____

2. (a) Use the standard electrode potentials for elements A, B, C, D and E given below to answer the questions that follow. The letters do not represent the actual symbols of the elements.

	E^{Θ} (volts)
$A^{2+}_{(aq)} + 2e^- \rightleftharpoons A_{(s)}$	-2.90
$B^{2+}_{(aq)} + 2e^- \rightleftharpoons B_{(s)}$	-2.38
$C^{+}_{(aq)} + e^- \rightleftharpoons \frac{1}{2}C_{2(g)}$	0.00
$D^{2+}_{(aq)} + 2e^- \rightleftharpoons D_{(s)}$	+0.34
$\frac{1}{2}E_{(aq)} + e^- \rightleftharpoons E^-$	+2.87

(i) Which element is likely to be hydrogen? Give a reason for your answer. (2mks)

_____

_____

(ii) Identify the strongest reducing agent. (1mk)

_____

(iii) In the space provided draw a labeled diagram of the electrochemical cell that would be obtained when half cells of element B and D are combined. (3mks)

(iv) Calculate the E^{Θ} value of the electrochemical cell constructed in (iii) above. (2mks)

_____

_____

_____

_____

(b) During the electrolysis of copper (II) sulphate solution using copper electrodes, a current of 0.2A was passed through the cell for 5 hours.

(i) Write the equation of the reaction occurring at the anode. (1mk)

(ii) Determine the change in mass of the cathode which occurred as a result of the electrolysis process. (Cu = 64, IF = 96500C). (3mks)

3. (a) A hydrocarbon contains 85% carbon. Its molecular mass is 68g.

(i) Determine its empirical and molecular formula. (C = 12, H = 1). (2mks)

(ii) Draw two positional isomers of the hydrocarbon. (1mk)

(iii) Write an equation for the reaction between one of the isomers with chlorine and name the products formed. (2mks)
Equation.

Name _____

(b) In an experiment an organic compound was reacted with absolute ethanol in the presence of concentrated sulphuric (VI) acid to form a compound whose formula is
$CH_3\ CH_2\ CH_2\ COOCH_2\ CH_3$

(i) Name I The type of reaction that took place. (½mk)

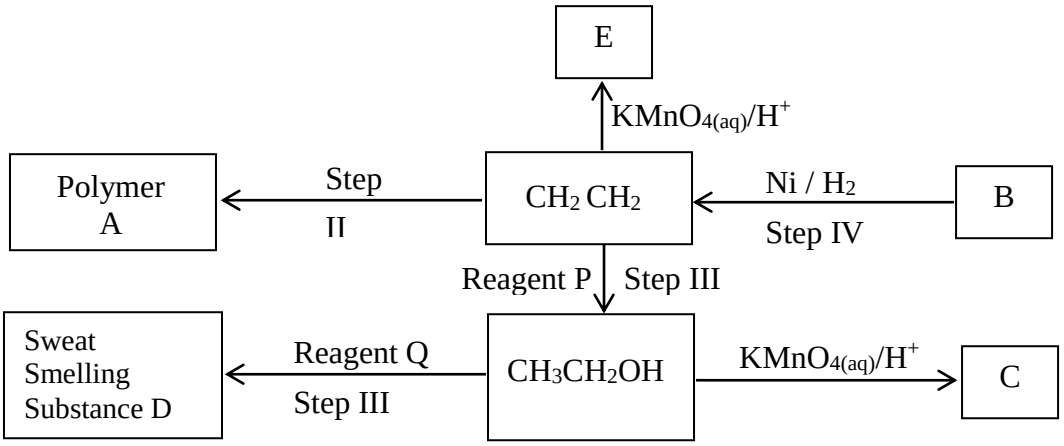
_____

II The name of the organic compounds to which the compound belonged.

_____ (½mk)

(ii) Write the structural formula and give the systematic name of the acid used in the above experiment. (1mk)

(c) Study the flow diagram **below** and answer the questions that follow.



(i) Identify the following compounds.

B _____ (½mk)

C _____ (½mk)

A _____ (½mk)

E _____ (½mk)

(ii) Name the process in steps.

