

NAME Adm No.

Date:

Candidate's Signature:.....

233/1

CHEMISTRY

Theory

PAPER 1

JUNE 2016

TIME: 2 hours

4MCK JOINT EXAMINATION
FORM 4 EXAMS, JULY 2016
CHEMISTRY Paper 1
2 hours

Instructions to candidates

1. Write your name and admission number in the spaces provided above
2. Sign and write the date of the examination in the spaces provided above
3. Answer all the questions in the spaces provided in the question paper
4. Mathematical tables and silent calculators may be used
5. All working *MUST* be clearly shown where necessary

For Examiner's use Only

Questions	Maximum Score	Candidate's Score
1-26	80	

1. a) Explain why an atom is electrically neutral. (1 mark)

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b) An ion is represented as P^{3-} and the electron arranged is 2·8·18·8. Write the electron arrangement of the atom. (1 mark)

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2. a) What is an ion. (1 mark)

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b) Using dots (•) and crosses (x) to represent electrons draw a diagram of the compound formed between Lithium and Oxygen (Li = 3, O = 8). (2 marks)

3. Study the table below and answer the question that follow. (The letters are not the actual symbols of elements).

Element (Metals)	Ionic radius	First ionization energy (kJ/Mol)	Second ionization energy (kJ/Mol)
P	0.031	900	1800
R	0.065	736	1450
Q	0.099	590	1150

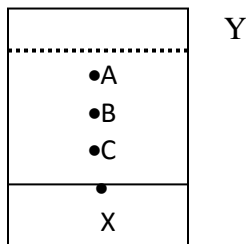
i) Which element is the most reactive? Explain. (2 marks)

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ii) Give a reason as to why the 2nd ionization energy for element R is higher than its 1st ionization energy. (1 mark)

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4. The diagram below is a chromatogram of different pigments of a leaf extract.



a) Name a suitable solvent for the dye. (1 mark)

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b) Giving a reason, state the least soluble pigment. (1 mark)

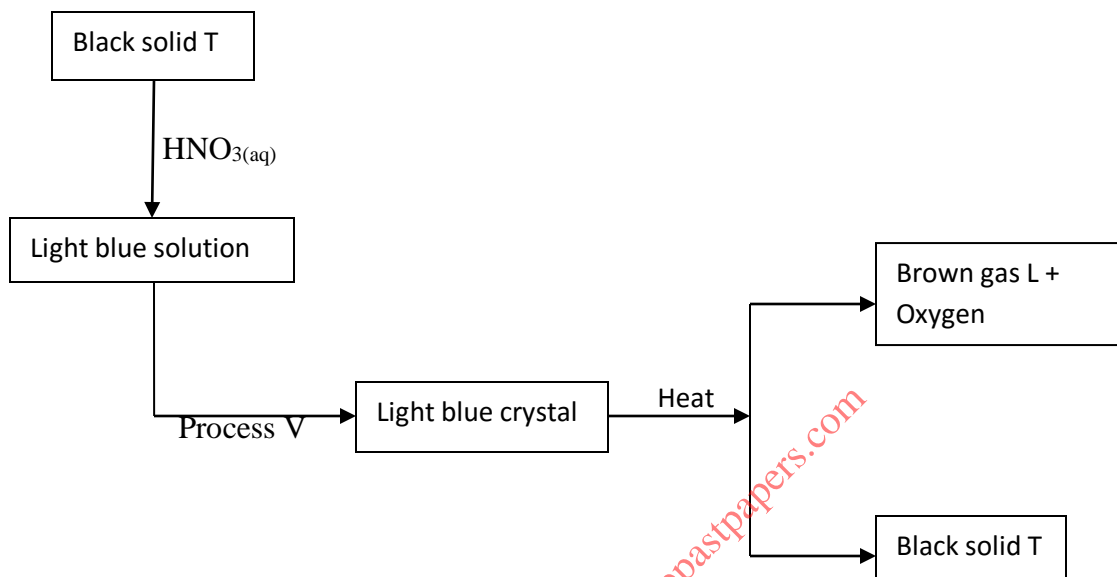
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c) On the diagram show the direction of movement of the solvent. (1 mark)

5. If it takes 30 seconds for 100cm³ carbon (iv) oxide to diffuse across a porous pot. How long will it take for equal volume of sulphur (VI) oxide (C = 12, O = 16, S = 32) to dispose through the same porous pot? (3 marks)

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6. Study the flow chart below and answer the questions that follow:



a) Identify the following

i) Solid T

(1 mark)

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ii) Gas L

(1 mark)

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b) Write an equation for the reaction between Solid T and dilute Nitric (v) acid.

