

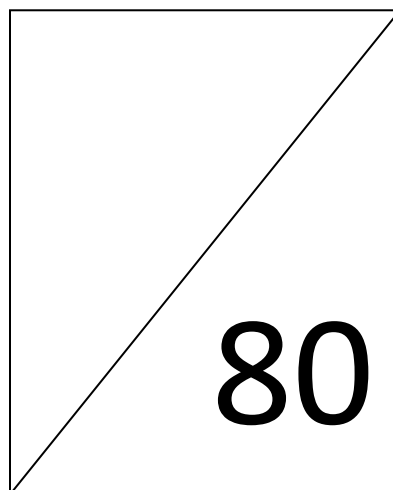
**FORM 3  
CHEMISTRY  
END TERM EXAM – MARCH 2016  
TIME: 2 HOURS**

**NAME:** .....**CLASS:**..... **ADM NO:**.....

**INSTRUCTIONS**

1. Write your name and admission number on the spaces provided.
2. Answer your questions in spaces provided.
3. All working must be shown clearly.
4. Silent electronic calculators may be used.

**For examiners use only**



1. (a) State graham's law of diffusion

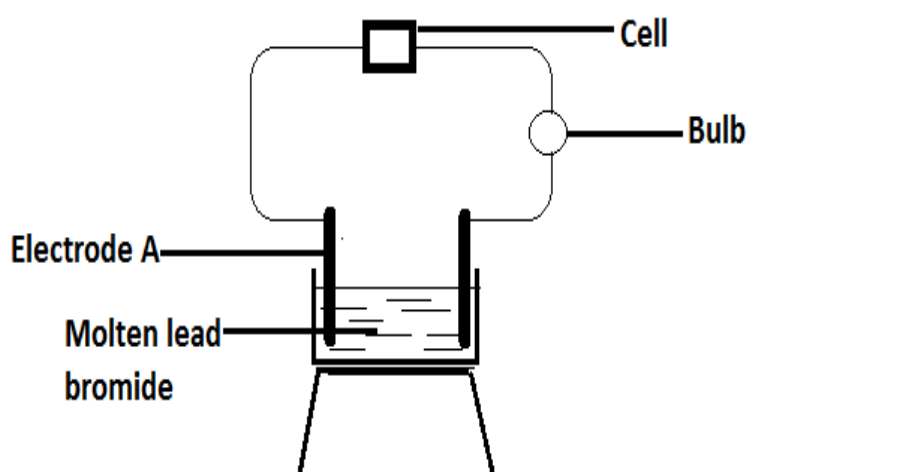
(1 mark)

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(b)  $60\text{ cm}^3$  of hydrogen chloride gas diffuses through a porous barrier in 40 seconds. How long will it take an equal volume of chlorine gas to diffuse through the same barrier at the same temperature and pressure? (2mark)

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2. The set-up below was used to investigate the effect of an electric current on a molten lead (II) Bromide.



(a) The bulb lit for a while then went off. Explain this observation.

(1 mark)

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(b) A red gas was formed at electrode A while the bulb was still lit. Using this observation label the terminals of the cell.

(1mark)

(c) Write an equation to show the formation of the product at the other electrode.

(1mark)

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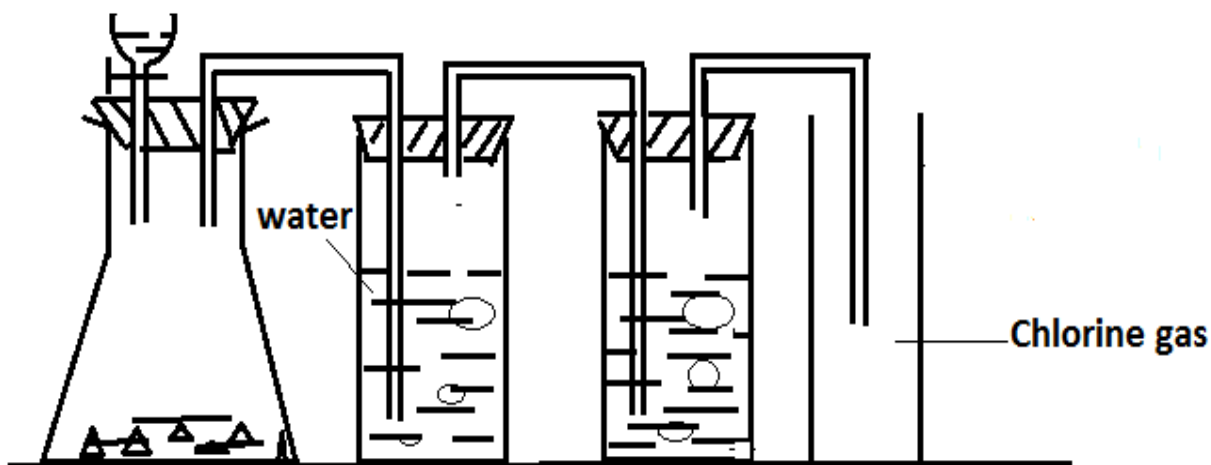
3. An element has three isotopes with abundances as shown below.

