MINISTRY OF EDUCATION AND HIGHER EDUCATION

FORM FOUR EXAMS, 2017

CHEMISTRY

2017

P/LAND NATIONAL EXAMINATION BOARD

MINISTRY OF EDUCATION AND HIEGHER EDUCATION
PUNTLAND NATIONAL EXAMINATIONS BOARD

Code Number

FORM FOUR EXAMINATION 2017
Time 2 hours AND 10 minutes for reading

CHEMISTRY

Instructions to candidates

- Answer all the questions
- This paper consists of 15 pages, count it and if any is missing inform your invigilator
- Do not write your **name and roll number** on the exam paper
- Make sure that **student's profile** is attached to the exam paper, if not, inform you invigilator.
- No extra paper is allowed. Rough work can be done on page 1. This will not be marked.
- If you make a mistake, **cross out the incorrect** answer and **write your correct answer.**

This exam paper consists of following parts

PART ONE:	MULTIPLE CHOICE QUESTIONS	10 MARKS
PART TWO:	STRUCTURED QUESTIONS	90 MARKS
	TOTAL	**100 marks**

For the marker only

Parts	Marks
Part one	
Part two	
Total	%

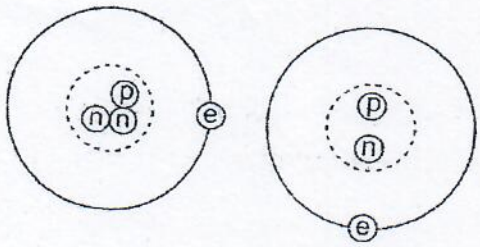
Use this page for rough work, it will not be marked.

PART ONE: MULTIPLE CHOICE QUESTIONS 10 MARKS

1- Which one of the following methods is used to remove hardness of water?

A- Filtration
B- Condensation
C- Decantation
D- Distillation

2- Which do these two diagrams represent?



A- Different atoms of the same element.
B- Ions of the same element
C- Atoms of two different elements in the period
D- Atoms of the same element in the same group.

3- Magnesium chloride ($MgCl_2$) and calcium oxide (CaO) are ionic compounds. Electricity is passed through the molten compounds, in two separate experiments. Which are the products at the cathode?

A- Magnesium and calcium
B- Magnesium and Oxygen
C- Oxygen and Calcium
D- Chlorine and Oxygen

4- A chemical has a relative molecular mass of **100 g** , which of these could it be?

A- H_2O
B- H_2SO_4
C- $CaCO_3$
D- $C_{14}H_{16}$

5- The table below shows the PH value of some solutions.

Solution	A	B	C	D
PH	2	7	10	1

Which solution is likely to be sodium hydroxide?

A- Solution D
B- Solution A
C- Solution B
D- Solution C

6- Which substance has a giant structure, in which each carbon atom forms a tetrahedron with four other carbon atoms?

A- Silicon dioxide
B- Methane
C- Diamond
D- Graphite

7- Enthalpy change of neutralization is the enthalpy change when one mole of

A- Compound burns completely with oxygen
B- Compound form from its elements
C- An acid reacts with one mole of an alkali
D- An acid reacts with one mole of an ethanol

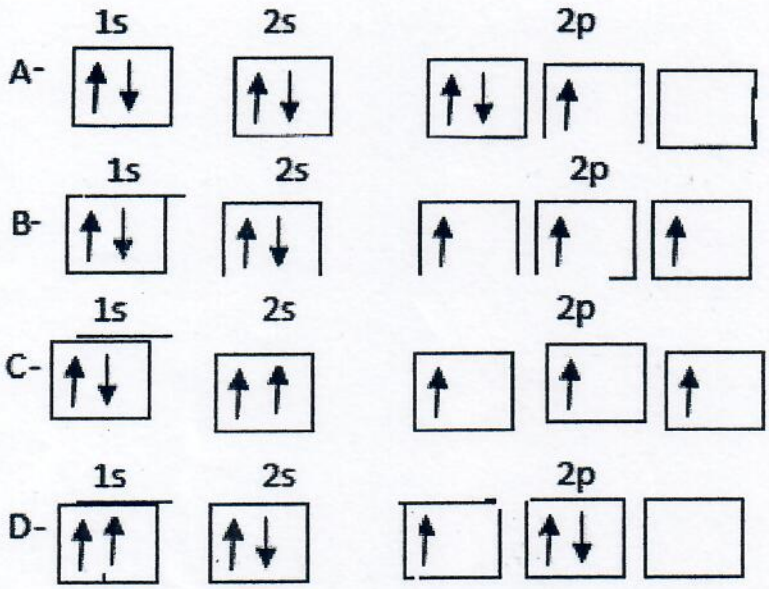
8- $CH_3\ CH_2OH$ is an example of:

A- Primary alcohol
B- Secondary Alcohol
C- Tertiary alcohol
D- Quaternary alcohol

9- Carbon dioxide has two carbon-oxygen double bonds and the double bond pairs repel each other as far as possible. Which of the following shapes can carbon dioxide forms?

A- Non-linear or bent shape
B- Linear shape
C- Tetrahedral shape
D- Triangular pyramidal shape

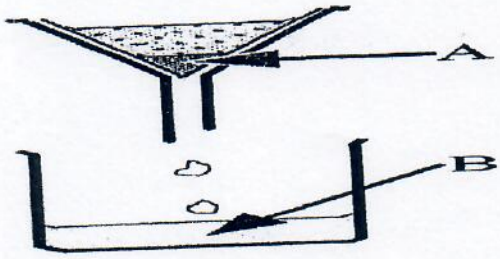
10- Which of the following is the correct orbital diagram for nitrogen atom ($_7N$)



PART TWO: STRUCTURAL QUESTIONS 90 MARKS

Question 1: (8 marks)

A- A mixture of sand salt was stirred up with water and then filtered as shown in the diagram below



i) Substance **A** was left behind in the filter paper, Name that substance.

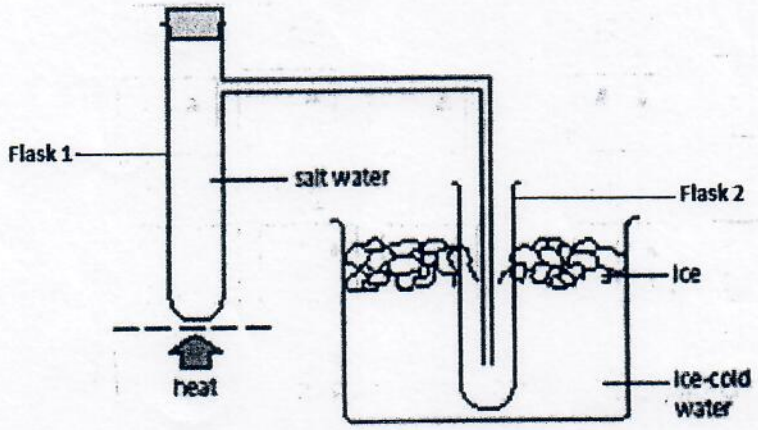
_____ 1 mark

ii) Substance B was passed through the filter paper. What is the name of that substance _____ 1 mark

iii) Which one dissolves in water sand or salt?

_____ 1 mark

B- The apparatus below can be used to obtain pure water from salt solution.



i) What is the purpose of the ice cold water?

_____ 1 mark

ii) What is this separation method called?

_____ 1 mark

iii) What will remain in the first flask at the end of the experiment

_____ 1mark

iv) In the above apparatus, where do these processes occur?

Condensation _____ 1mark

Evaporation _____ 1mark

Question 2: (10 marks)

A- The molecular formula of methane is CH_4 (C= 12, H = 1)

i) Calculate the relative molecular mass of methane

_____

_____

_____ 1mark

ii) Find the percentage composition of hydrogen in methane.

_____

_____

_____

_____ 2 marks

iii) Define the term relative molecular mass.

_____

_____ 1 mark

B- A salt contain 59 g sodium and 41 g oxygen, given that the relative formula mass of the salt is 78, determine its molecular formula.
(Na=23, O= 16)

_____

_____

_____

_____

_____

_____ 5 marks

C- Write a word equation for the reaction between iron (II) and chlorine to form iron (II) chloride.

_____ 1 mark

Question 3: (13 marks)

A- i) The table below is about the preparation of salts. Fill in the missing places. 4 marks

Methods of preparation	Reactants	Salt formed	Other product
Acid + alkali	_____ and potassium hydroxide	Potassium sulphate	Water
Acid + metal	Zinc and hydrochloric acid	Zinc chloride	----------
Acid + base	_____+ copper(II) oxide	Copper(ii) sulphate	_____

ii) Which bases react with acids to give carbon dioxide

_____ 2 mark

i) What is the pH of the neutral substances?