(1 mark)

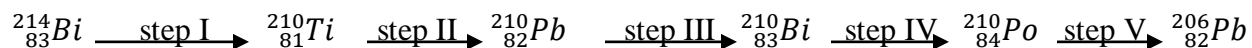
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7. a) State two differences between nuclear and chemical reactions.

(2 marks)

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c) Below is a radioactive decay series. Study it to answer questions that follow.

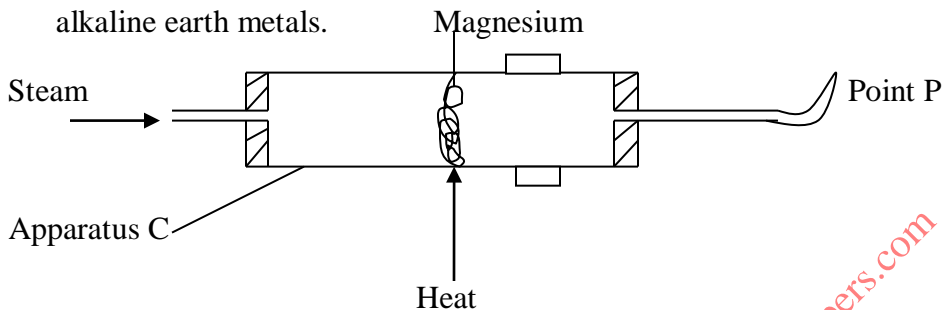


Identify the particles emitted in step III and step V.

Step III (1 mark)

Step V (1 mark)

8. The set up below was used by students from a secondary school to study reaction of alkaline earth metals.



a) Why is it important to burn the gas at point P. (1 mark)

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b) Write the equation for the reaction taking place in the combustion tube. (1 mark)

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c) Before heating the Magnesium, steam is first passed through the apparatus C. Explain. (1 mark)

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9. Study the information in the table below and answer question below the table.

Bond	Bond energy kJ/mol
H - Cl	431
Cl - Cl	244
C - H	414
C - Cl	326

Calculate the enthalpy change for the reaction,



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10. $\text{R-COO}^- \text{Na}^+$ and $\text{R-C}_6\text{H}_5\text{SO}_3^- \text{Na}^+$ represent two cleaning agents where R is a long hydrogen chain.

a) Which cleaning agent will be suitable in water with calcium ions. (1 mark)

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b) Write formulae of the compound formed between cleaning agent in (a) above and calcium ions. (1 mark)

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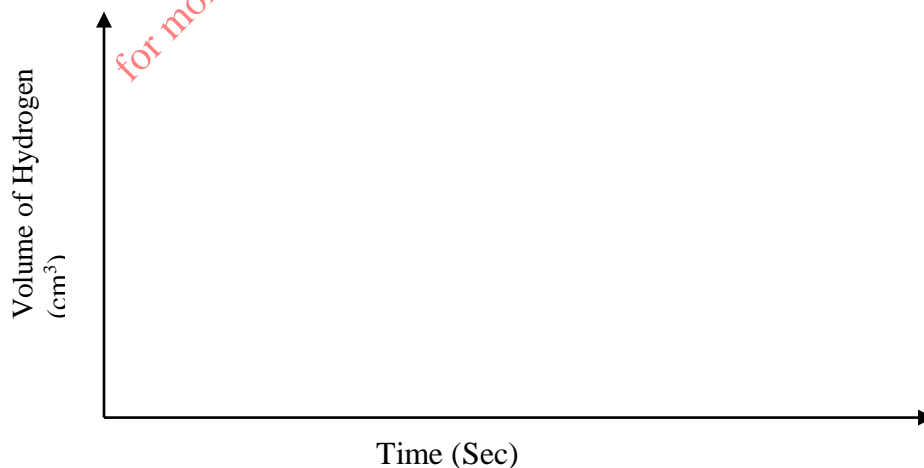
c) Which of the two cleaning agents does not pollute environment. (1 mark)