I _____ (½mk)

II _____ (½mk)

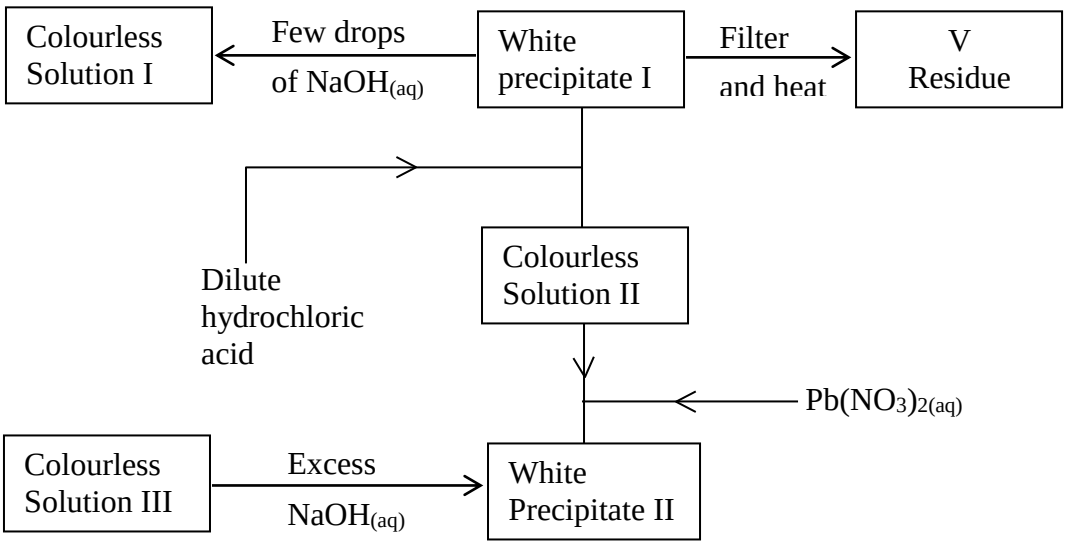
IV _____ (½mk)

(iii) Reagent

P _____ (½mk)

Q _____ (½mk)

4. (a) Study the flow chart **below** and answer the questions that follow.



Residue **V** was yellow when hot and white when cold.

(i) Identify

I White precipitate **I**. (1mk)

_____

II Solution **II**. (1mk)

_____

III Residue **V**. (1mk)

_____

(ii) Write an ionic equation for the reaction of solution **II** with $Pb(NO_3)_{2(aq)}$. (1mk)

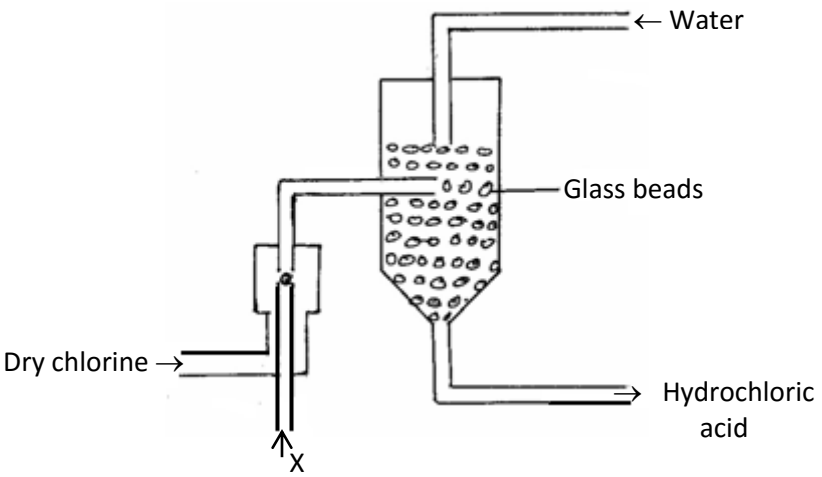
(iii) Write observations that would be made when ammonia solution is added drop wise till in excess to the colourless solution II. (1mk)

_____

_____

_____

(b) The diagram **below** represents a set-up for large scale manufacture of hydrochloric acid. Study it and answer the questions that follow:



(i) Name substance **X**. (1mk)

_____

(ii) What is the purpose of glass beads? (1mk)

_____

_____

_____

(iii) Give **one** source of substance X used in the above process. (1mk)

_____

_____

_____

(iv) Give **two** use of hydrochloric acid. (2mks)

_____

_____

_____

_____

5. (a) Use the information below to answer the questions that follow.

$Ca_{(s)} + \frac{1}{2}O_{2(g)} \rightarrow CaO_{(s)}$ $\Delta H = -635$ KJ mol^{-1}

$Ca_{(s)} + O_{2(g)} \rightarrow CaO_{2(g)}$ $\Delta H = -394$ KJ mol^{-1}

$Ca_{(s)} + e_{(s)} + \frac{3}{2}O_{2(g)} \rightarrow CaCO_{3(s)}$ $\Delta H = -1207$ KJ mol^{-1}

Calculate the enthalpy change for the reaction.

