

NAME.....INDEX NO:.....ADM NO.....
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233/1

CHEMISTRY PAPER 1 (THEORY)

THEORY

TERM 2

2 HOURS

FORM 4

Kenya Certificate of Secondary Education (K.C.S.E)

INSTRUCTIONS TO CANDIDATES

- ❖ Write your name and index in the **spaces** provided.
- ❖ Sign and write the date the examination is done.
- ❖ Answer **all** the questions in the spaces provided.
- ❖ Mathematical tables and **electronic calculators** may be used.
- ❖ ALL workings **MUST** be clearly shown where necessary.
- ❖ **This paper contains 13 printed pages.**
- ❖ **Candidates should check the question paper to ascertain that all pages are printed as indicated and that no question is missing.**
- ❖ **Candidates should answer questions in English.**

For Examiner's Use Only

Question	Maximum score	Candidates score
1-27	80	

1. An atom of element A has mass number 23 and 12 neutrons.

(a) Write the electron arrangement of the atom (1 mark)

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(b) State the period and group to which element A belongs

Group (½ mark)

Period (½ mark)

(c) State whether the element is a metal or a non-metal. (1 mark)

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2. (a) What is an indicator? (1 mark)

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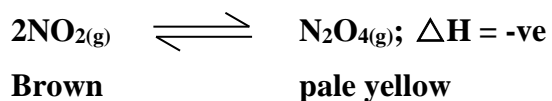
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(b) Name the indicator which can be used to determine the pH value of lemon juice. Give a reason for your answer. (2 marks)

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3. At 20°C, NO₂ and N₂O₄ gases exist in equilibrium as shown in the equation below:



State and explain the observation that would be made when;

(a) A syringe containing the mixture at 20 °C is immersed in ice-cold water.

(1 ½ marks)

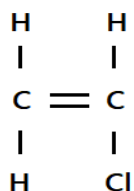
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(b) The volume of the gaseous mixture in a syringe is reduced. (1 ½ marks)

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4. A monomer has the following structure



(a) Draw the structure of its polymer that contains two monomers. (1 mark)

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(b) A sample of the polymer formed from the monomer has a molecular mass of 4500.
Determine the number of monomers that formed the polymer (C= 12; H= 1; Cl=35.5).

(2 marks)

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5. (a) Name the gaseous pollutant produced during Contact Process (1 mark)

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(b) Describe how scrubbing of the gas named in (a) above is done to reduce pollution.

(1 mark)

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6. Use the table below to answer the questions that follow. (The letters are not the actual symbols of the elements)

Element	Atomic number	Boiling point (°C)
A	19	774
B	11	890
C	17	-35
D	13	2470
E	14	2360

- (a) Identify an element that exists as a gas at room temperature. Explain. (2 marks)

- (b) Using dots (●) and crosses(x) draw the bonding formed when element A and C react to form a compound. (1 mark)

7. Lead (II) chloride can be prepared from lead (II) carbonate using the following procedure:

Step 1: Add excess lead (II)carbonate to dilute nitric (v) acid.

Step 2: Filter to obtain lead (II)nitrate solution as filtrate.

Step 3: Add sodium chloride solution to the filtrate.

Step 4: Filter off to obtain lead (II)chloride as residue.

Step 5: Wash the lead (II)chloride residue with distilled water dry between filter papers.

Why are the following steps necessary?

- (a) Using **excess** lead (II)carbonate used in step 1 (1 mark)

- (b) Using dilute nitric(V) acid instead of sulphuric (VI) or hydrochloric acid in step 1 (1 mark)

(c) Washing the lead (II)chloride residue with distilled water in step 5 (1 mark)

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8. Phosphorus is in group (V) of the periodic table. Explain the following observations.

