NAME…………………………..……………….. DATE …………………

INDEX NO. …………………...…..… SIGNATURE …………..…………..

233/1
CHEMISTRY
PAPER 1
(THEORY)
JULY/AUGUST 2018
TIME: 2 HOURS.

LANY JOINT EVALUATION TEST 2018

Kenya Certificate of Secondary Education.

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CHEMISTRY
PAPER 1
(THEORY)
TIME: 2 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) **ALL** working must be clearly shown where necessary.
e) Mathematical tables and silent electronic calculators may be used.
f) This paper consists of 14 printed pages. Candidates should check to ensure that all pages are printed as indicated and no questions are missing

FOR EXAMINER'S USE ONLY.

Question	Maximum score	Candidate's score
1 – 27	80	

1. The diagram below shows a Bunsen burner
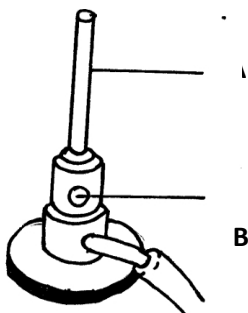
Name the parts labeled **A** and **B**   (2mks)

2. The table below gives information about elements P, Q, R, and T.

| Element	ATOMIC NUMBE	Ratomic radius(nm)	Ionic raidus (mn)
P	3	0.134	0.074
Q	5	0.090	0.012
R	13	0.143	0.050
T	17	0.099	0.181

(a) In which period of the periodic table is element Q? Give a reason   (2mks)

(b) Explain why the atomic radius of P is greater than that of Q   (1mk)

3. When magnesium is reacted in steam it reacts rapidly forming awhite solid and hydrogen gas

Magnesium ribbon

Heat

Glass soaked in water
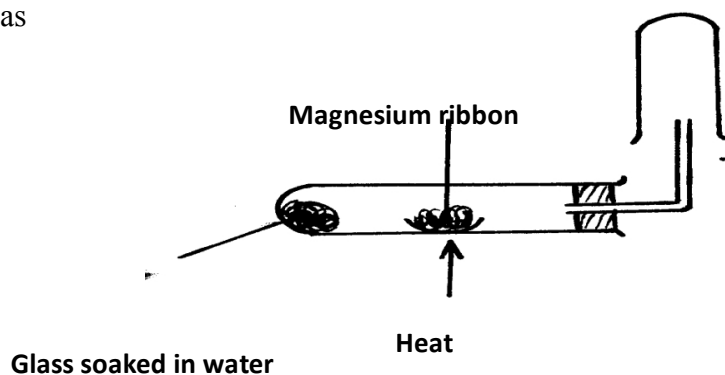
(a) Why is hydrogen collected as shown above?   (1mk)

(b) How would you show that the gas collected is hydrogen?   (1mk)

(c) When copper turning were used instead of magnesium in above reaction, hydrogen gas was not produced .Explain   (1mk)

4. Solutions can be classified as acid, baser or neutral. The table below shows solutions and their PH values.

Solution	pH values
K	1.5
L	7.0
M	14.0

(i)   Select a pair that would react to form a solution of pH 7   (1mk)

(ii)   Identify **two** solutions that would react with Aluminium hydroxide. Explain
(2mks)

5. 1.9g of Magnesium chloride was dissolved in water. Silver nitrate solution was added till excess. Calculate the mass of silver nitrate that was added for complete reaction.
    ($MgCl_2 = 95$, N = 14, O = 16, Ag = 108)   (3mks)

6. Using reagents provided only, explain by means of balanced chemical equations how you would prepare a salt of zinc carbonate solid.
    Zinc powder, Nitric (v) acid (dilute), Water and solid sodium carbonate.   (4mks)

