

Candidates Name.....

Signature.....Random No...../...../...../...../.....Personal No.....

545/2

## CHEMISTRY

### Paper 2

Nov.2022

2 hours

**CHEMISTRY DEPARTMENT**  
**UGANDA CERTIFICATE OF EDUCATION**  
**End of term 3 Examinations 2022**

**S.3**

**PAPER 2**

**TIME. 2 hours**

### INSTRUCTIONS TO CANDIDATES.

*Section A consists of 10 structured numbers. Attempt all questions in this section. Answers to this section must be written in the spaces provided.*

*Section B consists of 4 semi-structured questions. Attempt only 2 questions from this section. Answers to this section must be written in the answer booklets provided. In both sections, All working must be clearly shown.*

**Where necessary use, (Al = 27, C = 12, O = 16, N = 14, S = 32, Pb = 207 )**

1 mole of a gas occupies **24 l** at room temperature.

1 mole of a gas occupies **22.4 dm<sup>3</sup>** at s.t.p

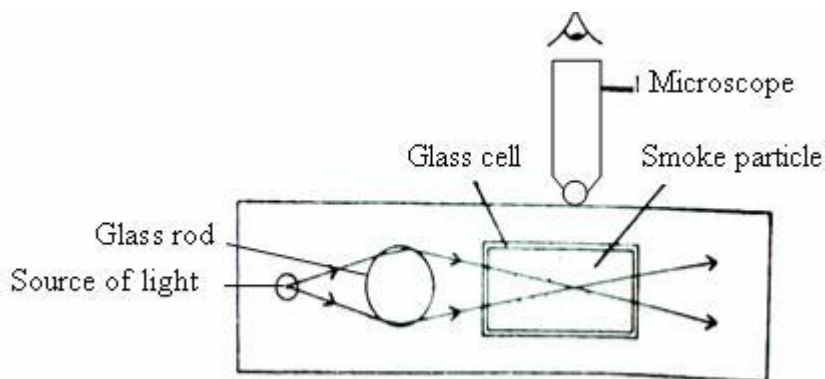
### For Examiners Use Only.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total

**SECTION A( 50 marks)**

*Attempt all questions*

1. (a) Bright light from the touch was passed into a glass cell containing smoke particles. The particles were then observed using the microscope.



- (i) State what was observed? ( ½ mark)

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.....

- (ii) Give a reason for your observations in (i) ( ½ mark)

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.....

- (iii) State what the experiment indicated? ( ½ mark)

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.....

- (b) The experiment in (a) was repeated with the glass temperature maintained at 60 °C

- (i) State what was observed? ( ½ mark)

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- (ii) Explain your observations in (a) (i) (01 mark)

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2. Zinc and iron are some of the metal elements from which different alloys can be made when each element is combined with **one** other element. Each pure metal element can also be used in different ways other than making of alloys.

(a) Name the alloy that contains, (01 mark)

(i) zinc. ....

(ii) Iron. ....

(b) Name one other element which is contained in the alloy named,

(i) in (a) (i) above. ( ½ mark)

.....

(ii) in (a) (ii) above. ( ½ mark)

.....

(c) State one use of the alloy named,

(i) in (a) (i) above. ( ½ mark)

.....

(ii) in (a) (ii) above. ( ½ mark)

.....

(d) (i) Name the gas which is used in the manufacture of the alloy named in (a) (ii) from iron. ( ½ mark)

.....

(ii) Give two reasons why the alloys named in (a) are preferably used instead of pure metals. ( 01 mark)

.....  
.....

(e) State one application of pure zinc in iron industry. ( 01 mark)

.....  
.....

(3) The atomic numbers of chlorine, magnesium and phosphorus are 17 , 12 and 15 respectively .

(a) State what is meant by *atomic number*? ( 01 mark)

.....  
.....

(b) State the,

(i) valency of magnesium, give a reason for your answer. (01 mark)

.....  
.....

(ii) the group of the periodic table to which phosphorus belong, ( ½ mark)

.....  
.....

(c) Chlorine separated reacted with phosphorus and magnesium respectively forming compounds W and Y respectively. State the type of bond in compound,

(i) W. ( ½ mark)

.....  
(ii) Y. (½ mark)

.....  
(d) (i) Which of the compounds W and Y doesn't conduct electric current when

current is passed through its molten state. ( ½ mark)

.....  
(ii) Give a reason for your answer in (d) (i). ( ½ mark)

.....  
.....  
4.(a) Write equation of reaction that takes place when hydrogen peroxide in a beaker is exposed to sunlight. ( 1½ mark)

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.....  
(b) Write the formula of compound formed when copper reacts with the gaseous product in (a). (01 mark)

.....  
.....  
(c) A mixture of magnesium and the product in ( b) was strongly heated until there was no further change .