_____ 1marks

B- Complete the following paragraph using the words below. 6 marks

Nitrogen	group 0	mixture	oxygen	noble gases

Air is a _____ of different gases. 99% of it consists of the two elements _____ and _____. One of these _____ is needed for respiration. Some of the remaining 1% of air consists of two compounds, carbon dioxide and water vapour. The rest of the air is made up of elements called _____. These are all members of group _____ Of the periodic table.

Question 4: (13 marks)

A- Complete the table below for the elements, magnesium, potassium chloride, silicon dioxide and hydrogen molecules.

i) Complete the structure column using the words giant or simple

ii) Complete the bonding column using the word metallic, ionic or covalent

Two examples done for you

A-

6 marks

Element	Structure	Bonding
Magnesium	Giant	
Potassium chloride		
Silicon dioxide		
Hydrogen molecules		Covalent

B- Write the chemical formula of the following:

i) Magnesium hydroxide _____ 1 mark

ii) Calcium oxide _____ 1 mark

iii) Sodium chloride _____ 1mark

iv) Ammonium ion _____ 1 mark

C- Electro-negativity value can be used to predict the polarity of a bond. Show the polarity of each bond by adding **δ+** or **δ–** to each bond.

Example **O — H** **δ–** O — H **δ+**

i) N — H _____ 1 mark

ii) H — Cl _____ 1 mark

iii) F — B _____ 1 mark

Question 5: (8 marks)

A- Carboxylic acids are organic acids, all the members of this family have same functional group which are called carboxyl group.

i) Define the term functional group.

_____ 1 mark

ii) Write the general formula of carboxylic acids

_____ 1 mark

iii) What is the meaning of homologous series?

_____

_____ 1 mark

iv) Write the formula of the second member of carboxylic acids

_____ 1 mark

B- There are several types of reaction, look at the reactions below and write what type of reaction is it using these words (substitution, elimination, addition and polymerization).

i) $CH_2 = CH_2\ (g) + H_2O\ (g) \longrightarrow CH_3CH_2OH\ (g)$

_____ 1 mark

ii) $CH_3CH_2OH\ (g) \longrightarrow CH_2 = CH_2\ (g) + H_2O\ (g)$

_____ 1mark

iii) $CH_3CH_2Br(l) + Cl_2\ (aq) \longrightarrow CH_3CH_2Cl\ (aq) + ClBr\ (aq)$

_____ 1 mark

iv) $CH_2 = CH_2\ (g) + CH_2 = CH_2\ (g) + CH_2 = CH_2\ (g) \longrightarrow (C_6H_{12})$

_____ 1 mark

Question 6: (8 marks)

Na Ca Mg Al Zn Fe Pb Cu Hg

Increasing reactivity

A- Use the above reactivity series to answer the following questions.

i) Which metal catches fire easily with a blinding white flame?

_____ 1 mark

ii) Which metal is reacts less violent with cold water?

_____ 1 mark

iii) Which is more reactive copper and iron

_____ 1 mark

iv) What gas is produced if a metal reacts with water

_____ 1mark

B- A student carried out an experiment to find out the results when electrolyzed molten lead iodide and silver nitrate solution using carbon electrodes. Write the results in the table below. 4 marks

Substance	What formed at the cathode	What formed at the anode
Molten lead bromide		
Silver nitrate solution		

Question 7: (9 marks)

Use the following bond energy value to answer the questions that follow.

$N \equiv N$ 945kjmol^{-1} H – H 432kjmol^{-1} N – H 391kjmol^{-1}

N_2 _____ + $3H_2$ (g) ⟶ $2NH_3$ _____

A- i) Write the missing state symbols of the above reaction _____ 1 mark

ii) Define these terms:

Endothermic reaction

_____

_____ 1 mark

Exothermic reaction

_____

_____ 1 mark

iii) Calculate the enthalpy change for the formation of ammonia from nitrogen and hydrogen.

_____

_____

_____

_____

_____

_____ 3 marks

iv) i) Define the term standard enthalpy change of formation.

