ST. MARY'S GIRLS' SCHOOL - RUNDA
NOV/DEC HOLIDAY - 2024
CHEMISTRY (QUESTION PAPER)
FORM TWO (2)
Time 6 weeks

Name: …………………………………………………. **Adm No**: ……………….

School: …………………………………………………... **Class**: ………………….

Signature: …………………………………………………... **Date**: …………………...

INSTRUCTIONS:

- *Write your **name** and **other details** on the space provided above*
- *Answer **all** the questions in the spaces provided for each question.*
- *All working **must** be clearly shown where necessary.*

WEEK 1

1. Draw a diagram of the apparatus used to measure accurately 250 cm^3 of liquids or solutions. (1 mark)

2. In the laboratory, there are two types of flames; **with reasons**, state which flame is used for: (2mks)

    (a) Heating

    (b) Lighting

3. Shanty accidentally mixed iron fillings, iron (III) chloride crystals and sulphur powder. Describe how she would obtain each of the substances separately. (3 marks)

4. Classify the following as either chemical or physical changes. (5 marks)

Process	Type of change
Electrical conductivity by copper wire	
Rusting of an iron nail	
Sublimation of iodine	
Burning candle wax	
Attraction of iron filings by a magnet	

5. Matter exists in three states. Describe how particles behave in each state according to kinetic theory of matter.

(a) Solid state: (2 marks)

(b) Liquid state: (2 marks)

(c) Gaseous state: (2 marks)

6. Solutions may be classified as strongly basic, weakly basic, neutral, weakly acid, or strongly acidic. The information below gives solutions and their pH values. Study it and answer the questions that follow. Classify the solutions in the table using the stated classifications. (2 Marks)

Solution	pH value	Nature of solution
B	0.5	
C	6	

7. A farmer tested soil in his farm and found out that its pH was 5.5. This was below the recommended pH of 7.0. Suggest how the farmer could achieve the recommended pH of soil in his fam. (1 mark)

8. (a) Zinc reacts with dilute sulphuric (VI) acid to produce a colourless gas. Write an equation for the reaction. (1 mark)

(b) Describe a test for the colourless gas. (2 marks)

9. The set – up below was used to obtain a sample of iron metal.
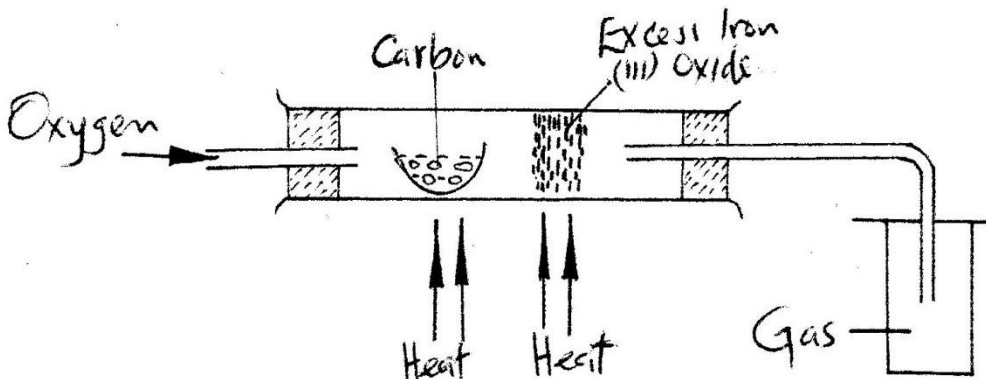
(a) Write **two** equations for the reactions which occur in the combustion tube. (2 marks)

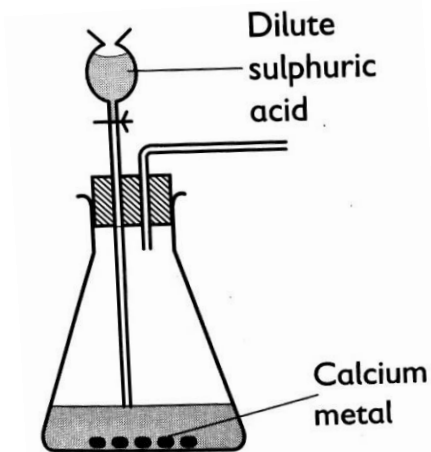Equation 1: ....