(a) Phosphorus exhibits two melting points. (1 mark)

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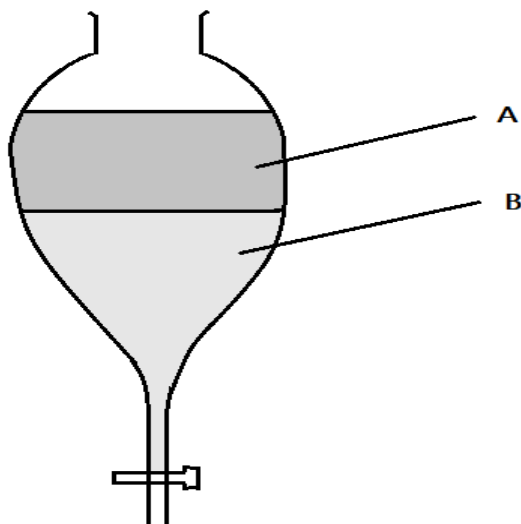
(b) The chloride of phosphorus forms musty fumes in damp air. (2 marks)

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9. The apparatus below was used to separate a mixture of **water** and **kerosene**.



(a) State **two** properties of the liquids that make it possible to separate them using such apparatus. (1 mark)

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(b) Name the liquids **A** and **B**. (1 mark)

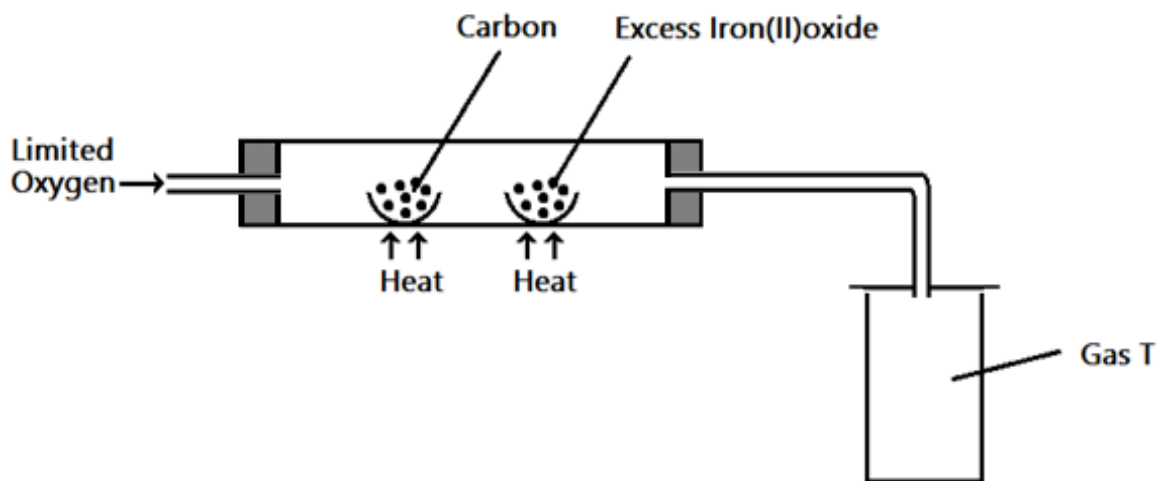
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(c) Give the name of the above method of separation. (1 mark)

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10. The set up below was used to obtain a sample of iron.



(a) Write **two** equations for the reactions which occur in the combustion tube.

(2 marks)

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.....

(b) Identify Gas T

(1 mark)

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11. Chlorine gas was bubbled through potassium iodide solution.

(a) State the observation that would be made.

(1 mark)

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(b) Write the ionic equation for the reaction that took place in (a) above. (1 mark)

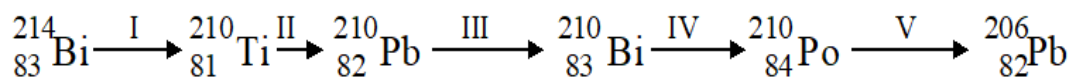
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(c) Identify the oxidizing agent in the ionic equation (b) above.

(1 mark)

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12. Consider the reaction chain below.



(a) Identify the particles emitted in

(i) I

(½ mark)

.....

(ii) II

(½ mark)

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(b) Write the nuclear equation for the reaction that takes place in V.

(1 mark)

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(c) State one environmental effect of radioisotopes.

