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KCSE REVEALED 2021

CHEMISTRY

PAPER I

This PDF consists of two sample exams that contains questions that are expected in the national exams 2021

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SAMPLE I

FORM FOUR

Kenya Certificate of Secondary Education

233/1 CHEMISTRY (Theory)

PAPER ONE

TIME: 2HRS

INSTRUCTIONS TO CANDIDATES

1. Write your name and admission number in the spaces provided above
2. Sign and write the date of examination in the spaces provided
3. Electronic calculators may be used.
4. All working must be clearly shown where necessary

FOR EXAMINERS USE ONLY

QUESTION	MAXIMUM SCORE	CANDIDATE SCORE
	81-280	

1. The table below shows pH values of solutions ABC and D

Solution	A	B	C	D
pH value	1	7	10	13

a) Give solution that is;

i) Acidic (1mk)

……

ii) Weak base (1mk)

……

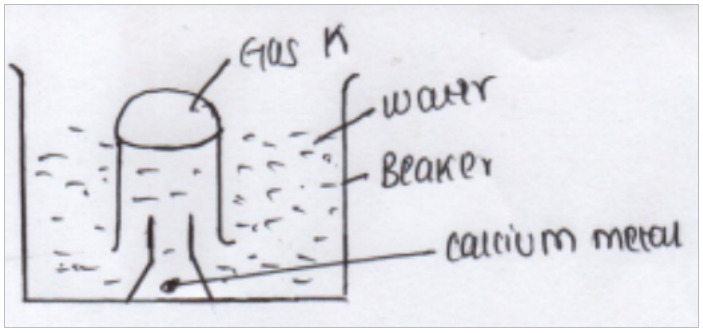
iii) Neutral (1mk)

……

b) Give the product formed when solution A react with a carbonate salt (1mk)

……

2. The set up below was used to collect gas K produced by the reaction between water and calcium metal



a) Name gas K (1mk)

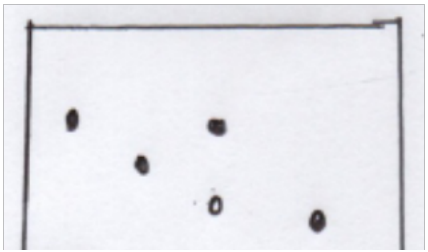
……

3. An organic compound P contains 64.9% carbon, 13.5 Hydrogen and the rest of the % is oxygen.

a) Determine empirical formula of the compound (3mks)

b) Determine the molecular formula given that the relative formula mass of P is 74 (1mk)

4. The diagram below shows spots of pure substances A, B and D on a chromatography paper. Spot C is that of the mixture.



a) On the diagram show the following
   i) Baseline (½mk)
   ii) Solvent front (½mk)

b) Which substances are present in C
   (2mks)

   ……

   ……

5. In a reaction $20cm^3$ of 0.1m sodium carbonate completely reacted with $13cm^3$ of dilute sulphuric (V) acid. Find h concentration of suphuric acid in moles per litres (3mks)

6. Using dots (·) and crosses (X) draw the structure of hydroxonium ion (H_3O^+) (2mks)

7. Study the information below and answer the questions that follows. Letters do not represent the actual symbol of element.

Element	Atomic No	Ionization energy kJmol
P	4	1800
Q	12	1450
R	20	1150

a) What is the general name given to the group in which element P, Q and R belong? (1mk)

   ……

b) Explain why P has highest ionization energy (2mks)

……

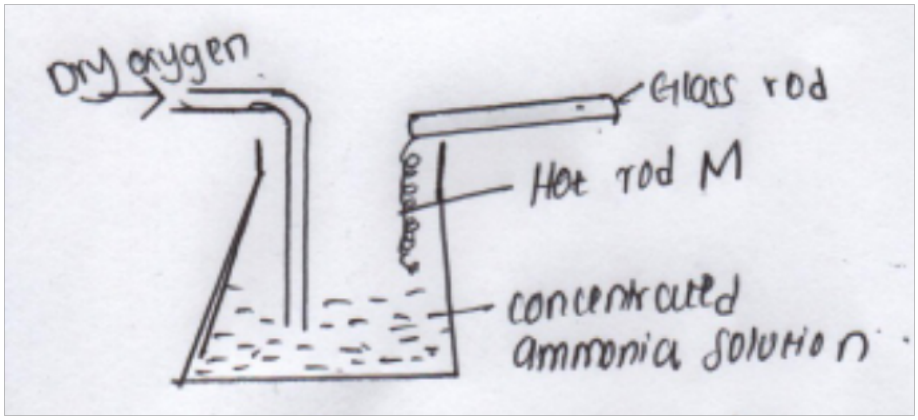
……

……

c) Write a balanced chemical equation for the reaction between element Q and water (1mk)