$CaO_{(s)} + CO_{2(g)} \rightarrow CaCO_{3(s)}$ (3mks)

(b) State **one** factor that should be considered when choosing a fuel for cooking. (1mk)

_____

_____

_____

(c) The following data was obtained during an experiment to determine the molar heat of combustion of ethanol.

Volume of water used	= 500cm^3
Initial temperature of water	= 25°C
Final temperature of water	= 44.5°C
Mass of ethanol + lamp before burning	= 121.5g
Mass of ethanol + lamp after burning	= 120.0g

Calculate the

(i) heat evolved during the experiment (density of water = 1g/cm^3, specific heat capacity of water = 4.2Jg^{-1}K^1). (1mk)

(ii) molar heat of combustion of ethanol (C = 12, O = 16, H = 1). (2mks)

(d) Write the thermo equation for the complete combustion of ethanol. (1mk)

(e) At 298K and one atmosphere pressure, graphite changes into diamond according to the equation.

$$C_{(graphite)} \rightarrow C_{(diamond)} \qquad \Delta H = +2.9 \text{ KJ/mol}$$

In the space provided, sketch a simple energy level diagram for the above change. (2mks)

6. (a) At 25°C 50g of substance X were added to 100g of water to make a saturated solution. What is meant a saturated solution? (1mk)

(b) The table **below** gives the solubilities of substance X at different temperatures.

Temperature °C	14	24	33	40	46	52
Solubility g/100g H_2O	24	36	50	62	72	90

(i) Plot a graph of the solubility of substance X (vertical axis) against temperature. (3mks)

(ii) Using the graph.

I determine the solubility of substance X at 20°C. (2mks)

II determine the mass of substance X that remained undissolved given that 90g of substance X were added to 100cm³ of water and warmed to 35°C. (2mks)

III Calculate the molarity of the solution at 30°C. (Relative formula mass of X = 122.5). (3mks)

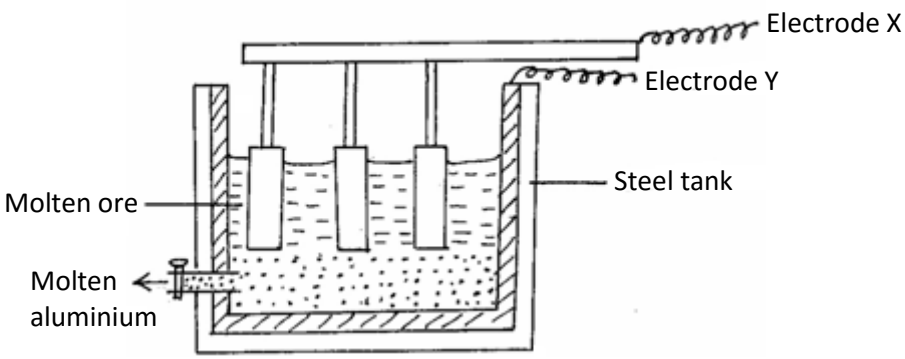
(c) In an experiment, soap solution was added to three separate samples of water. The table **below** shows volumes of soap solution required is form lather with 1000cm³ of each sample of water before and after boiling.

	Sample		
Volume of soap before water is boiled (cm³)	25.0	5.0	10.0
Volume of soap after water is boiled (cm³	25.0	5.0	5.0

(i) Which water was likely to be soft? Explain. (2mks)

(ii) Explain the change in volume of soap solution used in sample III. (1mk)

7. Aluminium is extracted using the electrolytic cell represented by the diagram **below**.



(a) Why is aluminium extracted by electrolytic method? (1mk)

_____

_____

_____

(b) Name the electrodes labeled.

X _____ (½mk)

Y _____ (½mk)

(c) The chief ore from which aluminium is extracted is bauxite.

(i) Name **two** main impurities present in bauxite. (2mks)

_____

_____

(ii) Aluminium oxide is the main component in bauxite with a melting point of 2015°C but electrolysis of molten aluminium oxide is carried out at 800°C. Explain how this is achieved. (2mks)

_____

_____

_____

(d) Write the equations for the reaction taking place at the anode. (1mk)

(e) One of the electrodes is replaced periodically. Which one and why? (2mks)

_____

_____

_____

_____

(f) Duralumin (an alloy of copper, aluminium and magnesium) is preferred to pure aluminium in the construction of aeroplane bodies. Give **one** property of duralumin that is considered. (1mk)

_____

_____

_____