MINISTRY OF EDUCATION AND HIGHER EDUCATION

FORM FOUR EXAMS, 2011

CHEMISTRY

2011

P/LAND NATIONAL EXAMINATION BOARD

Name .....

School .....

Roll Number.....

Puntland State of Somalia

Ministry of Education

Puntland National Examination Board

Form 4

CHEMISTRY EXAMINATION

2011

Time 2 hours

Plus 10 minutes before the exam for reading through the paper

TOTAL TIME 2 hours 10 minutes

INSTRUCTIONS TO CANDIDATES

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This paper consists of 18 printed pages

Count them now. If there are any missing, inform the invigilator

There are two parts:

SECTION A – 10 Multiple Choice Questions	**10 Marks**
SECTION B – 10 Structured Questions	**90 Marks**
TOTAL	**100 Marks**

- Answer all questions
- All answers and working must be written on this paper in the spaces provided immediately after each question
- Rough work can be done on page 2. This will not be marked
- No extra paper is allowed
- No calculators are allowed
- If you make a mistake, cross out the incorrect answer and clearly write your correct answer

Use This Page for Rough Work, It Will Not Be Marked

SECTION A: MULTIPLE CHOICE QUESTIONS (10 MARKS)

Instructions for this section:

- For each question in this section, **circle** the correct answer

1. The non-luminous flame is

   A) silent B) blue C) sooty D) large

2. Which formula represents copper(I) oxide?

   A). CuO B) CuO_2 C) Cu_2O D) Cu_2O_2

3. Which term describes the relationship between oxygen and ozone?

   A) Allotropes B) Conjugates C) Isomers D) Isotopes

4. What is the empirical formula of a compound that has a carbon-to-hydrogen ratio of 2 to 6?

   A) CH_3 B) C_2H_6 C) C_3H D) C_6H_2

5. Electrical fires cannot be safely put out by dousing them with water. However, fire extinguishers that spray solid carbon dioxide on the fire work very effectively. This method works because carbon dioxide

   A) displaces the oxygen.
   B) renders the fire's fuel non-flammable.
   C) forms water vapour.
   D) blows the fire out with strong wind currents

6. $C_3H_8 + O_2 \longrightarrow CO_2 + H_2O$

   This chemical equation represents the combustion of propane. When correctly balanced, the coefficient for water is

   A) 2. B) 4. C) 8. D) 16.

7. Which electron configuration would you expect to see for a magnesium atom in its ground state?

A) $1S^2\ 2S^2\ 2P^6$ B) $1S^2\ 2S^2\ 2P^5$

C). $1S^2\ 2S^2\ 2P^6\ 3S^2$ D) $1S^2\ 2S^2\ 2P^6\ 3S^2\ 3P^3$

8. Which of the following process can be used to separate a mixture of sand and water

A) Fractional distillation B) Chromatography

C). Filtration D) Evaporation

9. The table below shows the pH and reaction to litmus of four body fluids.

BODY FLUID	**pH**	**RED LITMUS**	**BLUE LITMUS**
Blood	7.4	Turns blue	No change
Bile	8.2	Turns blue	No change
Saliva	6.8	No change	Turns red
Gastric Juice	1.7	No change	Turns red

These data indicate that gastric juice is

A) very acidic. B) very basic.

C) positively charged. D) negatively charged

10. Which of the following statements is true concerning acids and bases?

A) Acids and bases don't react with each other

B) Acids mixed with bases neutralize each other

C) Acids mixed with bases make stronger bases

D) Acids mixed with bases make stronger acids

PART 2: STRUCTURED QUESTIONS. 90 MARKS

QUESTION ONE: (6 Marks)

1. Choose a gas from the following list to answer the questions below. Each gas may be used once, more than once or not at all.

Ammonia	**argon**	**carbon dioxide**	**carbon monoxide**	
Chlorine	**ethene**	**hydrogen**	**nitrogen**	**oxygen**

Which gas

(i) is a noble gas.....

(ii) is an acidic oxide.....

(iii) can be polymerised.....

(iv) is the active component of air.....

(v) is used in the treatment of water.....

