

MINISTRY OF EDUCATION AND HIGHER EDUCATION

FORM FOUR EXAMS, 2018

CHEMISTRY



P/LAND NATIONAL EXAMINATION BOARD

MINISTRY OF EDUCATION AND HIGHER EDUCATION
PUNTLAND NATIONAL EXAMINATIONS BOARD

Code Number

Form four EXAMINATION 2018
Time 2 hours AND 10 minutes for reading

CHEMISTRY

Instructions to candidates

- Answer all the questions
- This paper consists of 11 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.
- If you make a mistake, **cross out the incorrect** answer and **write your correct answer**.

This exam paper consists of following parts

Parts	Marks
Part one: Multiple choice	15 marks
Part two: Structural Questions	85 marks
Total: 100 Marks	

For the markers only

PARTS	MARKS
Part one	
Part two	
TOTAL	%

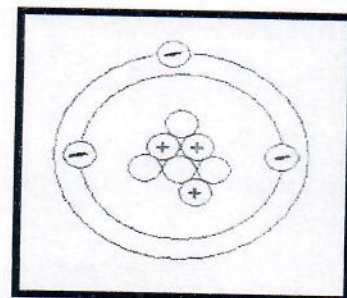


SOM EXAMS

Form Four Chemistry Examination 2018**Section One: Multiple Choice Questions.**

Instructions for this section, **circle** the correct answer from A, B, C, D.
For each question there is **only one** correct answer.

1- The following diagram represents an atom of lithium.



Which of the following statements is true?

- A) Electrons are found in the nucleus of the atom.
- B) Neutrons carry a charge of +1.
- C) Protons and neutrons have the same mass.
- D) Protons and neutrons carry the same charge.

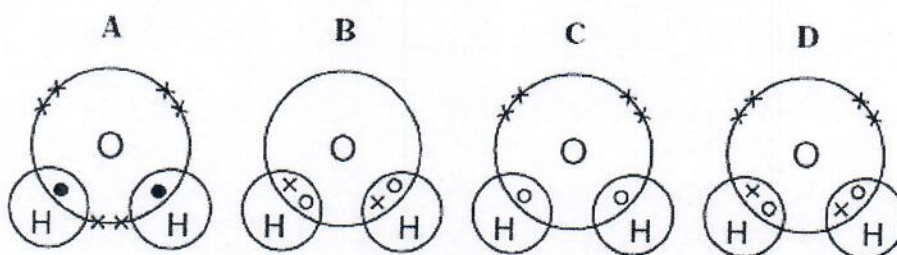
2- The permanent hardness of water is caused by:

- A) Sulphates of magnesium and calcium
- B) Sulphates of sodium and calcium
- C) Sulphates of magnesium and potassium
- D) Sulphates of sodium and potassium

3- What happens magnesium atom (**Mg**) is oxidized to (**Mg²⁺**)

- a) Two electrons are gained
- b) Two electrons are lost
- c) Two protons are gained
- d) Two protons are lost

4- Which diagram shows the correct bonding of water molecule?



5- To prevent corrosion from steel, the steel can be attached with a more reactive metal like magnesium. This process is called:

