K.C.S.E. 2011

CHEMISTRY PAPER 1

1 (a) What name is given to the process by which alcohol is formed from a carbohydrate?

(1 mark)

(b) Explain why the solubility of ethane in water is lower than that of **ethanol.**

(2 marks)

2. Complete the nuclear equation below:

(a)

$$^{131}_{53}I \longrightarrow {}^{131}_{54}Xe + \_\_\_\_\_$$

(b) The half-life of $^{131}_{53}I$ is 8 days

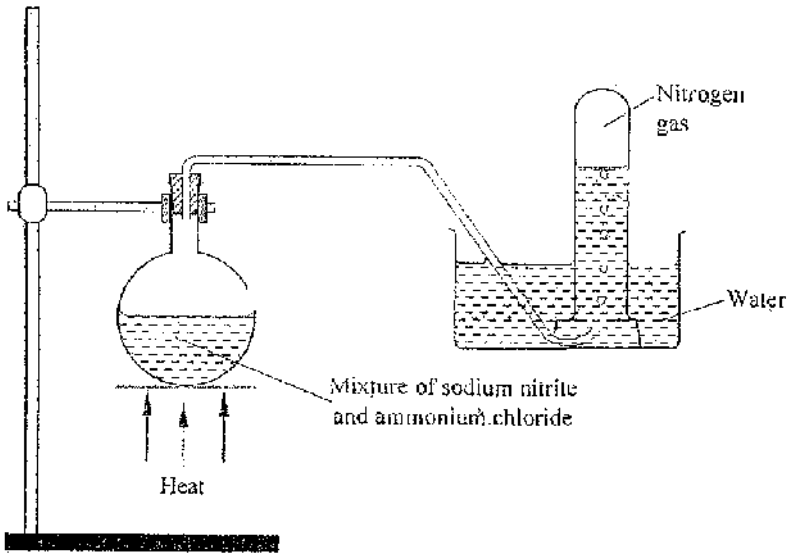
Determine the mass of $^{131}_{53}I$ remaining if **50 grammes** decayed for 40 days.
(1 **mark)**

(c) Give one harmful effect of radioisotopes. **(1mark)**

3. A mixture contains ammonium chloride, copper (II) oxide and sodium chloride.

Describe how each o the substances can be obtained from the mixture. (3mks)

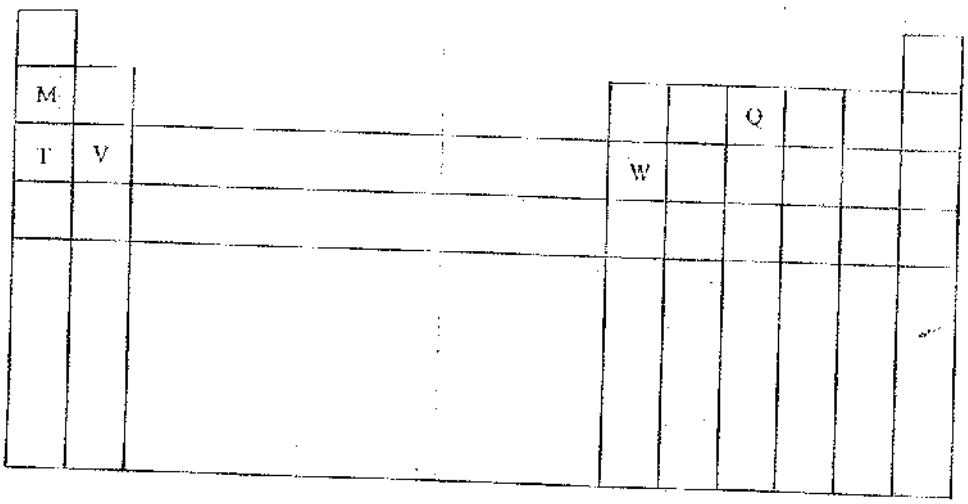
4. **The set up** below shows how nitrogen gas is prepared in a laboratory.