Equation 2: ....

(b) Name the gas collected in the gas jar. ..…………………………………… (1 mark)

WEEK 2

10. (a) Name **one** natural source of water for a chemical industry. (1 mark)

(b) Kerosene is a **hydrocarbon**. Name the product of burning kerosene that is a liquid at room temperature. …………………………………………………………………… (1 mark)

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(c) Metal **Y** can displace metal **X** from its oxide. Hydrogen can reduce the oxide of metal **X**. Metal **X** does not react with water, while metal **Y** reacts with water moderately. Metal **Z** reacts with explosively with water. Arrange the metals and hydrogen from the most reactive. (1 mark)

11. The set-up below was used to prepare a gas **Q**.

(a) Complete the diagram to show how a dry sample of gas **Q** may be collected. (2 marks)
(b) Give a reason why calcium is not the most appropriate metal for use in this preparation. (1 mark)
(c) Write an equation for the reaction for the formation of gas **Q**. (1 mark)

12. Complete the key shown below for sub atomic particles. (3 marks)

Key

A ....

B....................................

C ....
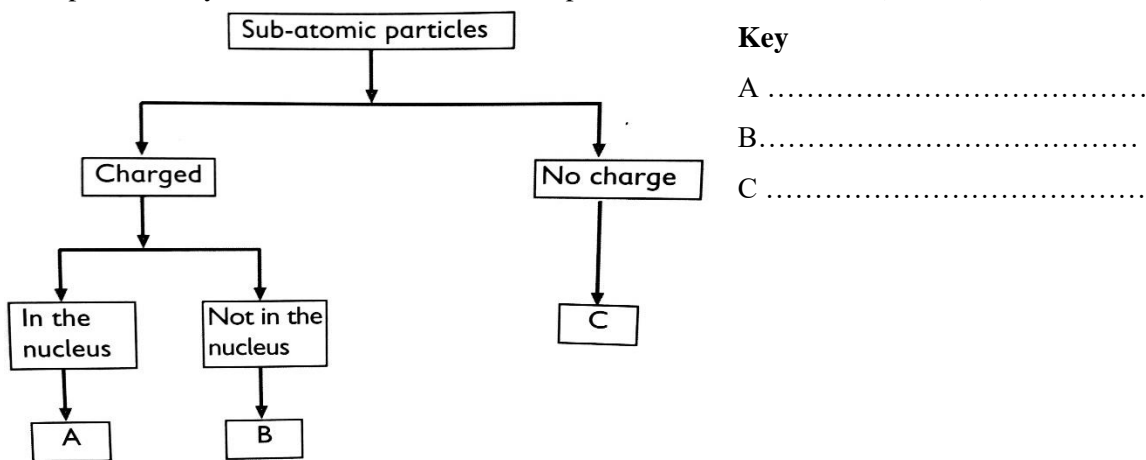
13. The relative atomic mass of element Y which consists of the isotopes ^{20}Y and ^{22}Y is 20.2. Calculate the percentage of the atoms in the isotopic mixture. (3 marks)

14. The ionic radii of the ions of Q and R are given as follows: Q^{2+} = 2,8,8 and R^- = 2,8.

(a) Complete the table below: (2 marks)

Element	Group	Period
Q		
R		

(b) Write the formula of the product formed when Q and R react. (1 mark)

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15. The halogens are a group of non-metals in Group VII of the Periodic Table.

(a) Describe an experiment which shows that chlorine is more reactive than iodine. Include an equation in your answer. (3 marks)

(b) State **two** observations made when warm sodium metal in a deflagrating spoon is lowered in a gas jar full of chlorine gas? (2 marks)

(c) Write an equation for the reaction in (b) above. (1 mark)

16. The following table gives the number of protons in the nucleus of some elements. The letters do not represent the actual symbols of elements. Use it to answer the questions that follow.