(vi) is a product of respiration.....[6 marks]

QUESTION TWO (5 Marks)

2. Copper II oxide catalyses the decomposition of hydrogen peroxide. 0.5 gm of the oxide was added to a flask containing 100cm3 of hydrogen peroxide. Solution. A gas was released.

a) What is a catalyst? [1mark]

.....

.....

b) Name the gas formed [1mark]

.....

c) Write a symbolic equation for the decomposition of hydrogen peroxide [1mark]

.....

d) What mass of copper II oxide would be left in the flask at the end of the reaction?

.....

..... [1mark]

e) Name one other chemical that catalyses this decomposition [1mark]

.....

.....

QUESTION THREE (13 Marks)

3. The diagram shows part of the Periodic Table.

I	II										III	IV	V	VI	VII	0
																He
Li												C	N	O	F	Ne
Na														S	Cl	Ar
K							Fe			Cu	Zn				Br	Kr

(a) Answer these questions using only the elements shown in the diagram.

Write down the symbol for an element which

(i) is a transition metal.....

(ii) forms an acidic oxide.....

(iii) has six electrons in its outer shell.....

(iv) has a giant covalent structure.....

(v) reacts rapidly with water.....

(vi) has a higher proton (atomic) number than iron.....

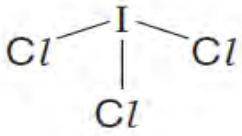
[6 marks]

(b) Some uses of some non-metallic elements are show below. Draw lines between the boxes to link the elements to their correct uses. The first one has been done for you.

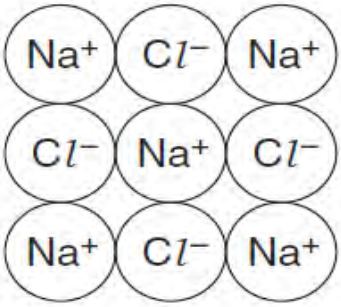
element	use
oxygen	in light bulbs
argon	in oxygen tents in hospitals
chlorine	to kill bacteria in water purification
carbon (graphite)	in balloons
helium	as a lubricant

[4]

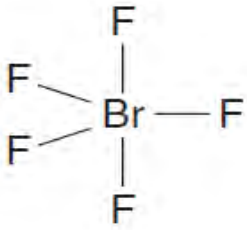
(c) The structures of some halogen compounds are shown below.



A



B



C

(i) Describe the type of bonding in compound **A**.....

(ii) State the simplest formula for compound **C**.....

(iii) Explain why compound **B** does not conduct electricity when solid but does conduct when molten.....

[3 marks]

QUESTION FOUR (Total 7 marks)

4. a).The first ionization energy of Lithium is 520 kj mol^{-1}

i) Explain the term first ionization energy [1mark]

.....

.....

.....

ii) Write an equation with the state symbols, to represent the first ionization energy of Lithium [2marks]

.....

.....

.....

b). Carbon and silicon are both **p** block elements and in group **IV**.

i). Write down the electronic configuration of carbon and silicon.

Carbon…….. [1mark]

.

Silicon ……... [1mark]

ii). What do you notice about their outer shell configuration [1mark]

.....

.....

.....

iii) suggest giving a reason, the outer shell configuration for germanium [1mark]