(i) State what was observed ( 1½ marks)

.....  
.....  
(ii) Explain your observations in (d) (i). ( 1½ marks)

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.....  
5.(a) Write the formula of the oxide formed when each of the given elements burns completely in oxygen gas.

(i) Iron. ( ½ mark)

(ii)Coke. ( ½ mark)

(iii)Magnesium. ( ½ mark)

(b) (i)State which of the oxides in (a) reacts with dilute sodium hydroxide solution, and give a reason for your answer. (01 mark)

(ii)Write equation of reaction that would take place when the oxide stated in (b) (i) reacts with dilute sodium hydroxide solution. ( 1½ marks)

(c)Excess dry carbon monoxide gas was passed over strongly heated oxide of iron in (a). Write equation of reaction that took place. ( 1½ marks)

6.Below is part of the periodic table. The letters indicated are not the usual symbols of the elements but use the letters in the table to answer the questions that follow.

	I	II	III	IV	V	VI	VII	VIII
2				E		G	M	
3	A	B	D		F	L	N	Q
4		C						

(a)State which of the elements is the;

(i) most reactive metal. ( ½mark)

.....

(ii)Least reactive non metal. ( ½ mark)

.....

(b)State the family name of the group to which the following elements belong.

(i) B and C. ( ½ mark)

.....

(ii) M and N. ( ½ mark)

.....

(c)(i) Write the formula of the ion formed by element D. ( ½ mark)

.....

.....

(ii)Write the electronic configuration of the ion formed by element L. ( ½ mark)

.....

.....

(d)Using outer most energy electrons, show how A forms a compound with G.

(02 marks)

7. (a) An organic compound **P** of formula mass 89.99 consists of 26.67% by mass of carbon; 2.22 % by mass of hydrogen and the rest being oxygen .

(i) Calculate the empirical formula of organic compound **P**. ( 2 ½ marks)

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(ii) Determine the molecular formula of organic compound **P**. ( 1½ marks)

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8. Diamond is one of the two *crystalline allotropes* carbon.

(a) (i) State what is meant by *allotropes*? ( 01 mark)



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.....  
.....

(ii) Name another crystalline allotrope of carbon. ( ½ mark)

.....

(b) State one use of,

(i) diamond. ( ½ mark)

.....

(ii) the crystalline form of carbon named in (a) (ii). ( ½ mark)

.....

(c) State the property of,

(i) diamond which is as a result of the its use stated in (c) above. ( ½ mark)

.....

.....

(ii) the allotrope of carbon named in (b) as a result of its use in (c). ( ½ mark)

.....

.....

(d)(i) State the condition(s) under which nitric acid can react with carbon.

( 01 mark)

.....

.....

(ii) Write equation of reaction that would take place when nitric acid reacts with carbon under the condition(s) stated in (i). (1½ marks)

.....

.....

9. (a) (i) State the condition(s) of reaction under which nitrogen gas readily reacts with calcium ( ½ mark)

.....  
.....

(ii) Write equation of reaction that would take place when calcium reacts with calcium under the conditions stated in (b) ( 1½ marks)

.....  
.....

(b) Explain briefly why the nitrogen readily reacts with calcium under the condition(s) stated in (a). (02 marks)

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.....

(c) When substance **G** was added to product formed in (a), a colourless gas with a choking smell, that turns moist red litmus paper blue was evolved.