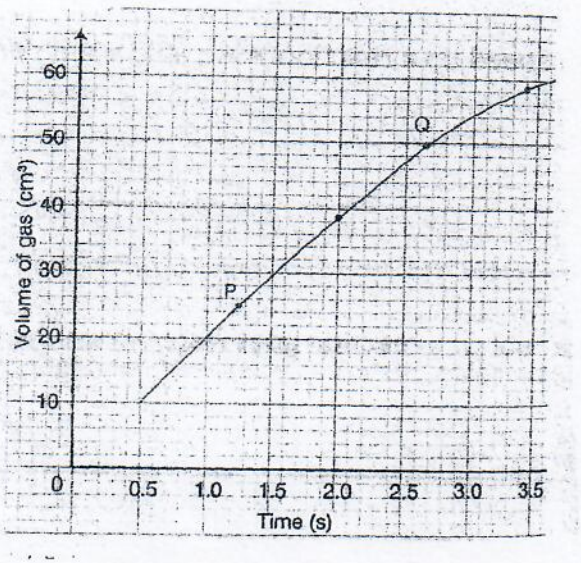
_____ 1 mark

iii) Write the chemical equation for the reaction of formation of water from its elements and add its $\Delta H^{\ominus}_f (H_2O) = -286 kjmol^{-1}$

_____ 2 mark

Question 8: (10 marks)

The reaction between magnesium and dilute hydrochloric acid is a typical metal-acid reaction. The results for this reaction can be presented graphically as shown below.



A- i) Write word equation for the reaction that takes place.

_____ 1mark

ii) Name the gas produced in this reaction

_____ 1 mark

iii) How much gas was produced at the end of the reaction?

_____ 1 mark

iv) On the above graph how much gas was produced when the time was 2 minutes?

_____ 1 mark

B- i) Put a dot (•) on the curve to show the starting point of the reaction. _____ 1 mark

ii) How does the rate at **P** compare with that at **Q**

At P _____ 1 mark

At Q _____ 1 mark

C- i) What is a catalyst?

_____

_____ 1 mark

ii) Explain why a catalyst can speed up a reaction, even at low temperature

_____

_____

_____ 1 mark

iii) Explain why the rate of a reaction goes faster when the temperature increased?

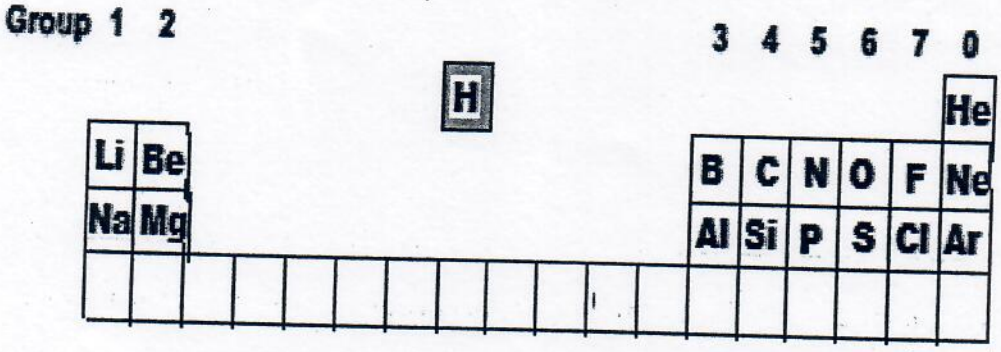
_____

_____

_____ 1 mark

Question 9: (11 marks)

This question refers to the elements in the first three periods of the periodic table.



A- Identify an element from the first three periods that fits each of the following descriptions:

i) The element that forms a 2 — ion with the same electronic configuration as Ne.

_____ 1mark

ii) The element that forms 3+ ion with the same electronic configuration as Ne.

_____ 1 mark

iii) The element that has the electronic configuration $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$

_____ 1mark

iv) An element that forms a compound with hydrogen with tetrahedral molecules.

_____ 1 mark

v) An element that forms a compound with hydrogen with pyramidal molecules.

_____ 1mark

vi) The element that forms a chloride XCl_2 with a molar mass of 93.5 g/mol.

_____ 1 mark

vii) The element with the largest atomic radius

_____ 1 mark

viii) The element in period 3 with the highest boiling point.

_____ 1 mark

B- i) Define the term first ionization energy.

_____

_____ 1 mark

ii) Explain why the first ionization energy show a general increase across period 2?

_____

_____

_____

_____ 2 marks

End.