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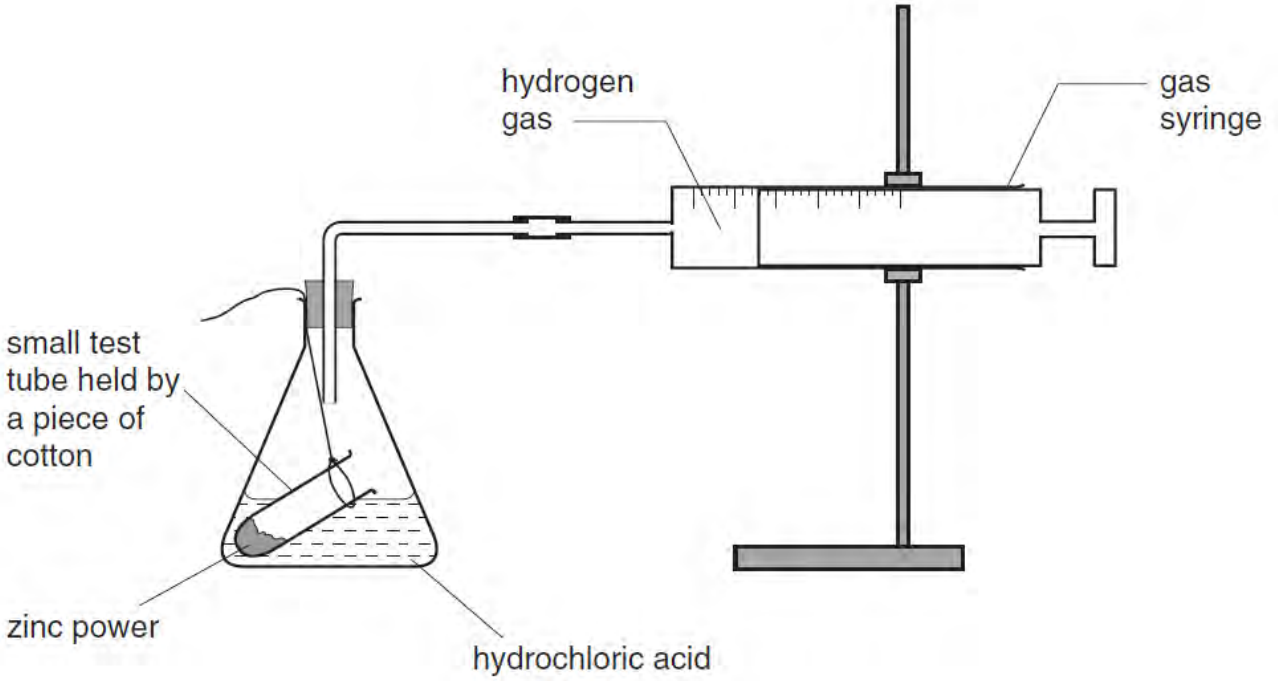
.....

.....

QUESTION FIVE: (12 Marks)

5. A student investigates the reaction between zinc and hydrochloric acid. The hydrochloric acid is in excess. The student uses the apparatus shown in the diagram.



(a) What should the student do to start the reaction?