……

8. The diagram below shows catalytic oxidation of ammonia gas. Use it to answer the questions that follows.



a) Name metal M (1mk)

……

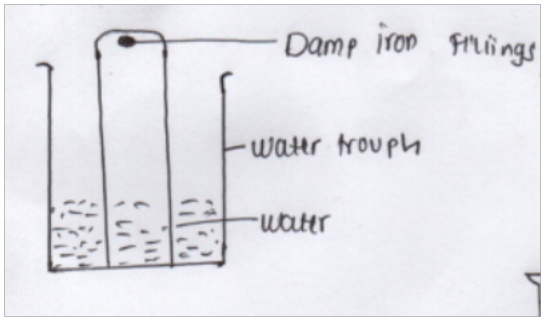
b) State and explain two observations made inside the flask (2mks)

……

……

……

9. In an experiment a gas jar containing some damp iron fillings was inverted in a trough containing some water and the set up was left for 3 days.



a) Why was iron fillings moistened (1mk)

……

b) State and explain observation made after 3 days
(2mks)

……

……

……

10. a) Distinguish between hygroscopy and efflorescence (2mks)

……

……

……

b) Starting with lead (II) oxide, describe how you would prepare lead (II) sulphute (3mks)

……

……

……

……

11. a) Define the term isotope (1mk)

……

……

b) Chlorine gas has a mass of 35.5. It is made up of two isotope $^{35}_{17}$Cland$^{37}_{17}$Cl . Determine the relative abundance of each isotope in the chlorine gas.
(2mks)

12. Explain the reason why Aluminium is used for making utensils like sufuria (1mk)

……

……

13. Describe a chemical test to differentiate between carbon (IV) oxide and carbon (II) oxide gas
(2mks)

……

……

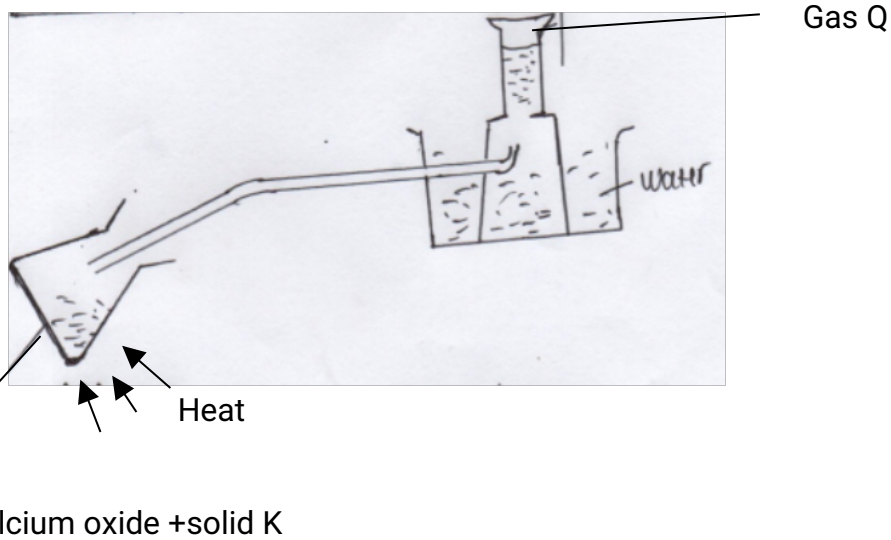
……

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

……

ii) 120cm^3 of methane gas takes 30 seconds to diffuse through a certain membrane. Determine the rate of diffusion of surphure (IV) oxide gas through the same membrane (C=12, H=1, S=32, O=16) (3mks)

15. Study the set up below and answer the questions that follow



i) Name gas Q (1mk)

……

ii) Identify solid K (1mk)

……

iii) What is the purpose of calcium oxide in the experiment (1mk)