7. (a) Distinguish between a strong acid and a concentrated acid.   (1mk)
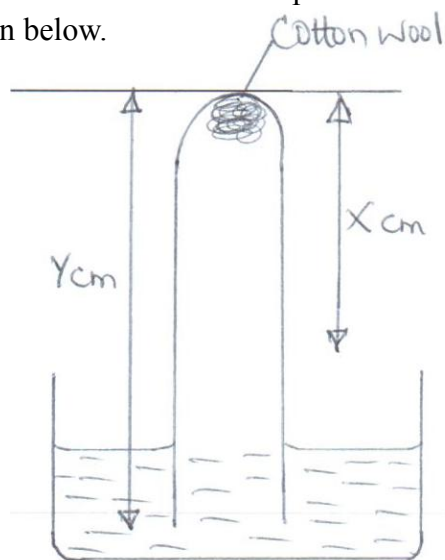
(b) Giving a reason in each case, identify an acid and a base in the equation.
$H_3O^+_{(aq)} + NH_{3(g)}$ $NH_4^+_{(aq)} + H_2O_{(l)}$ (3mks)

8. Calculate the oxidation number of nitrogen in the following species:
NO_2 (1mk)

NH_4^+ (1mk)

9. Some moist iron wool was placed in a test tube and the tube was inverted and set up as shown below.

The apparatus was left for one week. The water level rose and iron wool turned brown.

(a) Write the chemical equation to show the rusting of iron. (1mk)

(b) Write the expression for an approximate percentage of air used in the rusting of iron. (1mk)

(c) State **two** similarities between rusting and combustion. (2mks)

10. Paper chromatography is a method of separating colours or dyes. What two properties should the components of a mixture have that would make the separation possible.(2mks)

11. (i) State Graham's law of diffusion. (1mk)

(ii)A sample of unknown compound Z is shown by analysis to contain sulphur and oxygen. The gas requires 28.3 seconds to diffuse through aperture into a vacuum. An identical number of oxygen molecules pass through the same aperture in 20 seconds. Determine the molecular mass of Z. (O = 16, S = 32). (3mks)

12. The following diagram represents a charcoal burner. Study it and answer the questions that follow.
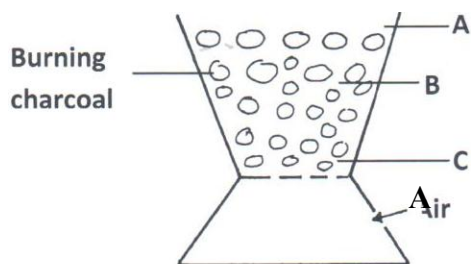
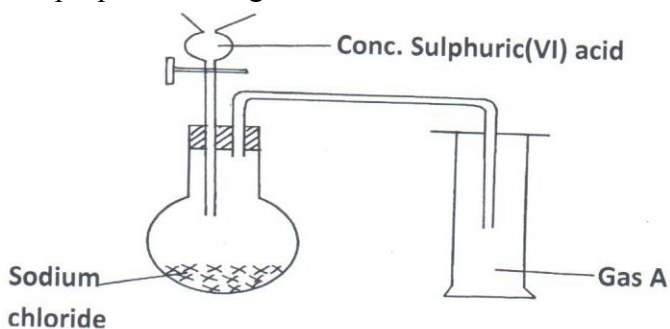

Write the equations for the reaction at: (3mks)

A

B

C

13. A student set up the apparatus below in the school laboratory to prepare and to study the properties of a gas A.

(a)   Name gas A. (1mk)

(b)   Write down a chemical equation for the reaction taking place to produce gas A. (1mk)

(c)   What major property of gas A enables the student to collect the gas above as shown in the diagram?   (1mk)

14. Study the standard potential given below and answer the questions that follow. (letters do not represent actual symbols of elements)

$M^{2+}_{(aq)} + 2e^-$ $M_{(s)}$ -0.76v
$N^{2+}_{(aq)} + 2e^-$ $N_{(s)}$ -2.37v
$P^+_{(aq)} + e^-$ $P_{(s)}$ +0.80v
$Q^{2+}(aq) + 2e^-$ $Q_{(s)}$ -0.14v

(a) $E^{\ominus}$ for Fe^{2+} is -0.44v. Select the element that would best protect Iron from rusting
                                                                                                      (1mk

(b) Calculate the $E^{\ominus}$ value for the cell
$M(s)/M^{2+}(aq)//P^+(aq) / P(s)$ (2mks)