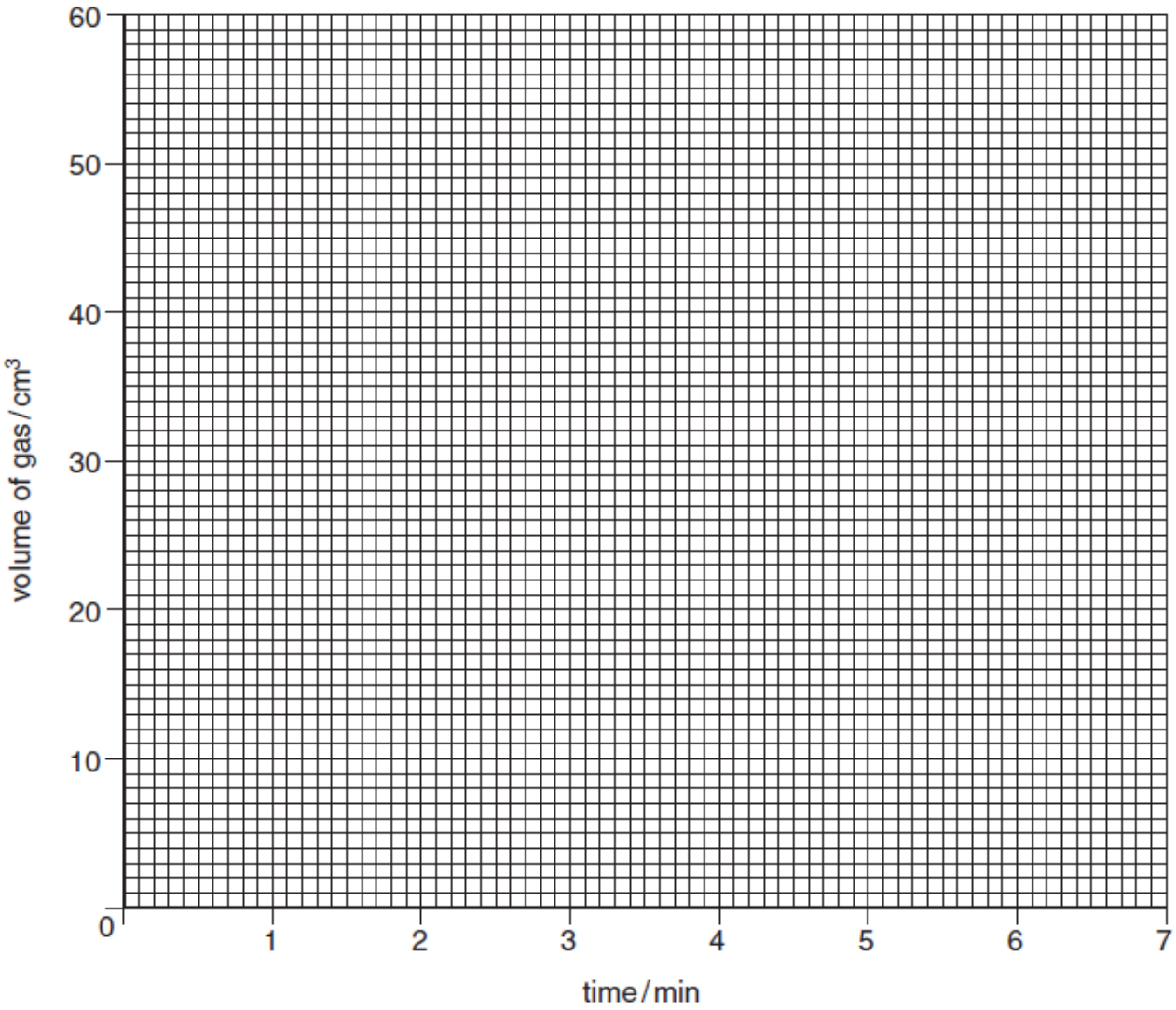
..... [1 mark]

(b) The student reads the volume of gas in the syringe every minute.

The results are shown in the table.

time in minutes	0	1	2	3	4	5	6	7
volume of gas in cm^3	0	23	35	45	50	53	55	55

(i) Plot the results on the grid below.



(ii) Draw the best curve through the points.

(iii) Explain why the volume of gas stays the same after six minutes.

.....

.....

..... [5 marks]

(c) The student does the experiment again.The only difference is that the student uses warm, rather than cold, hydrochloric acid.

On the grid, draw the shape of the graph you would expect for the experiment with the warm hydrochloric acid. [2 marks]

(d) (i) Balance the equation for the reaction between zinc and hydrochloric acid. [1 mark]

$$Zn + ...HCl \rightarrow ZnCl_2 + H_2$$

(ii) Name the compound which has the formula $ZnCl_2$. [1 mark]

.....

(iii) Calculate the relative formula mass of $ZnCl_2$. [1 mark]

.....

.....

.....

(e) Zinc is an element. State the meaning of the term *element*. [1 mark]

.....

.....

QUESTION SIX (9 Marks)

6. Use the information given in the table below to answer the questions below concerning the elements Q, R, S,T and X.

Element	Atoms number	Mass number	Electronic structure
Q	3	7	2.1
R	20	40	2.8.8.2
S	18	40	2.8.8
T	8	18	2.6
X	19	39	2.8.8.1

a) Which element has 10 neutrons in each atom? ……[1mark]

b) Which two elements are in the same group of the periodic table and which group is this? …… [2marks]

c) Which two elements form ions with the same electron structure as argon? Explain your answer. ……

……

…… [3marks]