(1 mark)

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13. 25cm³ of 0.1M sulphuric (VI) acid required 20cm³ of sodium carbonate solution for complete neutralization. Calculate the concentration of sodium carbonate in moles per litre.

(3 marks)

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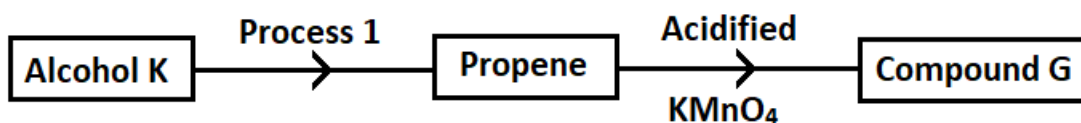
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14. Study the flow chart **below**.



(a) Write the molecular formula of alcohol **K**. (1 mark)

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- (b) Name
- (i) Compound **G** (1 mark)
- (ii) Process **I** (1 mark)

15. (a) Define the term oxidation state. (1 mark)

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(b) Calculate the oxidation states of chromium and manganese in the following ions.

(i) Chromium in $\text{Cr}_2\text{O}_7^{2-}$ (1 mark)

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(ii) Manganese in MnO_4^- (1 mark)

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16. (a) What is a flame? (1 mark)

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(b) Which type of flame is produced when the air hole of a Bunsen burner is closed?
(1 mark)

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(c) State one observable differences between a luminous and a non-luminous flame.
(1 mark)

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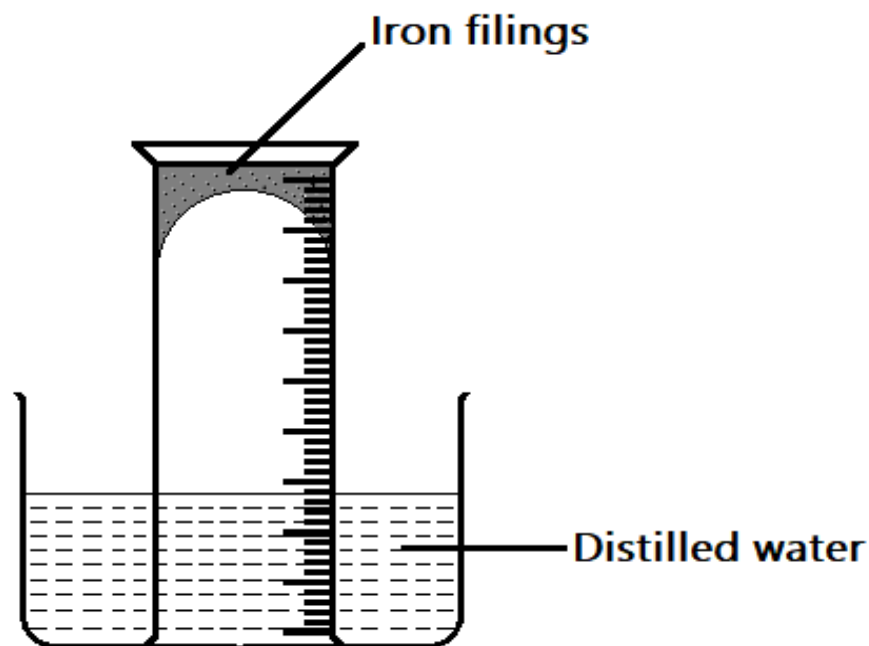
17. In an experiment to electroplate a copper spoon with silver, a current of 0.5A was passed for 18 minutes. Calculate the amount of silver deposited on the spoon (1 Faraday = 96500 coulombs, $A_g = 108$)
(3 marks)

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18. A measuring cylinder containing moist iron filings was inverted in a trough of distilled water as shown in the diagram below.