……

……

16. Both ions Y^{2-} and Z^{2+} have an electron configuration of 2.8.8
    a) Write the electron arrangement for:
       Y ……. (½mk)
       Z ……. (½mk)
    b) What is the mass number of atom Z given that it has 20 neutrons (1mk)

17. Magnesium ribbon was burnt in air;
    a) State the observation made
       (1mk)
       ……
       ……
    b) Write the equations for the reaction (2mks)
       ……

18. a) Distinguish between a weak acid and a dilute acid
    (2mks)
    ……
    ……
    ……
    b) Giving a reason, identify an acid in the reverse reaction below (2mks)
    $H_3O^+{}_{(aq)} + NH_{3(g)} \rightleftharpoons NH_4^+ + H_2O_{(l)}$
    Acid ……. (½mk)
    Reason …… (½mk)

19. What causes water hardness (1mk)
    ……
    ……

20. a)Using ionic equation, explain how sodium carbonate removes permanent hardness (1mk)

b) State one disadvantage of using hardness in the boilers
(1mk)

……

21. Study the equation below

$CH_3CHClCHClCH_3$

i) Give the structural formula of Q (1mk)

……

ii) Name the type of reaction in the equation above
(1mk)

……

iii) To which family of hydrocarbons does Q belong?
(1mk)

……

22. Consider the scheme below for allotropes of sulphur

Allotrope J $\rightleftharpoons$ Allotrope K

i) What is the significance of temperature 96^0C (1mk)

……

ii) Name allotrope J and K (2mks)

……

……

23. In term of structure and bonding explain why Diamond is used in drilling and graphite used as a lubricant
(2mks)

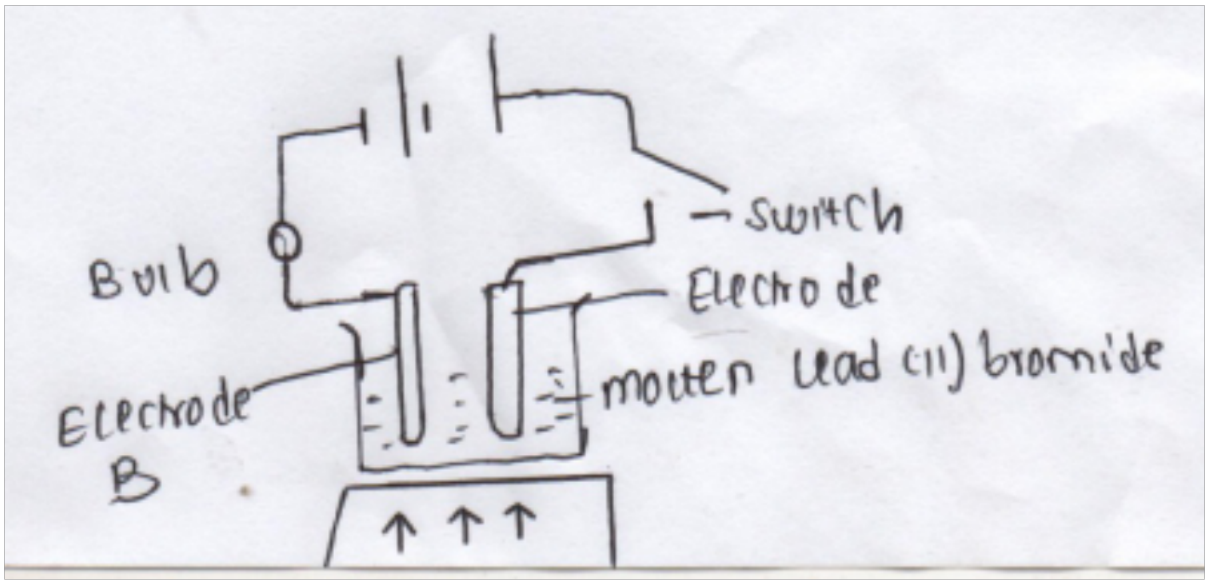
24. The table below gives the bond energies of some compounds.

Bond	Bond energy kJ/mole
H-H	435

Cl-Cl	244
H-Cl	431

Calculate the enthalpy change for the reaction $H_{2(g)} + Cl_{2(g)} \longrightarrow 2HCl_{(g)}$ (3mks)

25.