$$^{17}\text{A} = 5\% \quad , \quad ^{16}\text{A} = 93\% \quad , \quad ^{15}\text{A} = 2\%$$

(a) Calculate the relative atomic mass of the element. (2marks)

(b) The atomic number for atom A is 8. What is the number of neutrons in  $^{15}\text{A}$  (1mark)

4. Chlorine gas can be prepared using the apparatus shown below.



(a) Name the reagent in the dropping funnel (1 mark)

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(b) What is the function of the water in the wash bottle (1 mark)

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(c) (i) Name the method of gas collection used (1 mark)

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- (i) What physical property of the gas is suggested by the method of gas collection used (1mark)

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- (d) Draw a dot (.) and cross(x) diagram to show the bonding in a molecule of chlorine. The atomic number for chlorine is 17. (1 mark)

5. (a)  $30\text{cm}^3$  of 1M hydrochloric acid solution was mixed with  $40\text{cm}^3$  of 1M sodium hydroxide solution. Calculate the number of moles of sodium hydroxide that did not react. (2marks)

- (b)  $200\text{cm}^3$  of distilled water was added to  $400\text{cm}^3$  of 1M sodium hydroxide solution. What is the molarity of the solution formed? (2 marks)

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6. (a) Substances with giant atomic structures have high melting points. Name two other types of giant structures (1 mark)

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- (b) Iodine and water molecules are each held by intermolecular forces of attraction.

- (i) Name the intermolecular forces which exist between iodine molecules (1 mark)

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- (ii) Draw the structural formulae for two water molecules and show the intermolecular force of attraction between the two water molecules (1 mark)

7. The table below shows an atomic numbers of four elements W, X, Y and Z.

Element	W	X	Y	Z
Atomic number	20	17	19	9

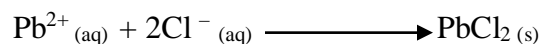
(a) Write electron arrangement of the ion of Z \_\_\_\_\_ (1 mark)

(b) (i) Write the formula of the compound formed between W and X. (1 mark )

(ii) Name the bond(s) and structure of the compound in (i) above. (1 mark)

8. Boron exists as two isotopes Boron – 10 and Boron 11. It has a relative atomic mass of 10.8. Work out the percentage abundance of each isotope. (2 marks)

9. 25cm<sup>3</sup> of a 0.2M lead (II) nitrate solution was shaken with excess aqueous hydrogen chloride. Lead (II) ions reacted with chloride ions accordingly to the following equation.



Calculate the mass of lead (II) chloride formed ( Pb = 207, Cl = 35.5 ) (3 marks )

10. (a) State Boyle's law.

(1mark)

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(b) A gas occupies  $400\text{cm}^3$  at 860 mmHg and  $25^\circ\text{C}$ . Calculate its volume at 750 mmHg and  $25^\circ\text{C}$  in SI units.