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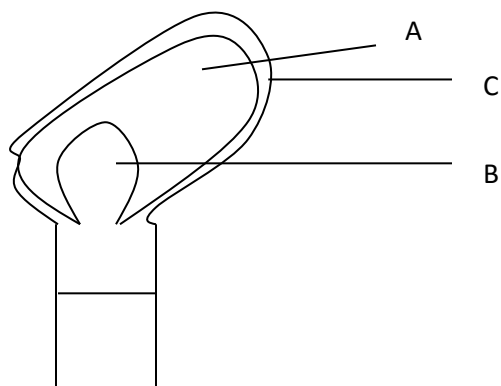
11. The table below gives three experiments on the reaction of excess sulphuric acid and 0.5g of Zinc done under different conditions. In each case the volume of gas produced was recorded at different time intervals.

Experiment	Form of Zinc	Sulphuric acid concentration
A	Powder	0.8M
B	Powder	1.0M
C	Granules	0.8M

On the axis below, sketch and label the three curves that could be obtained from such results. (3 marks)



12. The diagram below shows a Bunsen burner in use.



a) Name the regions B and C. (2 marks)

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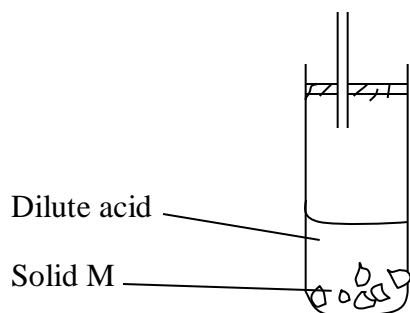
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b) Which region has partially burnt gases. (1 mark)

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13. The diagram below is an incomplete set up used to prepare and collect Hydrogen sulphide gas. S.



a. Complete the set up to show how the dry gas is collected. (2 marks)

b. Identify solid M. (1 mark)

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c. Describe a chemical test for the gas. (1 mark)

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14. Starting with lead (II) Oxide, describe how crystals of lead (II) Nitrate can be prepared. (3 marks)

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15. a) What is positional isomerism. (1 mark)

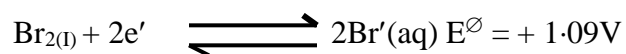
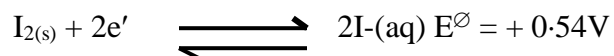
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c) Draw and name two isomers of Butene. (2 marks)

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16. a) State Gay lussac's law. (1 mark)

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b) 30cm³ of propane was mixed with 100cm³ of oxygen and mixture sparked. Calculate and identify residual gases when measured at room temperature and pressure. (3 marks)

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17. You are given the following half equations.



a) Write an overall equation for the cell reaction. (1 mark)

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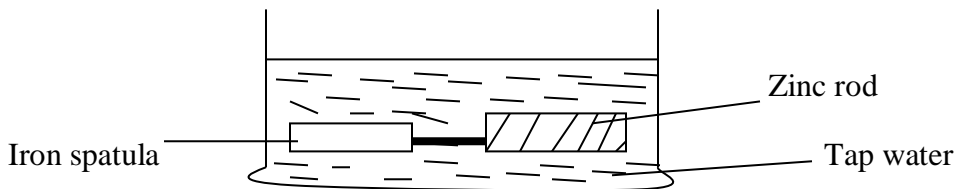
b) Calculate the E^{\ominus} value of the cell. (1 mark)

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c) Name the reading species. (1 mark)

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18. The diagram below was used by a student to prevent rusting of an iron spatula.



a) Did the student succeed in preventing rusting of the spatula? Explain. (2 marks)

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- b) Apart from the method being investigated above, mention two more methods of preventing rusting. (2 marks)
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19. Calculate the number of hydrogen ions in 5cm^3 of 0.5 M Phosphoric acid. ($L = 6.0 \times 10^{23}$) (3 marks)