Element	E	F	G	H	I	J	K	L
Number of protons	3	12	6	17	10	19	14	35

(a) Which elements belong to the same group of the periodic table? (2 marks)

(b) How will the reactivity of element **F** compare with that of element **K**? Explain. (2 marks)

17. The atomic numbers of elements **X** and **W** are 11 and 16 respectively.

(a) Write the electronic arrangements of the elements. (1 mark)

Element X…………………………………… Element W…………………………………

(b) Predict the type of bonding in the product formed if elements **W** and **X** were to be reacted. Give the formula of the resulting compound. (2 marks)

Type of bond………………………………… Formula of compound ………………………

WEEK 3

18. The table below show the physical properties of some substances. Use it to answer the questions that follow.

Substance	Melting point (^{0}C)	Boiling point (^{0}C)	Electrical conductivity	
			Solid	Liquid
U	1083	2595	Good	Good
V	801	1413	Poor	Good
W	6	80	Poor	Poor
X	-114	-84	Poor	Poor
Y	3550	4287	Poor	Poor

(a) Which substance is likely to be; (1 mark)

(i) An element …………………………… (ii) A liquid at 22ºC ………………………….

(b) Which substance is likely to have the following structures? (3 marks)

(i) Simple molecular structure …………………………………………………………….

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(ii) Giant ionic structure …………………………………………………………………………

(iii) Giant atomic structure …………………………………………………………………………

19. The diagram below shows the apparatus used for the electrolysis of molten sodium bromide.
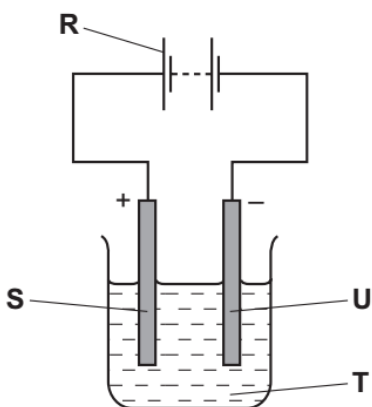
(a) Which letter **R, S, T** or **U** on the diagram represents the cathode?   (1 mark)

(b) State the observation made at the anode.   (1 mark)

(c) Which **condition** is missing in the set-up? …………………………………………   (1 mark)

(d) Write the half equation for the reaction at: (2 marks)

   (i) Cathode: ………………………………………………………………………………………….

   (ii) Anode: ………………………………………………………………………………………….

20. Describe an experiment that can be used to prepare a solid sample of sodium hydrogen carbonate in the laboratory starting with sodium metal.   (3 marks)

21. A form 2 student carried out the separation as shown in the set-up below:-
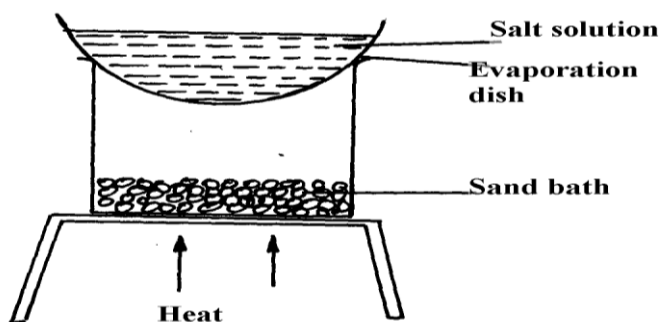
 (i) Identify the method above. (1Mark)

 (ii) Give **one** disadvantage of the above method.

22. The grid below shows a part of the periodic table. The letters do not represent the actual symbols. Use it to answer the questions that follow:-

C							T
	K					U	
X	Y		M			Q	W	
J							Z

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(a) How do the atomic radius of element **X** and **Y** compare.

(b)(i) Using crosses (**X**) to represent electrons, draw the atomic structure of element **Q**

(ii) State the period and the group to which element **Q** belong   (1Mark)

(c) (i) The ionic configuration of element **G** is 2.8 **G** forms an ion of the type **G**$^{-1}$.