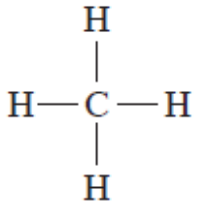
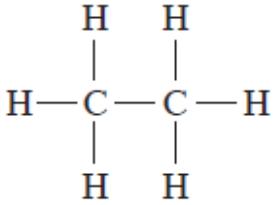
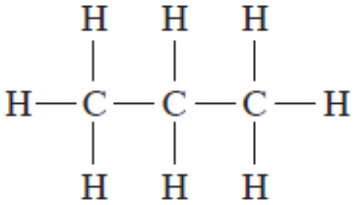
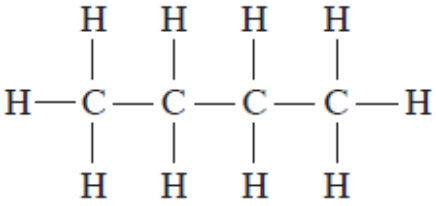
d) Which is the most reactive element shown in the table?..... [1mark]

e) Which of the above elements, can be calcium?.....[1mark]

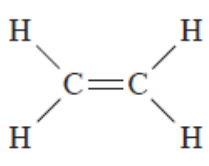
f) Which element can form an acidic oxide?.....[1mark]

QUESTION SEVEN (8 Marks)

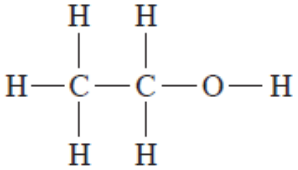
7. (i) The table below shows the names, molecular formulae and structural formulae of some alkanes. The molecular formula for propane is missing. Complete the table by putting in the missing molecular formula for propane. [1 mark]

Name	Molecular formula	Structural formula
Methane	CH_4	
Ethane	C_2H_6	
Propane	.....	
Butane	C_4H_{10}	

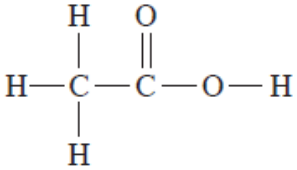
(ii) Use the four structural formulae drawn below to answer parts I, II and III.



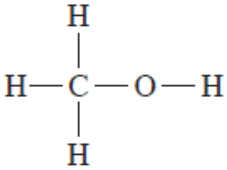
A



B



C



D

Give the letter, **A**, **B**, **C** or **D**, of the structure which shows

I. ethene, C_2H_4 ,.....

[1mark]

II. ethanoic acid, CH_3COOH, ... [1mark]

III. ethanol, C_2H_5OH. ..... [1mark]

(iii)

Wine	**Vinegar**	**Car battery acid**	**Orange juice**	**Petrol**

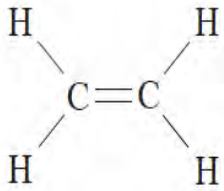
Choose, from the substances in the box above, the substance which contains

I. ethanol, ... [1 mark]

II. ethanoic acid. ..... [1 mark]

(iv) Complete the table below to show the structural formulae for the hydrocarbons given.

[2 marks]

Name	*methane*	*ethane*	*ethene*
Formula	CH_4	C_2H_6	C_2H_4
Structural formula	.....	.....	

QUESTION EIGHT (9 Marks)

8. a). Chemical and physical processes involve absorption or releasing of energy (a change in energy)

i) What name is given to the reactions that absorb energy from the surroundings? [1mark]

.....

ii) What name is given to reactions in which ΔH is negative [1mark]

.....

b). Draw the enthalpy profile of the reactions below. [4marks]

$C_{(g)} + O_2 \rightarrow CO_{2(g)}$ $\Delta H = -393 kjmol^{-1}$

$CO_{2(g)} \rightarrow C_{(s)} + O_{2(g)}$ $\Delta H = +393 kjmol^{-1}$

.....

.....

.....

.....

.....

.....

.....

c) . i). $25cm^3$ of 1.0m sodium hydroxide reacts with $25cm^3$ of 1.0m hydrochloric acid and the temperature rises from 22^0C to 28.5^0C. Determine the molar enthalpy of neutralization. Note: specific heat capacity =(4.2 J g^{-1} k^{-1}) [2marks]

.....

.....

.....

.....