15. Some average bond energies are given below.

Bond	Energy in kJ mol^{-1}
C – C	348
C – H	414
Cl – Cl	243
C – Cl	432
H – Cl	340

Calculate the energy change for the reaction below.   (3mks)
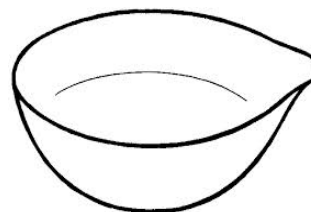$C_2H_{6\,(g)} + Cl_{2\,(g)}$ $CH_3CH_2Cl_{(g)} + HCl_{(g)}$

16.) Give 2 reasons why most laboratory apparatus are made of glass. (1mk)

(b) The diagrams below are some common laboratory apparatus. Name each apparatus and state its use. (2mks)

Name …………………………………..   Name …………………………….

Use ………………………………….   Use ……………………………...

17. Draw the structural formula and name possible isomers of organic compounds with the following molecular formula. C_3H_7Br (2mks)

18. Study the flow chart below and answer the questions that follows.

(a) Predict the cation and anion present, in solid **H**.
Cation

(½mk)

Anion

(½mk)

(b) Identify solid **K**, solution **B** and white-precipitate.
Solid **K** (½mk)

Solution **B** (½mk)

White precipitate (½mk)

(c) Write the formula of the complex ion present in solution **T**. (½mk)

19. The reaction below is in equilibrium.

$$Br_{2(aq)} + H_2O_{(l)} \rightleftharpoons OBr^-_{(aq)} + Br^-_{(aq)} + 2H^{+1}_{(aq)}$$

(a) State and explain the effect on the equilibrium when dilute hydrochloric acid is added. (1mk)

(b) What is the effect of increasing pressure in the reaction between hydrogen and chlorine? Explain. (1mk)

$$H_{2(g)} + Cl_{2(g)} \rightleftharpoons 2HCl_{(g)}$$
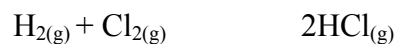
20. The diagram below shows the Frash process used for extraction of sulphur use it to answer the questions that follow.
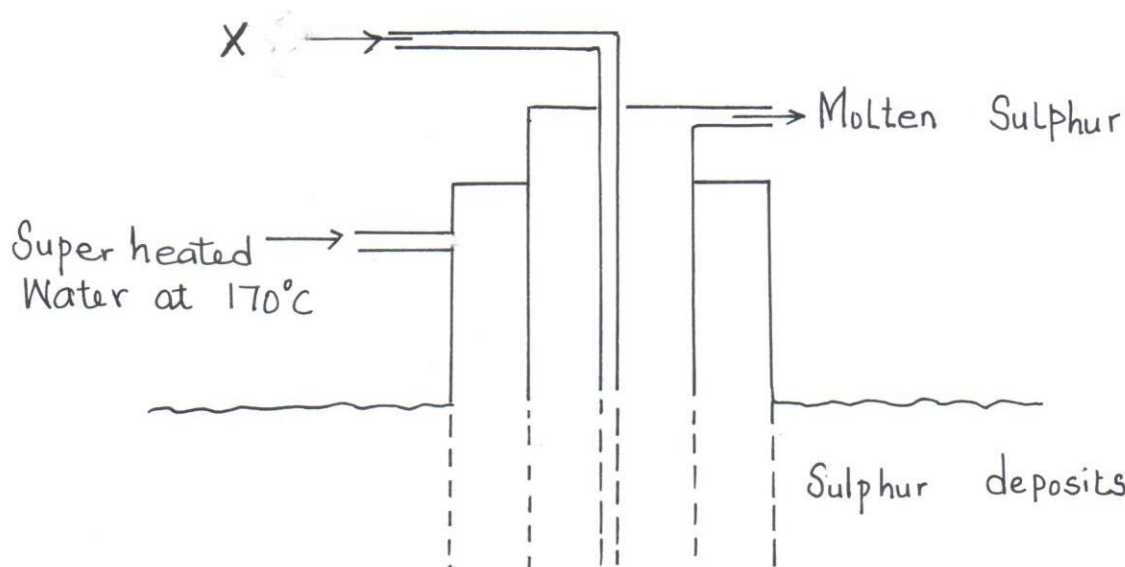
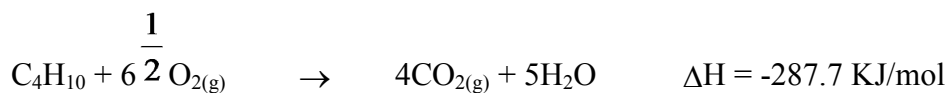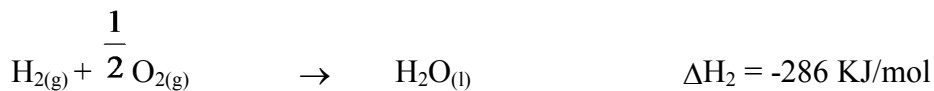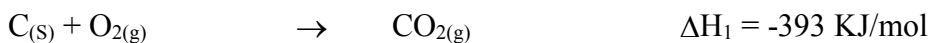(i)   Identify **X**.   (1mk)