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

(i) Moist iron filings after four days; (1 mark)

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(ii) Water level in the measuring cylinder after four days. (1 mark)

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(b) What would be the effect of using iron filings moistened with tap water? (1 mark)

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19. Below are properties of some elements in period 3 of the periodic table

Element	Na	Mg	Al
Atomic radius (nm)	0.152	0.136	0.125
Melting points ($^{\circ}\text{C}$)	97.8	650	660

(a) Explain the trend in the melting points (2 marks)

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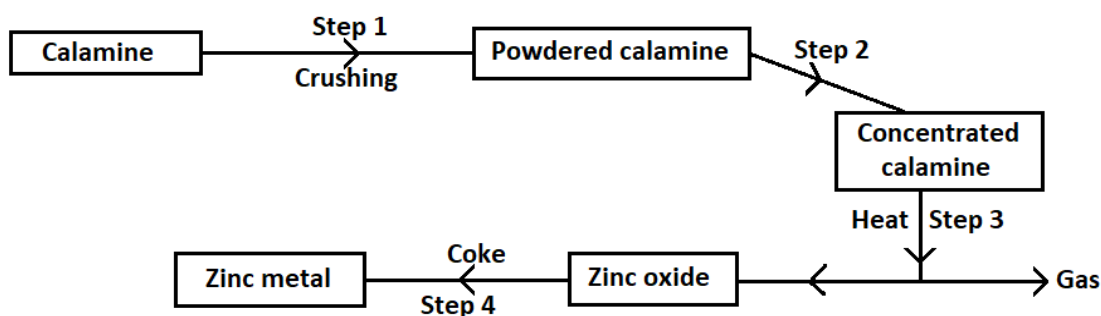
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(b) Why is there a decrease in size of the atoms from Na to Al? (1 mark)

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20. The flow chart below shows steps used in the extraction of zinc from one of its ores.



(a) Name the process that is used in **step 2** to concentrate the ore. (1 mark)

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(b) Write an equation for the reaction which takes place in **step 3**. (1 mark)

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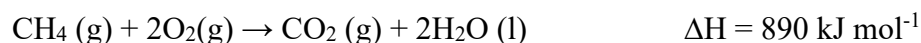
(c) State one use of zinc other than galvanizing. (1 mark)

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21. (a) What is the type of the heat change that occurs when one mole of a substance burns completely in oxygen? (1 mark)

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(b) Methane reacts with oxygen according to the equation given below.



Calculate the volume of methane which would produce 111.25 kJ when completely burnt.

(Molar volume of a gas = 24 litres.) (2 marks)

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22. (a) State the Graham's law diffusion. (1 mark)

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(b) The molar masses of gases W and X are 16.0 and 44.0 respectively. If the rate of diffusion of W through a porous material is $12\text{cm}^3\text{s}^{-1}$ calculate the rate of diffusion of X through the same material. (2 marks)

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23. Coal, oil and natural gas are major sources of energy. They are known as fossil. Hydrogen is also a source of energy.

(a) State two reasons why hydrogen is a very attractive fuel compared to fossil fuels (2 marks)

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(b) State one disadvantage of using hydrogen fuel instead of fossil fuels. (1 mark)

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24. (a) Other than salt, identify two substances that are formed when an acid reacts with a carbonate.

(1 mark)

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(b) When hydrogen chloride gas is dissolved in water, the solution formed turns blue litmus paper red but there is no effect on blue litmus paper, when the gas is dissolved in methylbenzene. (2 marks)

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25. When burning magnesium ribbon is introduced into a gas jar full of nitrogen, it continues to burn producing a greenish yellow powder.

(a) Write an equation for the reaction between nitrogen and magnesium. (1 mark)

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(b) Explain why magnesium continues to burn in nitrogen but sulphur does not. (2 marks)

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(c) State one use of nitrogen. (1 mark)

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26. Describe how the presence of calcium ions in a water sample can be tested in the laboratory. (3 marks)

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27. (a) Name the particles that are responsible for electrical conductivity in:

(i) Solids (½ mark)

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(ii) Both melts and aqueous solution (½ mark)

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(b) Give two properties of graphite that make it suitable for use as an electrode. (2 marks)

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(c) State one precaution that is necessary when carrying out electrolysis of molten
lead (II) bromide (1 mark)

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