The diagram above shows the effect of electric current on lead (II) bromide. Study it and use it to answer the questions that follow.

a) On the diagram, Name electrodes A and B
(2mks)

b) State the observations made at electrode A (1mk)

……

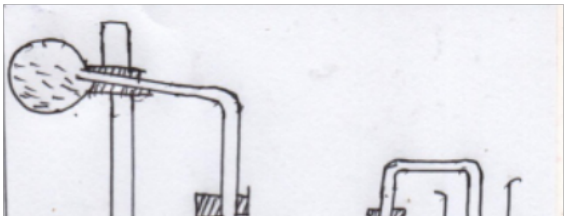
……

c) Write the equation that takes place at electrode B (1mk)

……

……

26. The diagram below represents the apparatus used to prepare and collect dry ammonia



gas.

Ammonia chloride and KOH

a) State two mistakes in the set up of apparatus (2mks)

……

…….

b) Write an equation for the reaction apparatus (2mks)

27. The table below gives the solubilities of potassium bromide and potassium sulphate at 0^0C and 40^0C.

Substance	Solubility g/100 water at	
	0^0C	40^0C
Potassium bromide	55	75
Potassium sulphate	10	12

When an aqueous mixture containing 60g of potassium bromide and 7g of potassium sulphate in 100g of water at 80^0C was cooled to 0^0C, some crystals were formed.

i) Identify the crystals (1mk)

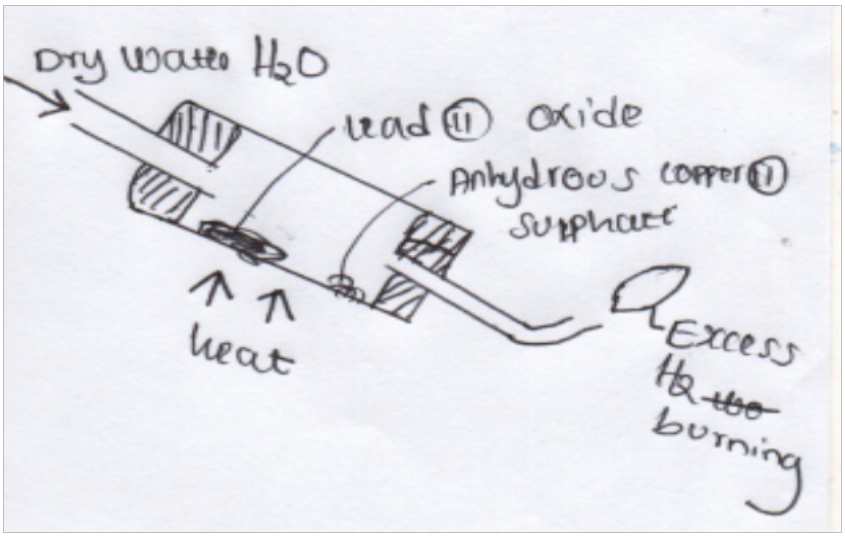
……

ii) Determine the mass of crystals formed (1mk)

iii) Name the method used to obtain the crystals (1mk)

……

28. Study the diagram below



a) What is the observation made on anhydrous copper (II) sulphate (1mk)

……

……

b) Write an aqueous for the reaction ,between hydrogen gas and lead (II) oxide (1mk)

c) What is the property of hydrogen gas being investigated above (1mk)

……

……

SAMPLE II

CHEMISTRY PAPER 1

ANSWER ALL THE QUESTIONS.

1. State two reasons why we use the non-luminous flame for leading in a laboratory instead of using the luminous flame. (1mk)

2. Chlorine has two isotopes with atomic mass 35 and x occurring in the ratio 3:1 respectively. The relative atomic (R.M.A) OF CHROLINE IS 35.5. Determine the value of x. (3mks)

3. The use of cfc_5 has been linked to the depletion of the ozone layer.

   a) What does CFC stand for? (1mk)

b) Explain the problem associated with the depletion or the ozone layer. (1mk)

c) State another environmental problem caused by CFC_5.