(ii)   Why is it necessary to use super heated water in this process?   (1mk)

(ii)   State **two** physical properties of sulphur that makes it possible for it to be extracted by this method.   (1mk)

21.   Use the information to answer the questions that follow.

$C_{(S)} + O_{2(g)}$ $\rightarrow$ $CO_{2(g)}$ $\Delta H_1 = -393$ KJ/mol

$H_{2(g)} + \frac{1}{2} O_{2(g)}$ $\rightarrow$ $H_2O_{(l)}$ $\Delta H_2 = -286$ KJ/mol

$C_4H_{10} + 6\frac{1}{2} O_{2(g)}$ $\rightarrow$ $4CO_{2(g)} + 5H_2O$ $\Delta H = -287.7$ KJ/mol

(a)   Define the term molar enthalpy of combustion of a compound.   (1mk)

(c)   Calculate the molar enthalpy of formation of butane C_4H_{10} from its elements in
        their normal states at standard temperature and pressure.   (2mks)

22.   (a.) Using dots (.) and crosses (x) to represent electrons draw diagrams to represent

        the bonding in   (2mks)

        (i) PH_3

        (ii) $PH_4{}^+$

        (b) State why a phosphine molecule (PH_3) can combine with H^+ to form $PH_4{}^+$
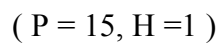
        (P = 15, H =1)   (1mk)

23. The arrangement below was used to compare the penetrating power of emissions in a radioactive decay.

N   Source   Paper   Zinc plate   Lead block

               F   G   H

(a) Name the radioactive that can be detected at F, G, H   (1½mks)

(b) Name the material N   (½mk)

(c) The half-life of $\underset{\text{U}}{}$ is 4500 years. The isotope decays by alpha emission. Write a nuclear equation for its decay to form Thorium (Th)   (1mk)

24. Study the set-up below and answer the questions that follow.

(a) Why is aqueous ammonia warmed gently?   (1 mk)

(b) What is the colour of the flame? (1 mk)

(c) Write the chemical equation for the reaction that takes place (1mk)

25. (a) State the role of the following parts during fractional distillation of a mixture of water and ethanol
(i) Glass beads in the fractionating column (1 mk)

(ii) Fractionating column (1 mk)

26. The table below shows results obtained from experiment carried out on a salt solution M.

	Experiment	Results
I	A few drops of barium nitrate added to solution M.	No white precipitate.
II	A few drops of lead (II) nitrate added to solution M.	White precipitate present.
III	Ammonia solution added drop wise until in excess.	White precipitate which dissolves to form a colourless solution.

(a) Identify the cation and anion present in solution M.

Cation (½mk)

Anion   (½mk)

(b)   Write an ionic equation for the formation of white precipitate in experiment II.

                                                                                            (1mk)

(c)   Write the formula of the ion responsible for the formation of colorless solution in

       experiment III.

            (1mk)

27. The diagram below shows a set up of apparatus used to prepare oxygen gas and pass it
    over burning candle. The experiment was allowed to run for several minutes.

(i)   Identify liquid **M**.   (1mk)

(ii)   The PH of the solution in flask **II** was found to be less than **7**. Explain.   (2mks)

(iii)   Write an equation for the reaction that forms oxygen gas in the set up.   (1mk)