(2 marks)

11. The table below shows properties of substances P, Q, R and S. Use it to answer the questions that follow.

Substance		Electrical conductivity		M.P	B.P
		Solid	Molten		
P		Does not	Conducts	808	1420
Q		Conducts	Conducts	850	1487
R		Does not	Does not	1700	2200
S		Does not	Does not	113	444

Identify substance (s) that is likely to be:

(a) Sodium chloride \_\_\_\_\_ ( 1 mark )

(b) Sulphur \_\_\_\_\_ (1 mark)

(c ) Magnesium \_\_\_\_\_ ( 1 mark )

(d) Diamond \_\_\_\_\_ (1 mark)

12. Dry carbon (II) oxide was passed over heated copper (II) oxide in a combustion tube.

(i) Write an equation for the reaction that took place. (1 mark)

(ii) State and explain observation made in the combustion tube. (2 marks)

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13. (a) In solvay process name two ways of separating the two salts formed in the carbonator. (2 marks)

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- (b) List two uses of sodium hydrogen carbonate (2 marks )

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14. A student reacted lead (II) carbonate with Sulphuric (VI) acid in order to prepare lead (II) sulphate salt.

- (a) Explain why he was unable to prepare the lead (II) Sulphate salt using the above reagents. (2marks)

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- (b) Give one other reagent he would use in place of lead (II) carbonate. (1 mark)

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15. Describe how you would obtain crystals of sodium chloride from a mixture of sodium Chloride, lead (II) chloride and anhydrous iron (III) chloride. (3 marks)

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16. Study the table below and answer the questions that follow:

Particle	Atomic No.	Ionic configuration	Formula of oxide	Atomic radius	Ionic radii
P	4			0.110	0.031
Q		2.8.8	QO	0.200	0.099
R		2.8.8	R <sub>2</sub> O	0.230	0.133
S	17	2.8.8	S <sub>2</sub> O <sub>7</sub>	0.099	0.181
T	16			0.104	0.231

(i) Complete the table above. (3 marks )

(ii) From the table choose the most reactive metal. Explain (1 mark)

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(iii) What is the bond type and structure of the formula of oxide formed by the metal mentioned in (ii) above

Bond type \_\_\_\_\_ ( 1 mark)

Structure \_\_\_\_\_

(iv) Using dots ( . ) and crosses ( x ) to represent electrons, show the bonding in the chloride of Q. (1 mark)

(v) Explain the solubility of element T in water. (1mark )

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(vi) Which element is the most electronegative. Explain. (1 mark )

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(vii) Aluminium metal is used to make utensils yet it is a reactive metal. Explain. (1 mark)

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(viii) Distinguish between valency and oxidation number. (2 marks )

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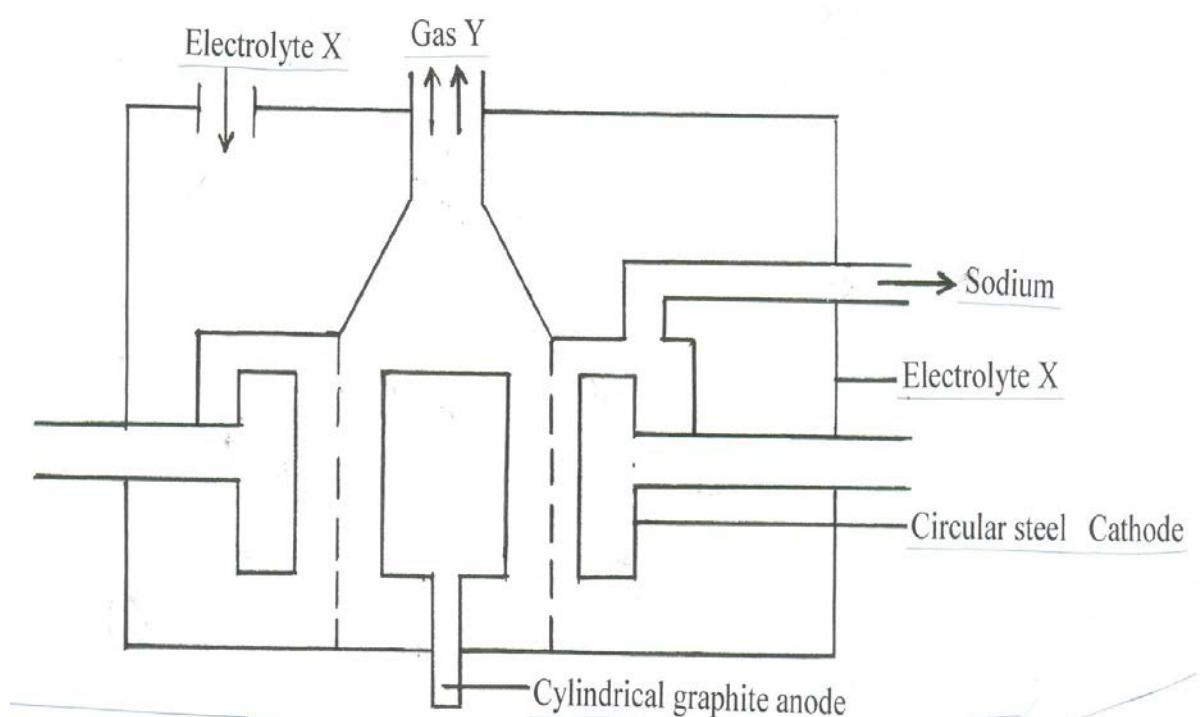
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17. (a) Below is a simplified diagrams of the Down's cell in which sodium metal is manufactured.