(a) Describe how nitrogen gas us formed in the flask.
(2mk)

(b). Nitrogen is inert, state **one** use of the gas based on this property.
(1 mk)

5. The diagram below represents part of the periodic table. Use it to answer the questions that follow.



a) Write the electronic arrangement for the stable ion formed by W.
(1mk)

(b) Write an equation for the reaction between V and Q.
(1mk)

(c) How do the ionisation energies of the elements M and T compare? Explain.

6. A certain mass of gas occupies 0.15dm^3 at 293K and 98,648.5Pa. Calculate its volume at 101,325Pa and 273K. (2 marks)

7 . When lead(II) nitrate is heated, one of the products is a brown gas.

(a) Write the equation of the reaction that occurs . (1 mark)

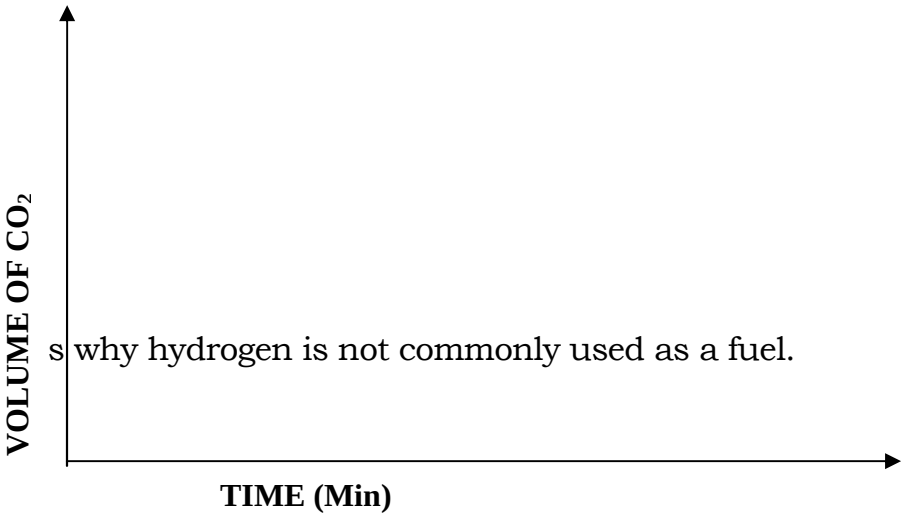
(b) If 0.290dm3 of the brown gas was produced, calculate the mass of the lead(II) nitrate that was heated. **(R .F.M** of lead (II) nitrate = 331; Molar gas volume = 24dm^3).

(2 marks)

8 . (a) What is meant by a strong acid? (1 mark)

(b) In an experiment 40cm^3 of 0.5M hydrochloric acid was reacted with excess sodium carbonate and the volume of carbon (IV) oxide produced recorded with time. In another experiment, the same volume and concentration of ethanoic acid was also reacted with excess sodium carbonate and the volume of carbon (IV) oxide produced recorded with time.

On the grid below, sketch and label the curves if the volumes of carbon (IV) oxide
were plotted against time. (2 marks)



9. State two reasons why hydrogen is not commonly used as a fuel. (2mk)

10. During a class experiment, chlorine gas was bubbled into a solution of potassium iodide.

(a) State the observations made. (1mk)

(b) Using an ionic equation, explain why the reaction is redox . (2mk)

11. Exhaust fumes of some cars contain carbon(II)oxide and other gases.

(a) Explain how carbon (II) oxide is formed in the internal combustion engines. (1 mark)

(b) Name **two** gases other than carbon (II) oxide that are contained in exhaust fumes and are pollutants. (2 marks)

12. Sodium hydroxide can be prepared by the following methods; I and II.

I. *Sodium metal* $\xrightarrow{\text{Cold water}}$ *Sodium hydroxide + Hydrogen*

II. *Concentrated sodium chloride* $\xrightarrow{\textbf{\textit{process A}}}$ *Sodium hydroxide +Chlorine +* Hydrogen

(a) Name the precaution that needs to be taken in method I. (1 mark)

(b) Give the name of process A. (1 mark)

(c) Give one use of sodium hydroxide, (1 mark)

13. Distinguish between the terms deliquescent and efflorescent as used in chemistry (2 marks)

14. Two organic compounds P and Q decolourise acidified potassium manganate (VII) solution but only P reacts with sodium metal to give a colourless gas.
Which homologous series does compound P belong? Give a reason.
(2 marks)

15 . Soap dissolves in water according to the equation below;

$NaSt_{(aq)} \longrightarrow Na^{+}_{(aq)} + St^{-}$ where St^{-} is the stearate ion.