   Indicate on the grid, the position of element **G.**   (1Mark)

(ii) To which chemical family does element **G** belong?   (1Mark)

(iii) State **one** use of element **U**   (1Mark)

(iv) What is the nature of the compound formed between **K** and **U**   (1Mark)

23. Sodium and Magnesium belong to the same period on the periodic table and both are

   Metal. Explain why magnesium is a better conductor of electricity than sodium.

WEEK 4

24.   Using dots and crosses to represent electrons, draw the structures of the following:

   (a) Phosphorous chloride (PCl$_3$)   (2Marks)

   (b) Hydroxonium ion   (H$_3$O$^+$)   (2Marks)

25. Water has a boiling point of 100°C while hydrogen chloride has a boiling point of

-115°C. Explain   (2Marks)

26.   Study the table below and answer the questions that follow:-

Substance		A	B	C	D	E	F
Melting Point (ºC)		801	113 119	339	5	-101	1356
Boiling point (ºC)		1410	445	457	54	-36	2860
Electrical Conductivity	Solid	Poor	Poor	Good	Poor	Poor	Poor
	liquid	Good	Poor	Good	Poor	Poor	Poor

I Identify with reasons the substances that:

(i) Have a metallic structure. Explain   (2Marks)

(ii) Have a molecular structure and exist in the liquid state at room temperature and

   pressure . Explain   (2Marks)

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(iii) Suggest with a reason why substance **C** has a higher melting point than **B**(2Marks)

(iv) Substances **A** and **C** conduct electric current in the liquid state.

State how the two substances differ as conductors of electric current.

27. Give the name of each of the processes described below which takes place when salts are exposed to air for sometime

    i) Anhydrous copper sulphate becomes wet   (1Mark)

     ii) Magnesium chloride forms an aqueous solution   (1Mark)

     iii) Fresh crystals of sodium carbonate, $Na_2CO_3.10H_2O$ become covered with

       white precipitate of $Na_2CO_3.H_2O$

28. In the preparation of magnesium carbonate, magnesium was burnt in air and the product C collected. Dilute sulphuric acid was then added and the mixture filtered and cooled. Sodium carbonate was added to the filtrate and the contents filtered. The residue was then washed and dried to give a white powder.

    (a) Give the name of the product C.   (1Mark)

    (b) Write a well- balanced chemical equation for the formation of the product C. (2Marks)

    (c) (i) Name the filtrate collected after sodium carbonate was added.   (1Mark)

       (ii) Write down the chemical formula of the white powder   (1Mark)

    (d) Write a chemical equation for the reaction between product C in **(a)** and the acid.   (2Marks)

    (e) Write an ionic equation to show the formation of the white powder.   (2Marks)

    (f) Write a well-balanced equation to show what happens when the white powder   heated. (2Marks)

    (g) Identify the ions present in the filtrate after addition of sodium carbonate.   (1Mark)

    (h) What is the name given to the reaction that takes place when sodium carbonate

     was added to the filtrate?   (1Mark)

29. The diagram below shows the heating curve of a pure substance. Study it and answer the

    questions that follow:
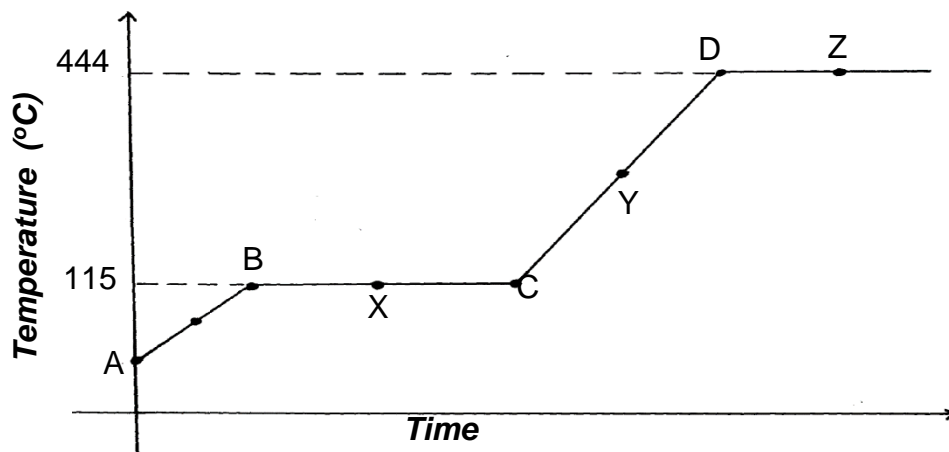
(a) What physical changes are taking place at points **X** and **Z**?   (2Marks)