(i) Identify (1 mark)

Electrolyte X \_\_\_\_\_

Gas Y \_\_\_\_\_

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

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(iii) In what state is sodium collected ? (1mark)

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(iv) Give two properties of sodium that make it possible to collect as in (iii) above.

(2 marks

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(v) The cathode is made of steel, but the anode is made of graphite although steel is a better conductor. Why is this? (1 mark)

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(vi) In this process, the naturally occurring raw material is usually mixed with another Compound. Identify the compound and state its use. ( 2 marks )

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(b) Chlorine and sodium hydroxide are manufactured by the electrolysis of brine in a mercury cathode cell.

(i) Write an equation for the reaction at the anode. (1 mark)

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(ii) At the cathode  $\text{Na}^+$  ions are discharged in preference to  $\text{H}^+$  ions. Explain why? (1 mark)

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(iii) Sodium metal dissolves in mercury at the cathode to form sodium amalgam. How is solid sodium hydroxide obtained from sodium amalgam? (Illustrate using equation) (2 marks)

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c) A current of 5A flowed for 3 min 16 seconds through molten lead (II) bromide ( $IF = 96500\text{C}$ ,  $RAM$  of  $\text{Br} = 80$ ,  $\text{Pb} = 207$  and molar gas volume at r.t.p =  $24\text{dm}^3$ )

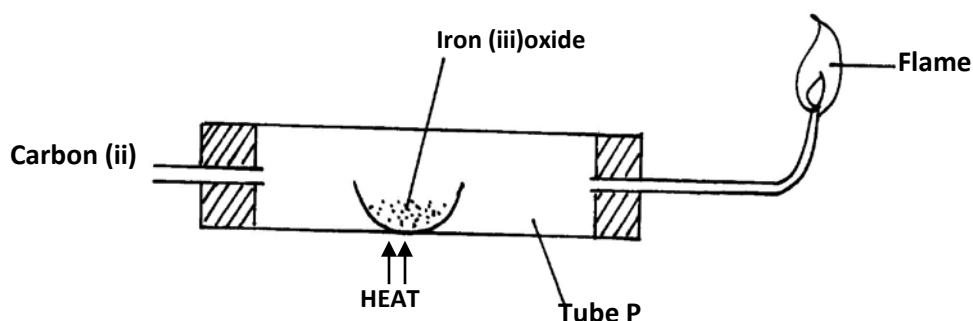
(i) What quantity of electricity in faraday was used? (2 marks)

(ii) Calculate the number of moles of  
(a) Lead deposited. (1 mark)

(b) Bromine produced. (1 mark)

(iii) Calculate the volume of bromine gas liberated at room temperature and pressure. (1 mark)

18. Carbon (ii)oxide gas was passed over heated iron (iii) oxide as shown below



- a) Give one observation made in tube **P** (1mk)

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- b) Write an equation for the reaction which takes place in test tube **P** (1mk)

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19. (a) Define a flame (1mk)

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- (b) Name the type of a flame produced by the Bunsen burner when the air hole is closed.

(1mk)

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20. The following table shows the  $P^H$  values of solutions **A** **B** and **C**

Solution	<b>A</b>	<b>B</b>	<b>C</b>
PH	2	<b>7</b>	11

- (a) Which solution is likely to be magnesium chloride. Give a reason. (1mk)

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- (b) Identify the solution in which a sample of aluminium chloride is likely to dissolve.

Explain

(2mks)

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