(a) Write the formula of the scum formed when soap is used in hard water. (1 mark)

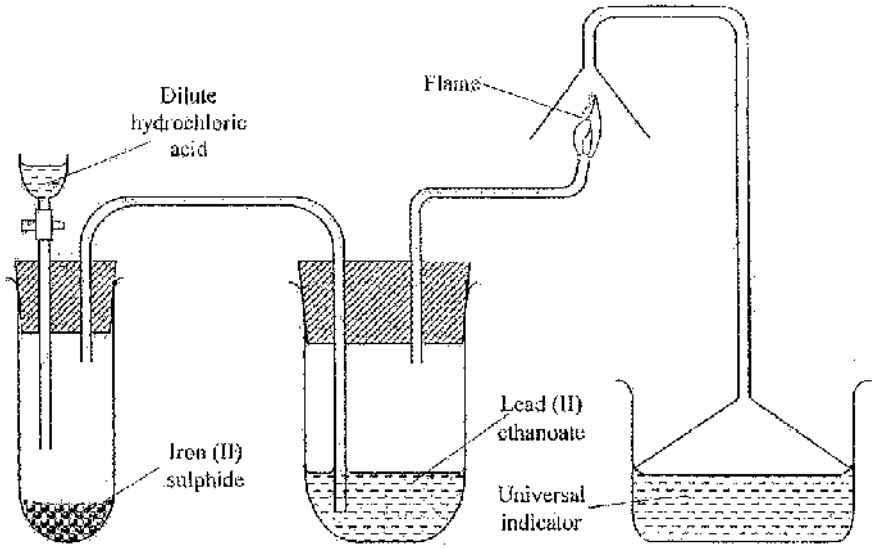
(b) Write the ionic equation for the reaction that occurs when sodium carbonate is used to remove hardness in water.
(1 mark)

16 . Ethanoic acid and ethanol react as shown in the equation below:

$$CH_3COOH_{(l)} + C_2H_5OH_{(l)} \rightleftharpoons CH_3COOC_2H_{5(l)} + H_2O_{(l)}$$

Other than warming, how would the state of equilibrium be established within a short time?
(1 mark)

17 . The set up below was used to prepare a gas and study some of its properties. Study it and answer the questions that follow:



(a) State and explain the observations made in the:

(i) tube labelled A; (1 mark)

(ii) beaker labelled B.

(b) State **one** precaution that should be taken when carrying out this experiment.

(1 mark)

18. Under certain conditions, chlorine gas reacts with sodium hydroxide to form sodium hypochlorite.

(a) Name the conditions under which sodium hydroxide reacts with chlorine to form sodium hypochlorite. (1 mark)

(b) State two uses of sodium hypochlorite. (2 marks)

19. 50kg of ammonium sulphate $(NH_4)_2SO_4$ and 30kg of urea $CO(NH_2)_2$ fertilizers were applied in two equal sizes of plots A and B to enrich their nitrogen content. Show by working, which plot was more enriched with nitrogen. (N = *14;* S = 32; O = 16; C = 12; H = 1) (3 marks)

20. Describe how the P^H of anti-acid (Actal) powder can be determined in the laboratory.

(2 marks)

21. Graphite is one of the allotropes of carbon.

(a) Name one other element which exhibits allotropy. (1 mark)

(b) Explain why graphite is used in the making of pencil leads. (2 marks)

22. The table below gives some properties three elements in group (VII) of the periodic table . Study it and answer the questions that follow:

Element	Atomic N	Melting Point (°C)	Boiling Point (°C)
Chlorine	17	101	-34.7
Bromine	35	-7	58.8
Iodine	53	114	184

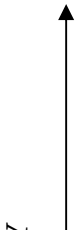
(a) Which element is in liquid form at room temperature? Give a reason. (1 mark)

(b) Explain why the boiling point of iodine is much higher than that of chlorine. (2 marks)

23. The thermalchemical reaction between carbon and sulphur is as shown by the equation below:

$C_{(s)} + 2S_{(s)} \longrightarrow CS_{2(l)} \quad AH = {}^{+}117.0\ kJmol^{-1}$.

