

Name: ..... Class: ..... Adm.No. ....

**CHEMISTRY**

**THEORY**

**Paper 1**

**March – April 2018**

Time: 2 hours

# **POST EVALUATION EXAMINATION**

**MARCH – APRIL 2018**

**Kenya Certificate of Secondary Education**

**CHEMISTRY**

**PAPER 1**

## **INSTRUCTIONS TO CANDIDATES**

- Answer **ALL** the questions in the spaces provided.
- Electric calculators fx – 82 ms is allowed.
- All working must be clearly shown.

## **FOR EXAMINER USE ONLY**

Question	Maximum score	Candidate's score
1 – 30	80	

1. A mixture contains zinc oxide, iron (III) chloride and potassium chloride. Describe how each of the substances can be obtained from the mixture. (3 marks)

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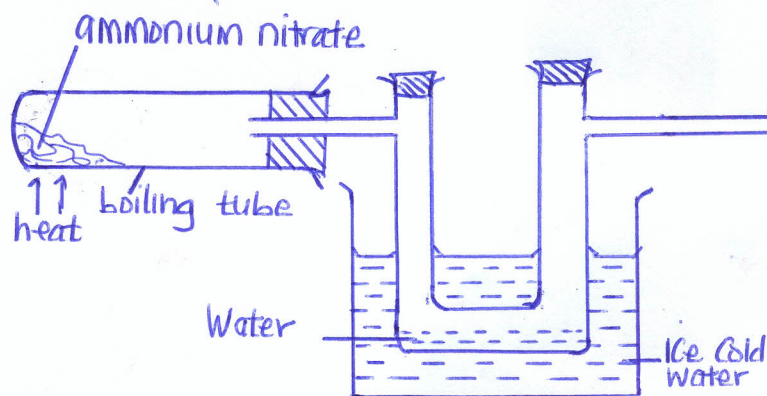
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2. Using a dot (•) and cross (x) diagram, draw the structure for silicon (IV) chloride.. (1 mark)  
(Atomic numbers Si = 14, Cl = 17)

3. Ammonium nitrate was gently heated as shown below.



- a) Complete the diagram to show how the gas is collected. (1 mark)
- b) Write the chemical equation for the reaction occurring in the boiling tube. (1 mark)

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c) State one chemical test that can be used to identify the gas collected in the above set up. (1 mark)

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4. a) What is a saturated solution? (1 mark)

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b) 115g of a saturated solution at 65°C is found to contain 65g of potassium nitrate. Calculate the solubility of potassium nitrate at 65°C. (2 marks)

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5. What do you understand by the term prescription in relation to drugs? (1 mark)

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6. Starting with sodium solid, describe how a sample of sodium hydrogen carbonate crystals may be prepared. (3 marks)

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7. In the extraction of sulphur by the Frasch process, hot compressed air at 15 atmospheres is forced down the innermost pipe.

a) What is the role of the hot compressed air?

(1 mark)

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b) Which allotrope of sulphur;

(i) is stable below the transition temperature of  $96^{\circ}\text{C}$ ?

(1 mark)