4. In an experiment to prepare Nitrogen C1) oxide, ammonium nitrate was gently heated in a flask.

   a) Write the equation for the reaction that took place in the flask. (1mk)

   b) State and explain how the gas was collected. (1mk)

   c) A sample of the gas was tested with damp blue and red litmus paper what observations were made. (1mk)

5. During an experiment sulphure (IV) oxide gas was formed to diffuse through a certain pore at a rate of 25cm3 per minute. When the experiment was repeated under the same conditions with another gas G, gas G was found to diffuse through the same pore at a rate of 26.26cm^3 per minute. Work out the molecular mass of Gas G. (0=16, 5=32) (3mks)

6. Element Y whose atomic number11 react with chlorine gas to form a compound.
   a) Name the group and period to which Y belongs. (1mk)

   b) Write an equation for the reaction. (1mk)

7. Draw all structural formulas for all the isomers with molecular formula $C_2H_3CL_3$. (2MKS)

8. Calculate the volume of 0.6M sulphuric (VI) acid solution needed to neutralize $30cm^3$ of 0.2M potassium hydroxide. (2mks)

9. Use dot (.) and crosses (x) to show the bonding of the following compounds.

    a) NH_3 (1MK)

b) NH_4^+ (1MK)

10. Analysis of a compound showed that it had the following composition: 69.42%carbon, 4.13% hydrogen and the rest oxygen. If the molecular formula of the compound (C=12, O=16, H=1) (3MKS)

11. A reference book states that the solubility of $CuSO_4$ in water at 15^oc is 19g/100g of water. What is meant is meant by this statement. (1mk)

12. State two uses of hydrogen gas. (2mks)

13. Explain how a solid mixture of sulphure and potassium Chloride can be separated into solid sulphur and potassium chloride. (3mks)

14. Aqueous ammonia was added to a solution copper (ii) sulphate dropwise until in excess. State the observations made when

    a) A few drop of aqueous ammonia were added.(1mk)

    b) Excess aqueous ammonia was added. (1mk)

15. By use of chemical equations distinguish the reaction of magnesium with water and magnesium with steam. (2mks)

16. The table below gives the number of electrons, protons and neutrons in substances X, Y, and Z.

Substance	Electrons	Protons	Neutrons
X	10	10	10
Y	10	8	10
Z	8	8	8

a) Which letter represents an ion? (1mk)

b) Which of the substances are isotopes? Give a reason. (2mks)

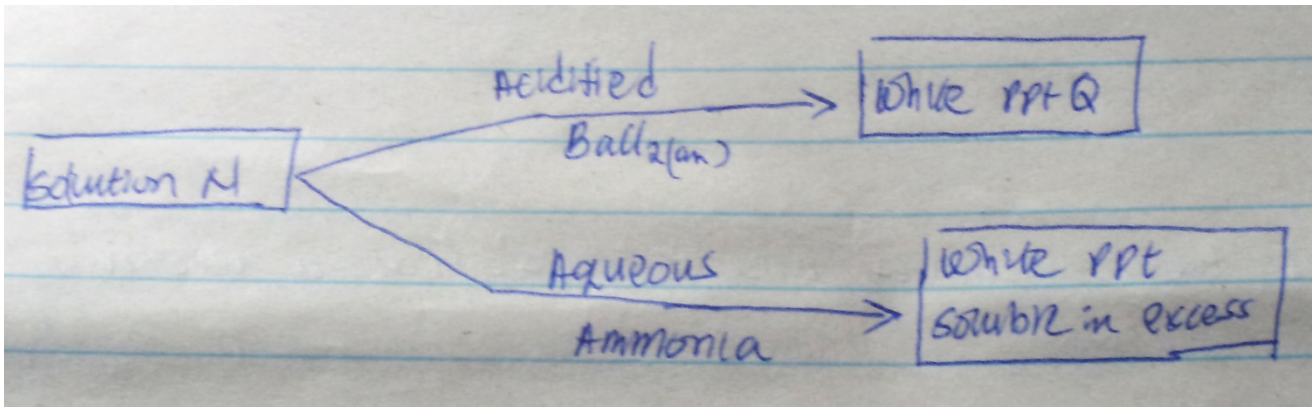
17. a) What is meant by the terms.

1) Element (1mk)

2) Atomic number (1mk)

(b) The formula for a chloride of titanium is $TiCl_3$. What is the formula of its sulphate? (1mk)

18. The chart below shows a scheme or reactions involving a sample of solution N. Study it and answer the questions that follow.