On the grid below, sketch and label the energy level diagram for the reaction. (2 marks)



24. The table below gives the number of electrons, protons and neutrons in substances X, Y and Z. Study it and answer the questions that follow.

Substanc	**Electro**	**Proton**	**Neuron**
X	10	10	10
Y	10	8	10
Z	8	8	8

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

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

25 (a) State the Gay Lussac's Law. (1 mark)

(b) 10cm^3 of a gaseous hydrocarbon, C_2H_X required 30cm^3 of oxygen for complete
combustion. If steam and 20cm^3 of carbon (IV) oxide were produced, what is the value of X? (2 marks)

26. The data given below was recorded when Metal M was completely burnt in air. M is not the
actual symbol of the metal. (RA.M; M = 56, O ==16)

Mass of empty crucible and lid = I0.240g

Mass of crucible, ;lid and metal M = 10.352g

Mass crucible,lid and metal oxide = 10.400g

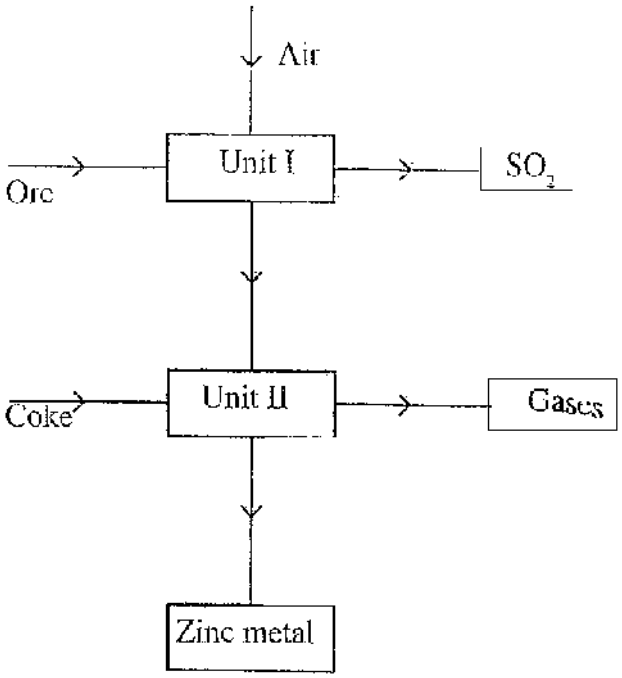
(a) Determine the mass of:

(i) Metal M ($^1/_2$mk)

(ii) oxygen. ($^1/_2$mk)

(b) Determine the empirical formula of the metal oxide. (2 marks)

27. The flow chart below shows some processes involved in the extraction of zinc metal:

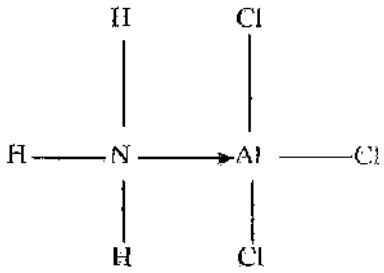


(a) Name **one** ore from which zinc is extracted. (1 mark)

(b) Write the equation of the reaction taking place in **unit II** (1 mark)

(c) Name **two** uses of zinc metal. (1 mark)

28. The diagram below shows the bonding between aluminium chloride and ammonia.



(a) Name the types of bonds that exist in the molecule.
(1mk)

(b) How many electrons are used for bonding in the molecule?
(1 mark)

29. Explain why the following substances conduct an electric current.

(a) Magnesium metal.
(1mk)

(b) Molten magnesium chloride.
(1mk)

30. A sample of river water is suspected to contain zinc and sulphate ions.

Describe how the presence of zinc ions and sulphate ions can be established. (3 marks)