(b) Explain what happens to the melting point of sodium chloride added to this substance. (2Marks)

30. When the air-hole is fully opened, the Bunsen burner produces a non-luminous flame. Explain. (2Marks)

31. (a) What is electrolysis?   (1Mark)

 (b) Give two reasons why graphite is used as an electrode during electrolysis (2Marks)

(c) Give three applications of electrolysis   (3Marks)

32. (a) Differentiate between allotropy and an allotrope   (2Marks)

   (b) Basing yourself on structure and bonding, comment on the electrical conductivity   of graphite and diamond (3Marks)

33. A student set up the following apparatus in order to determine percentage of Oxygen by volume of air.

Beggining
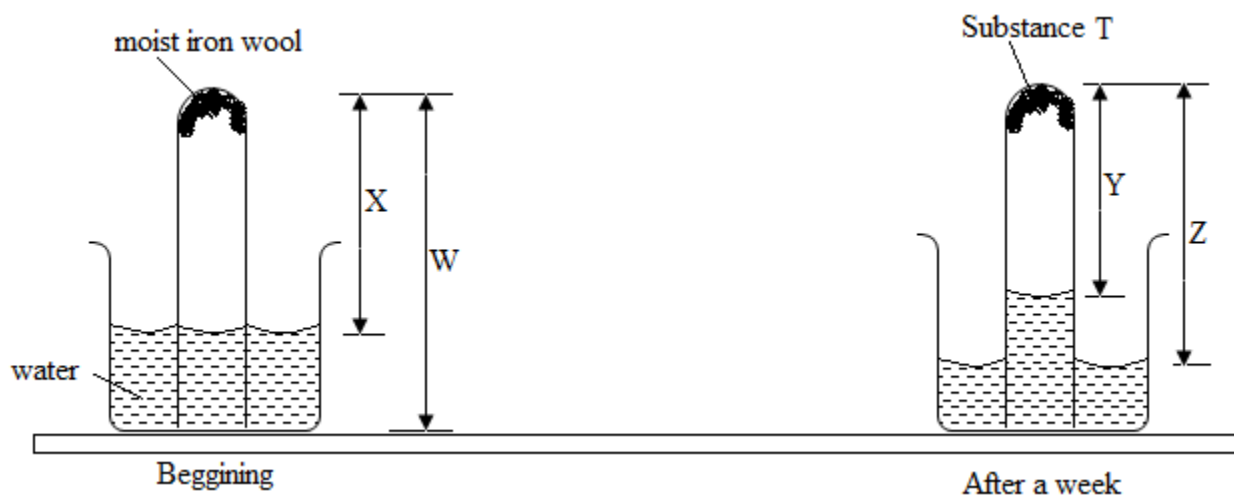
After a week

i. State and explain the observations made on the moist iron wool at the end of the experiment (after a week).   (1mk)
ii. Give the expression of the percentage of oxygen by volume in the air in terms of the letter X, W,Y and Z in the diagram.   (1mk)
iii. Write the formula of substance T.   (1mk)
 34. The paper chromatography below shows the identification of unknown metal ion E and F. The reference ions are K,L,M and N are shown. The experiment was done in ascending method.
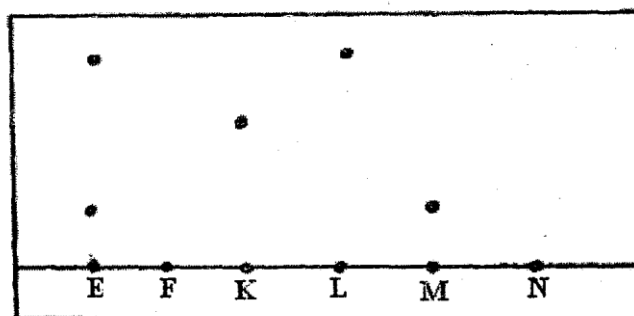
(i) Name the ions in the mixture E. (1mk)
(ii) Mixture F contains all the three ions. On the diagram show the chromatogram of F. (1mk)
(iii)Comment on the ion N in the diagram. (1mk)