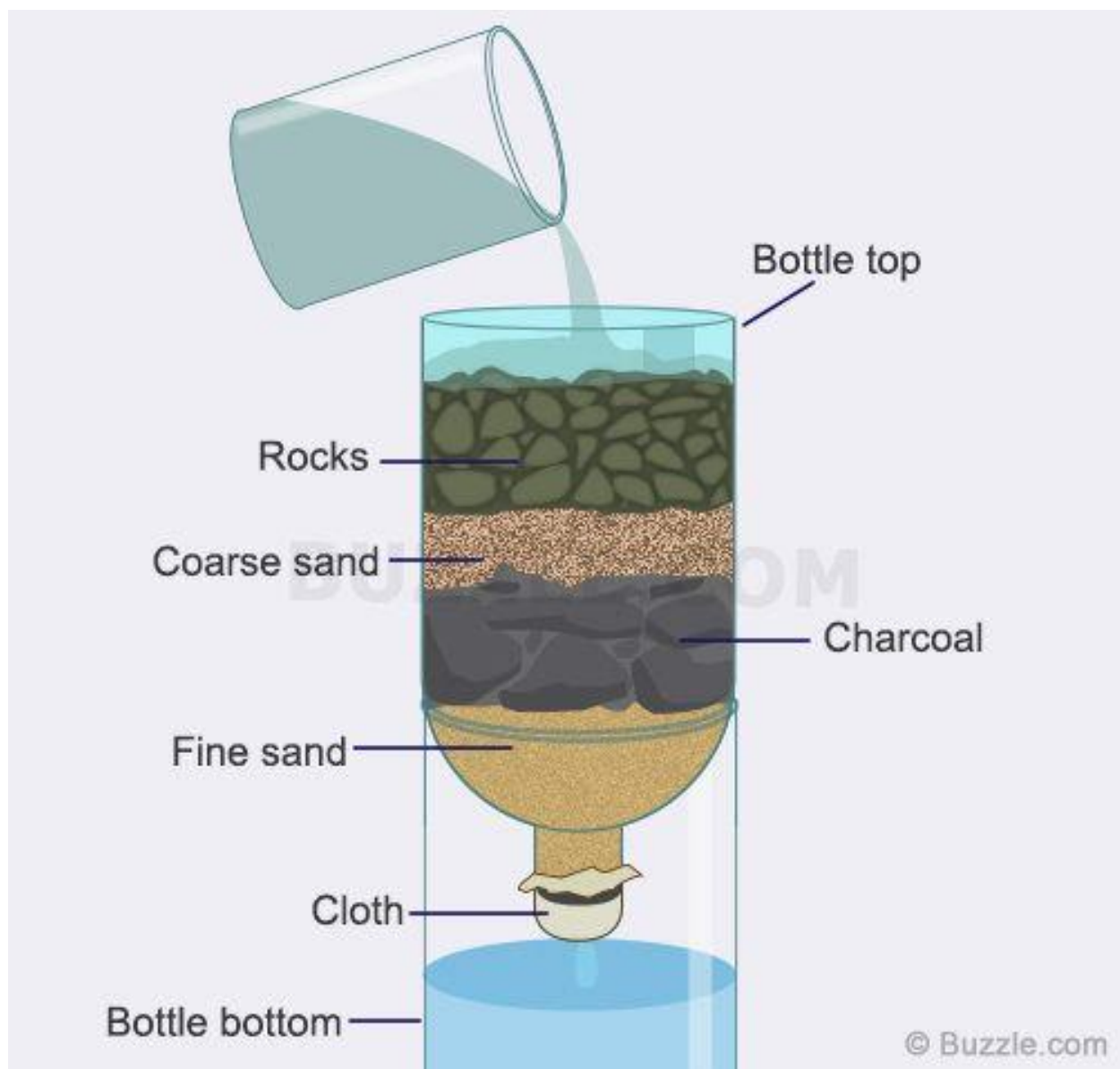
(i) Identify substance **G**. ( ½ mark)

.....

(ii) Write equation of reaction leading to the formation of the colourless gas. ( 1½ marks)

.....  
.....

10. Below is a simple home water purifier. Study it and answer the questions that follow. The charcoal used is *activated charcoal* .



(a) State the role of each of the following in the water purifier.

(i) Rocks. ( ½ mark)

.....  
 .....

(ii) Course sand. ( ½ mark)

.....  
 .....

(iii) Activated charcoal. ( ½ mark)

.....

.....

(iv) Fine sand. ( ½ mark)

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(b) Write the substance that serves as activated charcoal in the treatment of water on a large scale. ( ½ mark)

.....

.....

(c) Write equation of reaction between water and

(i) magnesium. ( 1 ½ marks)

.....

.....

(ii) Calcium. ( 1 ½ marks)

.....