1) Identify the cation and the anion in solution N, (2mks)

2) Write an ionic equation to show how Q is formed. (1mk)

19. Name the process

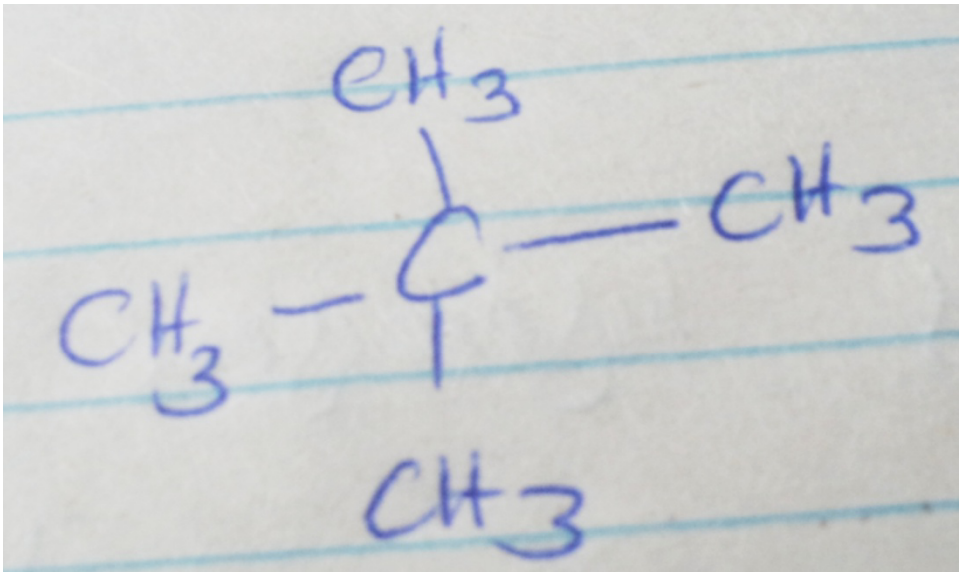
Solid carbon (IV) oxide (dry ice) changes directly into gas. (1mk)

20. When carbon (IV) oxide gas was passed through aqueous calcium hydrogen a white precipate was formed.

a) Write an equation for the reaction that took place. (1mk)

b) State and explain the changes that would occur when excess carbon (iv) oxide gas is bubbled through the white precipitate. (2mks)

21. Give the names of the following compounds



22. Explain why burning magnesium continue to burn in a gas jar full of sulphure (iv) oxide while humming splint would be extinguished. (3mks)

23. When hydrogen sulphide gas was bubbled into aqueous solution of iron (iii) chloride a yellow precipitate was formed.

    a. State another observation that was made. (1mk)

b. Write an equation for the reaction that took place. (1mk)

c. What type of reaction was undergone by hydrogen sulphade gas in this reaction? (1mk)

24. A. What is allotropy (1mk)

.

B. Name two allotropes of carbon. (2mk)

25. Ammonium sulphate is a fertilizer produced by passing ammonia gas into concentrated sulphure (VI) acid. Calculate the mass in kg of sulphure (VI) acid required to produce 25kg or the fertilizer. (s=32, 0=16, N=14,H=1) (3mks)

26. The reaction between hot concentrated Sodium hydrogen and chlorine gas produces sodium chloride (v), sodium chloride and water.

    a. Write the equation for the reaction. (1mk)

    b. Give one use of sodium chlorate (v). (1mk)

27. Explain why a solution of hydrogen chloride gas in methylbenzene does not conduct electricity but solution of a gas in water conduct electricity. (2mks)

28. Below is a sketch of a reaction profile. Study it and then answer the question that follows.

    State and explain the type of reaction represented by the profile. (2mks)

Reactants

Reaction path

29. I) what are amphoteric oxides? (1mk)

ii) Give a chemical formula example of an amphoric oxide. (1mk)

30. Calcium oxide can be used to dry ammonium gas.

i. Explain why Calcium oxide is not used to dry hydrogen Chloride gas. (2mks)

ii. Name one drying agent of hydrogen chloride. (1mk)

31. When an organic compound Y is reacted aqueous Sodium carbonate it produces carbon (iv) Oxide. Y reacts within propanal to form a pleasant smelling compound whose formula is.

O

CH3 CH2 C O CH_2 CH_2 CH_3

i. Name and draw the structure formula of compound Y. (2mks)

ii. What is the name given to the group of compound to which Z belongs? (1mk)

32. Element X and Y have atomic numbers 20 and 8 respectively.

i. Write the electron arrangement of their ions. (2mks)

ii. Write the formula of the compound formed between X and Y. (1mk)