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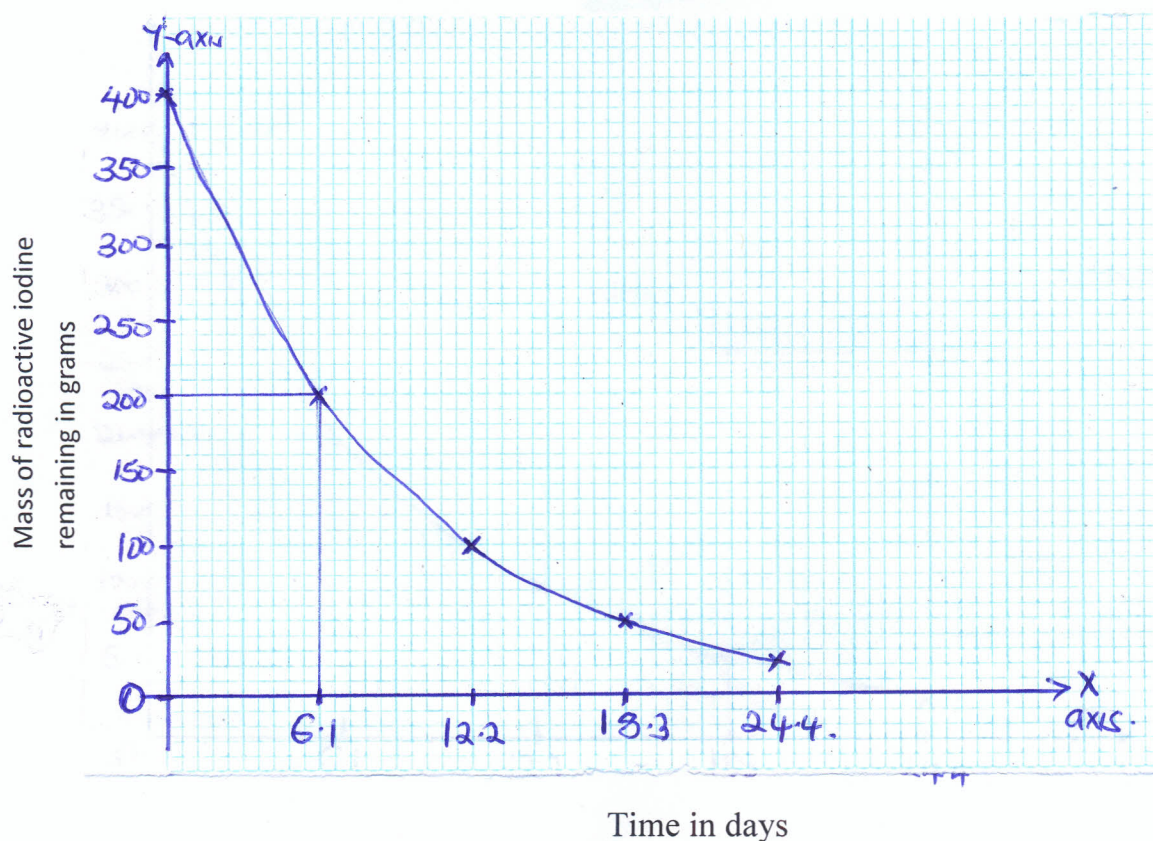
(ii) has prismatic crystals?

(1 mark)

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8. The graph below shows the radioactive decay for a sample 400g of iodine -131.



a) Define half life.

(1 mark)

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b) From the graph determine the half life of iodine-131

(1 mark)

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c) Determine the mass of the isotope present after 36.6 days

(1 mark)

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9. A certain salt was found to form a solution when exposed to air. Name the process undergone by the salt.

(1 mark)

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Give one example of such a salt

(1 mark)

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10. State and explain two observations made when a spatulaful of sodium carbonate solid is added to aluminium chloride solution in a boiling tube.

(3 marks)

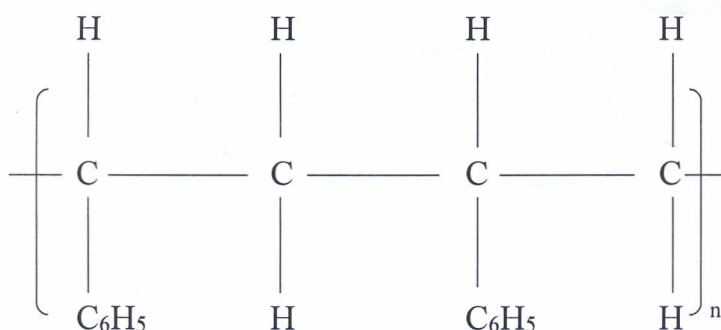
Observation

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Explanation

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11. The structure below shows a portion of a polymer



(i) Draw a repeat unit of the polymer

(1 mark)



(ii) Name the polymer

(1 mark)

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12. Give one use and difference between the apparatus below

(2 marks)

	Use	Difference
		
		

13. Element R has two isotopes with mass numbers 29.46 and 31. If the relative atomic mass of element R is 30. Determine the percentage abundances of each isotope. (3 marks)

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14. When chlorine is bubbled through water, the resulting solution acts as a bleaching agent.

a) Write an equation for the reaction between chlorine gas and water. (1 mark)

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b) Using an equation, explain how the resulting solution acts as a bleaching agent. (1 mark)

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- c) State and explain the observation made when chlorine gas is pumped into a gas jar containing moist hydrogen sulphide gas. (1 mark)