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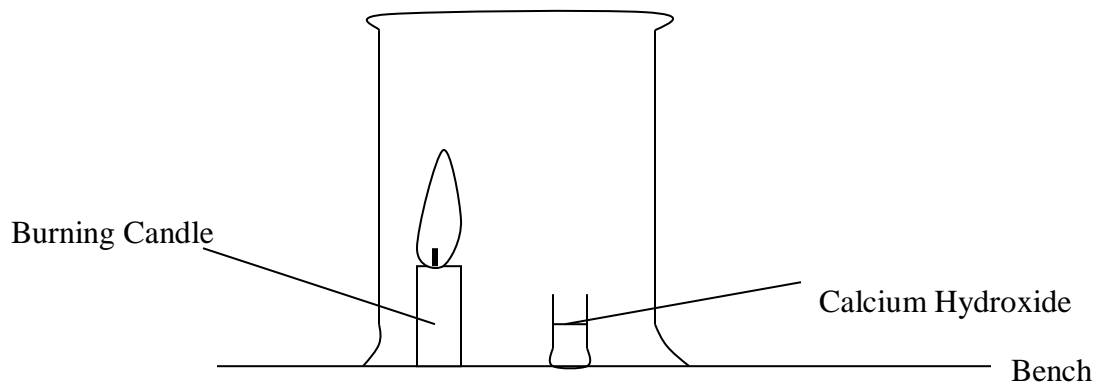
20. The following table shows the Ph values of solutions A,B,C and D.

Solution	A	B	C	D
pH	7	3	14	10

- a) Which solution is likely to be that of iron (III) Chloride. Explain. (2 marks)
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- b) Which two solutions when mixed will give the highest enthalpy change (1 mark)
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21. Study the arrangement below and answer the question that follow;



Explain what will be observed after sometime.

(3 marks)

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22. A piece of burning magnesium is lowered in a gas jar full of carbon (IV) Oxide.

a) Although carbon (IV) oxide gas does not support burning, the magnesium continues burning, explain this observation. (1 mark)

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b) Write the equation for the reaction. (1 mark)

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c) State one physical property why CO₂ gas is used in fire extinguishers. (1 mark)

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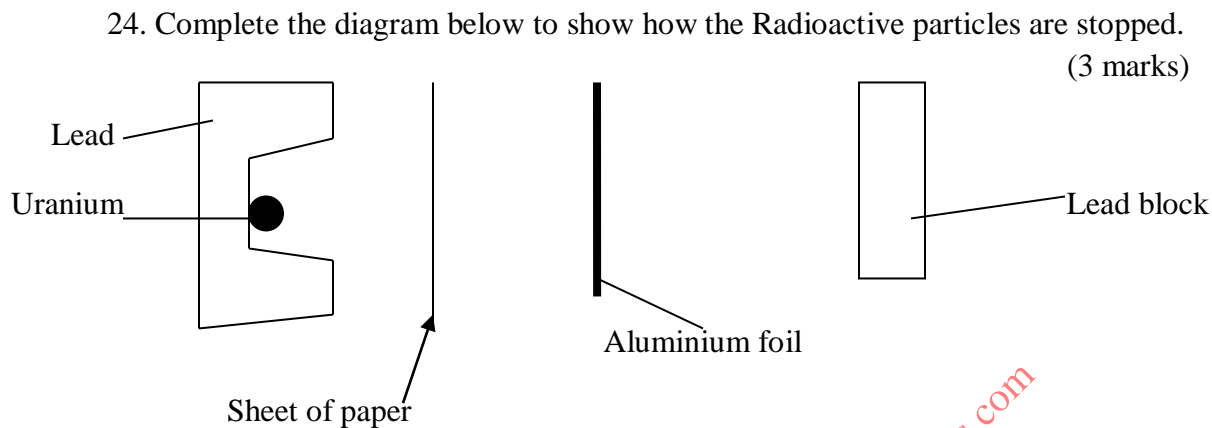
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23. Metal H can displace oxygen from oxide of G, but not of J. Metal K removes oxygen from Oxide J and also oxide H. Arrange the metals in order of increasing reactivity.

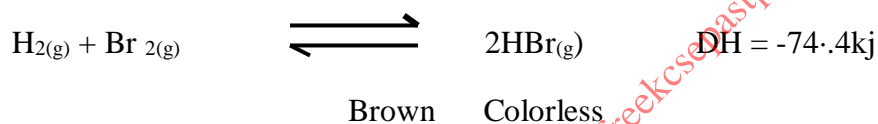
(2 marks)

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25. The following equation shows a reversible reaction.



a) State and explain the observation that can be made when
 i. Temperature is increased. (1½ marks)

iii) Pressure is reduced (1½ marks)

26. The solubility of salt X is 80g/100g of water at a temperature of 90°C. Solution is cooled to 40°C.

a) Explain the term solubility. (1 mark)

b) Calculate the amount of salt crystallized if the solubility of salt X at 40°C is 60g/100g of water. (2 marks)

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