WEEK 5

35. The following data gives pH values of solutions A, B and C.

Solution	A	B	C
PH	13.6	6.9	1.3

(i) Which solution named produce carbon (IV) oxide where reacted with a carbonate? (1mk)

(ii) Write an ionic equation to show how the above reaction a(i) would be represented (1mk)

(iii)What would be the colour of solution A after adding a few drops of phenolphthalein? (1mk)

36. Study the table below.

Metal	Reaction with air	Reaction with water	Reaction with dilute acid
A	Reacts	Reacts slowly	Reacts
B	Does not react	Does not react	Does not react
C	Reacts	Reacts	Reacts vigorously

a) Which metal is likely to be magnesium? (1mk)

b) Which metal may be used as a cooking pot? (1mk)
c) Arrange the metals in order of reacting starting with the most reactive. (1mk)

37. An element Q has atomic number 3, relative atomic mass 6.94 and consists of two isotopes of mass 6.0 and 7.0.
(i) What is the mass number of the more abundant isotope of Q? Give a reason for your answer.

(1mk)

(ii) Calculate the percentage abundant of the isotope which is more abundant. (2mks)
38. An element Y has the electronic configuration of 2.8.5.

(a) Write the formula of the most stable anion formed when element Y ionizes. (1mk)

(b) Write the formula of the compound formed by X and Y if the ion of x is represented as X^{2+} (1mk)

(c) Explain the difference between the atomic radius of element Y and its ionic radius. (1mk)

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39. Starting with zinc sulphate solution describe how a sample of zinc oxide can be obtained   (3mks)

WEEK 6

40. The diagram below shows a set up that can be used for preparation of solid T in the laboratory.
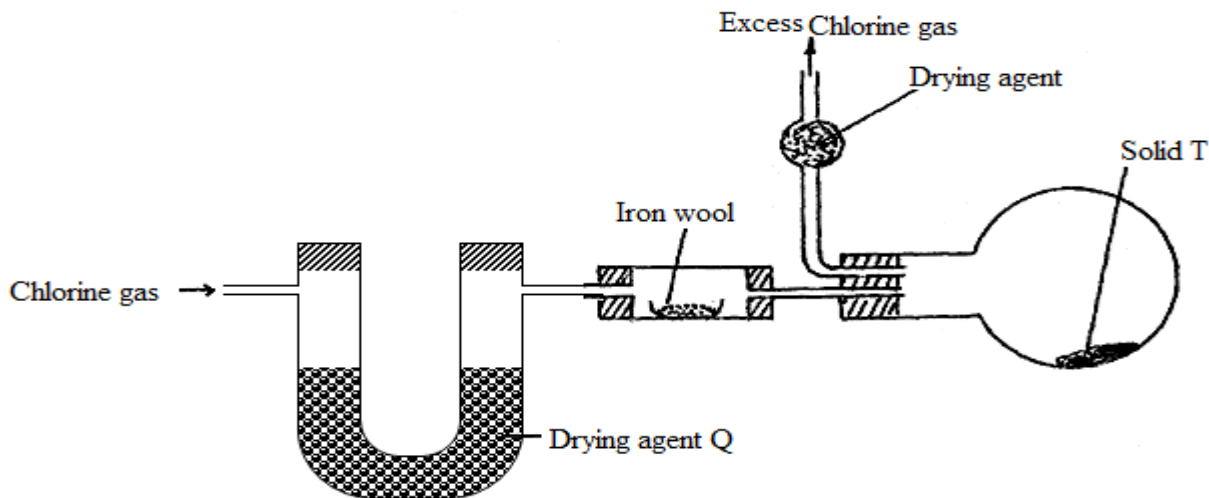
a) What condition must be included in the above apparatus for solid T to be formed?   (1mk)