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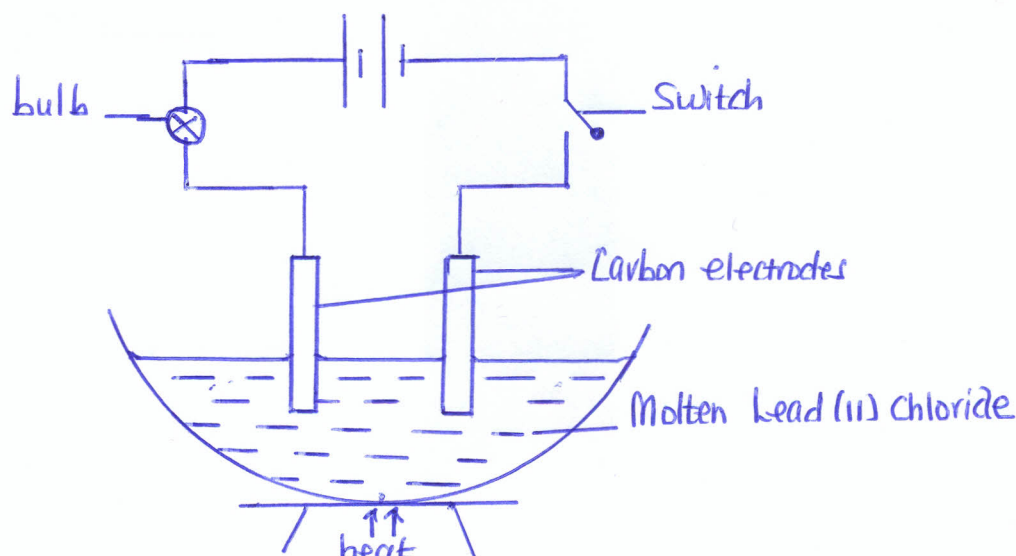
15. A compound M reacts with propanol to give another compound  $\text{CH}_3\text{COOCH}_2\text{CH}_2\text{CH}_3$ .

- a) Name compound M. (1 mark)

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- b) Draw the structure of M (1 mark)

16. Study the set up below and use it to answer the questions that follow.



- a) State and explain an observation that would be made at the anode when the circuit is completed. (2 marks)

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- b) Write an equation for the reaction at the cathode. (1 mark)

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17. In preparation of ammonia gas  $30\text{cm}^3$  of nitrogen gas and  $30\text{cm}^3$  of hydrogen gas were exploded in a vacuum

(i) Write an equation for this reaction (1 mark)

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(ii) Calculate the volume of the residual gases (2 marks)

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18. Juice extracted from a nettle plant were added drop wise into a boiling tube containing  $5\text{cm}^3$  potassium hydrogen carbonate solution until there was no further change.

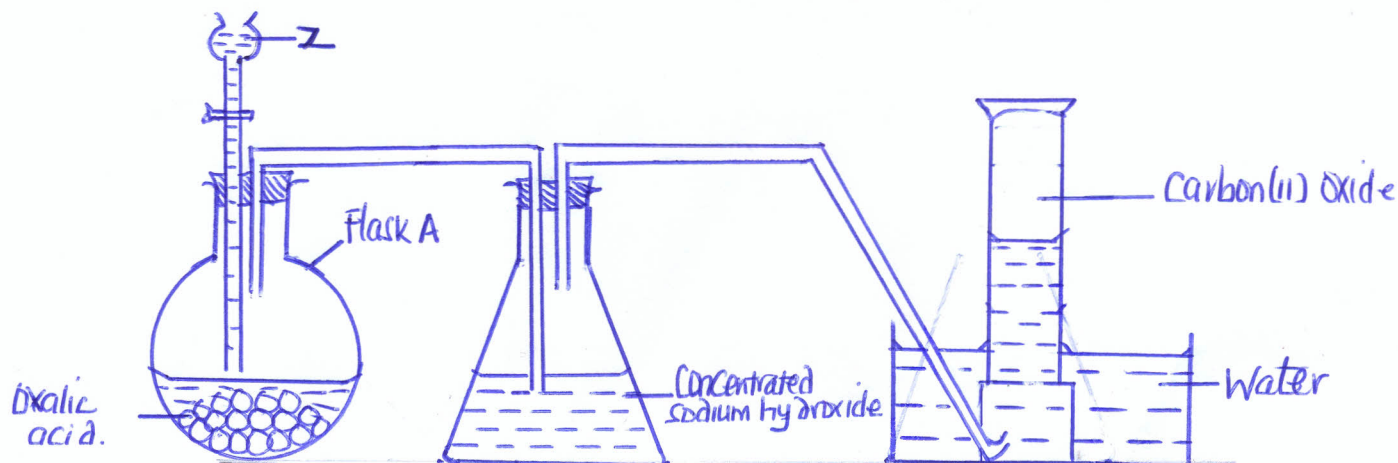
a) Explain the observation made in the boiling tube when the reaction was going on. (2 marks)