.....

ii). What is meant by molar enthalpy of solution? [1mark]

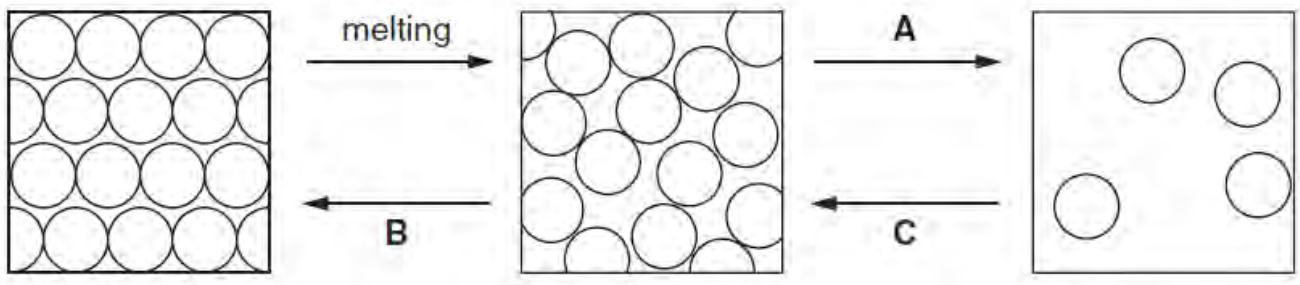
.....

.....

.....

QUESTION NINE (13 Marks)

9. The states of matter are solid, liquid and gas. The diagram below shows how the molecules are arranged in these three states.



(a) State the name given to the change of state labelled

(i) A .....

(ii) B .....

(iii) C.....

[3 marks]

(b) Which one of the following best describes the movement of molecules in the liquid state?

Circle the correct answer.

A) The molecules are not moving from place to place.

B) The molecules are sliding over each other.

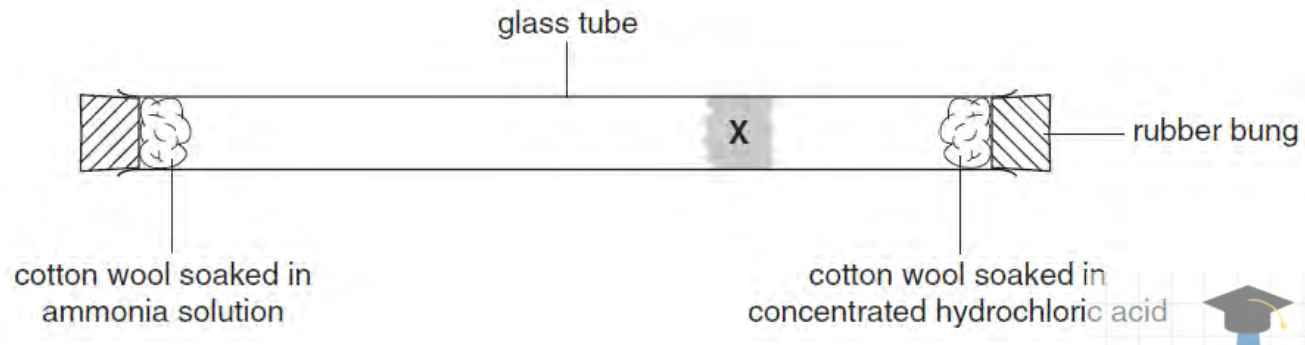
C) The molecules are moving freely. [1 mark]

(c) Which of the changes **A**, **B** or **C**, is endothermic? Explain your answer.

.....

.....[2 marks]

(d) A student set up the apparatus shown in the diagram below.



The white solid is formed because the molecules of hydrogen chloride gas and ammonia gas move at random throughout the tube and eventually react with each other.

(i) State the name given to this random movement of molecules.

.....

(ii) State the name of the white solid formed at **X**.

.....

(iii) Suggest why the white solid is formed towards one end of the tube and not in the middle.

.....