b) Name the solid:
   (i) Q…………………………………………………………………………………………. (½ mk)
   (ii) T…………………………………………………………………………………………….. (½ mk)
c) Why is it possible to collect T as shown?   (1mk)
41. Below is a table showing elements in group II of the periodic table. Study it and answer the questions that below.

Element	1st ionization energy (KJ/mol)	2nd ionization energy (KJ/mol)
Magnesium	900	1800
Beryllium	736	1450
Calcium	590	1150

(a) What is ionization energy?   (1mk)
(b) Explain why 2nd ionization energy of the elements is larger compared to 1st ionization.   (2mks)

42. The melting point of phosphorus trichloride is 90°C while that of magnesium chloride in 715°C in terms of structures and bonding explain the differences in their melting point.   (3mks)

43. (a) Name one property of Neon that makes it possible to be used in electric lamps.

(1mk)

(b) Name any other use of Argon other than in electric lamps.   (1mk)

44. a)   In the fractional distillation of liquid air explain how each of the following components

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are removed prior to air.

i)   Dust particles   (1mk)

ii)   Carbon (iv) Oxide   (1mk)

iii)   Water Vapour   (1mk)

45. Study the information below and answer the questions that follow.

| Number of carbon atoms for molecule	Relative molecular mass of hydrocarbon
2	26
3	40
4	54

46. When the oxide of element H was heated with powdered carbon, the mixture glowed and carbon(IV)oxide gas was formed. When the experiment was repeated using the oxide of element J, there was no apparent reaction.
(a) Suggest one method that can be used to extract element J from its oxide.   (1mk)
(b) Arrange the elements H, J and carbon in the order of their decreasing reactivity.   (1mk)

47. When a sample of concentrated sulphuric (IV) acid was left in an open beaker in a room for two days the volume was found to have increased slightly.
(a) What property of concentrated sulphuric (IV) acid is shown by the above reaction?   (1mk)

(b) State one use of concentrated sulphuric(IV) acid that depends on the property named above. (1mk)

48. The diagram below shows a set used to prepare gas Z.
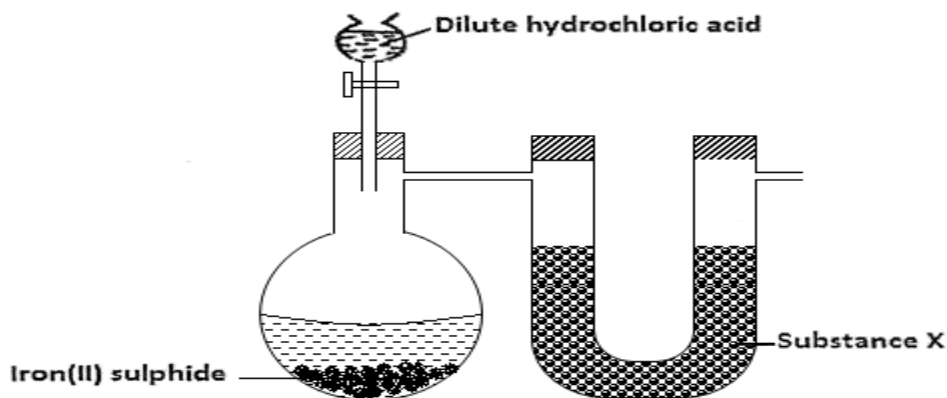
a)   Complete the diagram to show how gas z is collected.   (1mk)

b)   Write an equation for the reaction between iron(II)sulphide and dilute hydrochloric acid. (1mk)
c)   Name substance x.   (1mk)
49. When magnesium ribbon is burnt in air, two compounds were formed, one of which is magnesium oxide:

(i) Name the other compound. (1mk)