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b) What observation would have been made if the nettle juice were added to silver metal in a boiling tube? Explain (1 mark)

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19. The set up below was used to prepare and collect carbon (II) oxide in the laboratory.





(i) Identify Z and give its role in the reaction

(1 mark)

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(ii) Write an equation for the reaction in the flask A

(1 mark)

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(iii) Give one use of carbon (II) oxide.

(1 mark)

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20. When 94.5g of hydrated barium hydroxide  $\text{Ba}(\text{OH})_2 \cdot n\text{H}_2\text{O}$  was heated to a constant mass, 51.3g of anhydrous barium hydroxide was obtained. Determine the empirical formula of the hydrated barium hydroxide ( $\text{Ba} = 137$ ,  $\text{O} = 16$ ,  $\text{H} = 1$ ) (3 marks)

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21. Given that the thermochemical equations for combustion of ethanol, hydrogen and graphite (carbon) are;



- a) Draw an energy cycle diagram linking the enthalpy of combustion of ethanol and the enthalpy of combustion of its constituent elements. (2 marks)

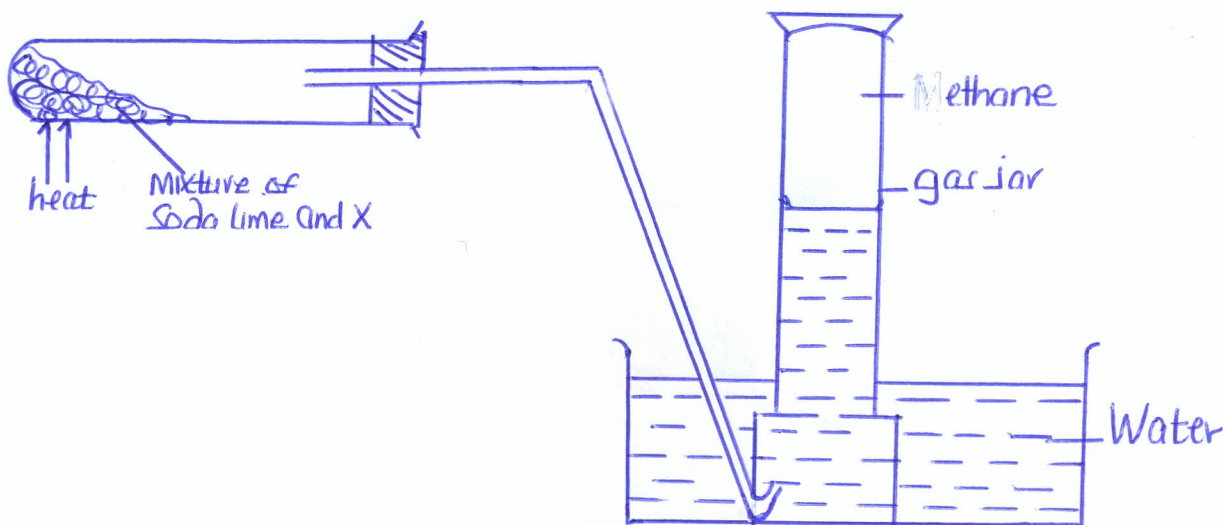
b) Calculate the enthalpy of formation of ethanol

(1 mark)

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22. The diagram below shows the apparatus used to prepare ethane in the laboratory. Study it and answer the questions that follow.



a) Identify X

(1 mark)

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b) Write an equation for the reaction that produces ethane gas.

(1 mark)

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c) Give a reason why the gas was collected over water.