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**SECTION B. ( 30 marks)**

***Attempt only two questions in this section. Additional questions will not be marked***

11. (a) (i) Draw a well labelled diagram to show how a dry sample of ammonia gas can be prepared in the laboratory from calcium hydroxide and ammonium chloride . ( 3½ marks)

(ii) Write equation of reaction that took place leading to the formation of ammonia gas in (a) ( i) ( 1½ mark)

(b)(i) Name the reagent that is used in the laboratory to test for ammonia gas. ( ½mark)

(ii) State what would be observed and write equation of reaction that would take place when the ammonia gas is treated with the reagent in (i). (2 marks)

(c) (i) State the conditions of reaction between ammonia gas and copper(II) oxide. ( 1½ marks)

(ii) Explain the changes that take place when ammonia gas reacts with copper(II) oxide under the conditions stated in c (i). Include equation of reaction. ( 04 marks)

(d) Excess ammonia gas was passed into freshly prepared aqueous iron(II) sulphate.

(i) State what was observed? ( ½ mark)

(ii) Write ionic equation of reaction that took place ( 1½ marks)

(e) State one industrial use of ammonia gas. ( ½ mark )

12 (a) (i) Describe with the aid of well labelled diagram how to prepare a dry sample of hydrogen gas from zinc granules. ( 6 ½ marks)

(ii) Name the substance that can be used to speed up the rate of formation of hydrogen gas in the reaction above. ( ½ mark)

(ii) State how hydrogen gas can be identified in the laboratory. ( 01 mark)

(b) (i) State the conditions of the reaction between hydrogen gas and lead(II) oxide (01 mark)

(ii) State what would be observed when hydrogen gas is reacted with lead(II) oxide under the conditions stated in (b) (i) ( 1 ½ marks)

(iii) Write equation for the reaction that would take place. ( 1½ marks)

(iv) state the role of hydrogen gas when it reacts with lead( II) oxide under the conditions stated in (a) ( ½ marks)

(v) Name any other metal whose oxide can react with hydrogen gas in a similar way like lead(II) oxide. ( ½ mark)

(c) Write equation for the complete combustion of hydrogen gas in air. ( 1½ marks)

(d) State one large scale use of hydrogen gas. ( ½ mark)

13.(a) State one difference between,

(i) mixture and compound? ( 01 mark)

(ii) Heterogeneous mixture and homogenous mixture? (01 mark)

(b) Name one liquid that when added to water forms a,

(i) heterogeneous mixture. ( ½ mark)

(ii) homogenous mixture. ( ½ mark)

(c) Giving a reason in each case, state a method that can be used in the laboratory to obtain water from its mixture with the liquid you have named ,

(i) in (b) (i). ( 1mark)

(ii) in (b) (ii). (1mark)

(d) Draw a well labelled diagram of the set up that can be used in the laboratory to separate the mixture in (b) (i) (2½ marks)

(e) 100 g of ice cubes of pure water were heated as temperature changes were recorded. The changes in temperature were recorded after different time intervals as shown in the table below.

Time (minutes)	0	1	3	5	7	8	8.8	11	12
Temperature	-20	-14	0	0	54	80	100	100	120

(i) Plot a temperature-time graph for the information in the table above. (03 marks)

(ii) Explain the shape of the graph. (4½ marks)

15. Carbon dioxide gas can be prepared in the laboratory by adding hydrochloric acid from the tap funnel and calcium carbonate in the flat bottomed flask, then gas bubbled through water in the first wash bottle, then bubbled through liquid Q in the second wash bottle and finally collected in the gas jar.

(a) (i) the condition(s) of reaction and write the equation of reaction leading to the formation of carbon dioxide gas ( 2 ½ marks)

(ii) the purpose served by water in the preparation of carbon dioxide gas.

( ½ mark)

(iii) Name liquid **Q**, and state its role in the laboratory preparation of carbon dioxide gas. ( 01 mark)

(iv) Give a reason for choice of liquid **Q** named in (iii) which makes it suitable for its role. (01 mark)

(b) (i) Name the method used to collect carbon dioxide gas. ( 01 mark)

(ii) Give a reason for the method of gas collection named in ( b) (i). ( 01 mark)

(c) State how carbon dioxide gas can be tested in the laboratory. ( 01 mark)

(d) Explain the changes that would take place when carbon dioxide gas is bubbled into sodium hydroxide solution. (05 marks)

(e) (i) Write equation of reaction that would take place when a burning piece of magnesium is lowered into a gas jar of carbon dioxide gas. ( 1½ mark)

(ii) State one industrial use of carbon dioxide gas ( ½ mark)

**END.**

*@Ssemogerere Ha'sem's Ramkapul.*

*+256759985315*

*Chemistry Department 2015 – 2022.*