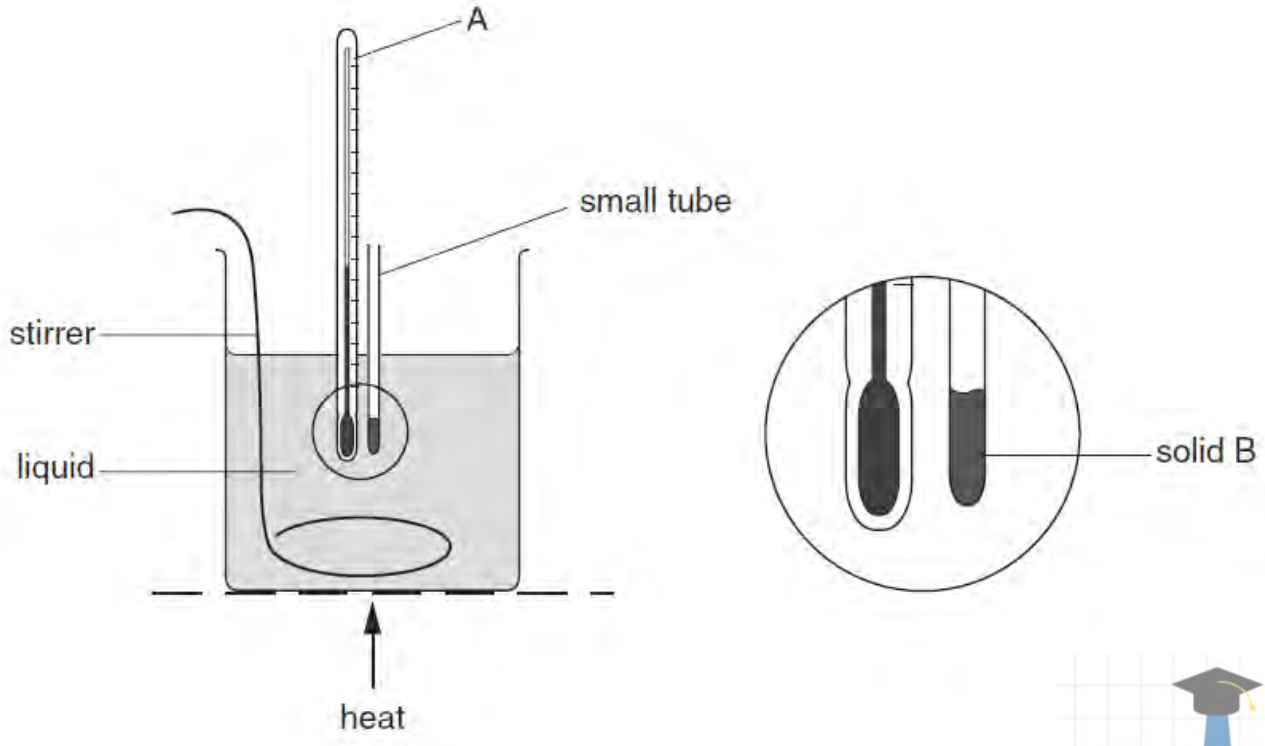
..... .[3 marks]

(f) What type of chemical reaction takes place when ammonia reacts with hydrochloric acid?

.....[1 mark]

(g) The diagram below shows a simple apparatus that can be used for measuring the melting point of a solid. The liquid in the beaker is heated slowly and the temperature at which the solid B melts is recorded.

(i)



(i) State the name of the piece of apparatus labelled **A**.

.....

(ii) Solid **B** melted at 155^{o}C.

Why would water **not** be a suitable liquid to put in the beaker when using this apparatus to find the melting point of solid **B**?

.....

.....

.....

(iii) Suggest why the liquid needs to be kept stirred.

.....

.....

.....[3 marks]

QUESTION TEN (9 Marks)

10.a). Ethanol is an important chemical. It is a member of homologous series.

i) To which homologous series does ethanol belong? [1mark]

.....

.....

ii) What is the general formula for the series? [1mark]

.....

.....

iii) What is the functional group of ethanol's homologous series? [1mark]

.....

.....

iv) What does functional group mean? [1mark]

.....

.....

v) Write down the formula of ethanol. [1mark]

.....

.....

.....

b). When ethanol vapour is passed over heated Aluminum oxide, a dehydration reaction occurs and the gas ethene is produced.

i) Write a chemical equation for the reaction [1mark]

.....

.....

ii) What does dehydration reaction mean? [1mark]

.....

.....

iii) What is the purpose of Aluminium Oxide [1mark]

.....

.....

.....

c. Ethanol burns well in oxygen, giving plenty of heat. Complete the reaction.

Ethanol + oxygen → carbon dioxide +…. ……. ……. + heat. [1mark]

END