(1 mark)

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23. The decomposition of methanol to form hydrogen and carbon (II) oxide can be represented by the equilibrium  $\text{CH}_3\text{OH}_{(g)} \rightleftharpoons 2\text{H}_{2(g)} + \text{CO}_{(g)}$   $\Delta H = +92\text{kJmol}^{-1}$

What would be the effect on the equilibrium when

(i) The temperature is decreased.

(1 mark)

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(ii) The pressure is decreased

(1 mark)

24. a) State Graham's law of diffusion

(1 mark)

b) A sample of an unknown gas W is shown by analysis to contain sulphur and oxygen. The gas requires 28.3 seconds to diffuse through a hole into a vacuum. An identical number of oxygen molecules pass through the same hole in 20 seconds. Determine the molar mass of W. (O = 16, S = 32)

(2 marks)

25. Write the chemical formula of the major component in the ore of ;

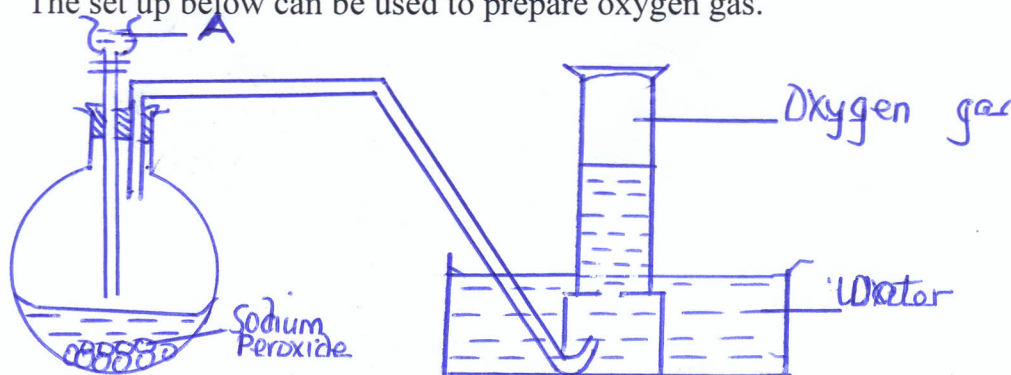
(i) Sodium

(1 mark)

(ii) Aluminium

(1 mark)

26. The set up below can be used to prepare oxygen gas.





a) Identify A

(1 mark)

b) Write an equation for the reaction that occurs at the flask

(1 mark)

c) Give one industrial use of oxygen

(1 mark)

27. 0.52g of lead powder were dissolved in excess nitric (v) acid to form lead(II) nitrate solution.

a) Write an ionic equation for the reaction between lead(II) nitrate and potassium sulphate solution

(1 mark)

b) Determine the mass of the lead (II) sulphate formed in (a) above

(Pb = 207.0, S = 32.0, O = 16.0)

(2 marks)

28. The table below shows the standard reduction potentials for four half-cells. Study it and answer the questions that follow.

	$E^{\circ}(\text{volts})$
(i) $\text{Pb}^{2+}_{(\text{aq})} + 2\text{e}^{-} \longrightarrow \text{Pb}_{(\text{s})}$	-0.13V
(ii) $\text{Ag}^{+}_{(\text{aq})} + \text{e}^{-} \longrightarrow \text{Ag}_{(\text{s})}$	+0.80V
(iii) $\text{Al}^{3+}_{(\text{aq})} + 3\text{e}^{-} \longrightarrow \text{Al}_{(\text{s})}$	-1.66V
(iv) $\text{Fe}^{2+}_{(\text{aq})} + 2\text{e}^{-} \longrightarrow \text{Fe}_{(\text{s})}$	-0.44V

(i) Identify the strongest reducing agent

(1 mark)

(ii) Calculate the  $E^{\circ}$  value from the two half-cells that produces the highest potential difference when combined.

(2 marks)

29. When a candle was burnt completely, the total mass of products was found to be greater than the original mass of the candle. (2 marks)

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30. On complete combustion of 0.5g of a hydrocarbon, 1.257g of carbon (IV) oxide and 0.514g of water were produced. If the molecular mass of the hydrocarbon is 84. Determine the molecular formula (C = 12, H = 1, O = 16) (3 marks)

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