- A) Galvanization
- B) Sacrificial
- C) Electrolysis
- D) Electroplating



- 6- When H^+ ions react with H_2O molecules, H_3O^+ ions are formed. The type of bond formed when H^+ ions react with H_2O molecules is:
- A. Covalent bond
B. Metallic bond
C. Dative bond
D. Ionic bond
- 7- Which of the following compounds is an electrolyte
- A) Sodium chloride
B) Ethanol
C) Glucose
D) Carbon dioxide
- 8- Adding a catalyst in a chemical reaction will
- a) Lower the activation energy needed
b) Lower the potential energy of the reactants
c) Increase the activation energy needed
d) Increase the potential energy of the reactants
- 9- How many moles are there in $24cm^3$ of 2 molar sodium chloride solution?
- A) 0.024 mole
B) 0.048 mole
C) 0.028 mole
D) 0.045
- 10- Which one of the following equations best describes the enthalpy change of combustion of methane?
- A) $2CH_4(g) + 4O_2(g) \longrightarrow 2CO_2(g) + 4H_2O(g)$
B) $CH_4(g) + 1\frac{1}{2} O_2(g) \longrightarrow CO(g) + 2H_2O(g)$
C) $CH_4(g) + 2O_2(g) \longrightarrow CO_2(g) + 2H_2O(g)$
D) $CH_4(g) + O_2(g) \longrightarrow C(s) + O_2(g) + 2H_2(g)$
- 11- The equation below represents the reaction between ethene and bromine .
 $CH_3CH=CH_2 + Br_2 \longrightarrow CH_3CHBr-CH_2Br$
What type of reaction does the equation reaction represent
- A) Substitution reaction
B) Neutralization
C) Addition reaction
D) Condensation reaction
- 12- What could be the formula of the salt produced when nitric acid (HNO_3) reacts with calcium hydroxide ($Ca(OH)_2$)
- A) $CaNO_3$
B) $CaNO_2$
C) $Ca(NO_2)_2$
D) $Ca(NO_3)_2$
- 13- A **0.1 mole** of carbon dioxide has a mass of; (RAM, C = 12 O = 16)
- A) 44 g
B) 4.4 g
C) 40 g
D) 0.4 g
- 14- Alkenes are hydrocarbons which contain :
- a) One double bond in the chain
b) Two double bond in the chain
c) One tribal bond in the chain
d) Single bond in the chain
15. Which of the following species is free radical
- A) CH_3^+
B) CH_3^-
C) Cl^-
D) Br^\bullet

PART TWO: STRUCRURAL QUESTIONS

Answer all the following questions in space provided.

Question 1 (10 marks)

- a) The list below contains some elements and compounds,
(Hydrogen, Copper oxide, Sodium, Calcium chloride)

- i) Classify into elements and compounds. (4M)

Elements _____

Compounds _____

- ii) Define the word element

(1M)

- b) Explain how would you separate the first substance named from each mixture below:

- i) Sodium chloride (common salt) and sand

(1M)

- ii) Iron fillings and sugar

(1M)

- iii) Ethanol and water

(1M)

- c) Explain the difference between miscible and immiscible liquids?

Miscible liquids _____

(1M)

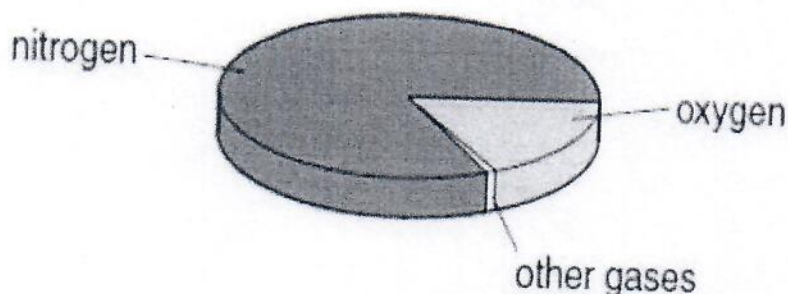
Immiscible liquids _____

(1M)



Question 2 (8 Marks)

a) The diagram below shows the composition of air.



i) What is the percentage of nitrogen in the air?

_____ (1M)

ii) Apart from nitrogen and oxygen, state the name of **one** noble gas present in air.

_____ (1M)

iii) Only one gas in the air will allow things to burn in it. Which gas is this?

_____ (1M)

iv) Which gas containing sulphur is a major cause of air pollution?

_____ (1M)

v) Name the main gas that causes global warming.

_____ (1M)

b) There are two types of hard water, permanent hard water and temporary hard water.

Match from each statement to the correct type of water.

3 marks

Statement	Answer	type of water
1. Easily makes a lather with soap		a. Permanent hard water
2. Boiling cannot affected		b. Temporary hard water
3. Can be made soft by boiling		c. Soft water



Question 3 (8 marks)

- a) Across period 2 and 3, the nuclear charge increases from element to element.
Explain why the size of the elements remains the same?

(2M)

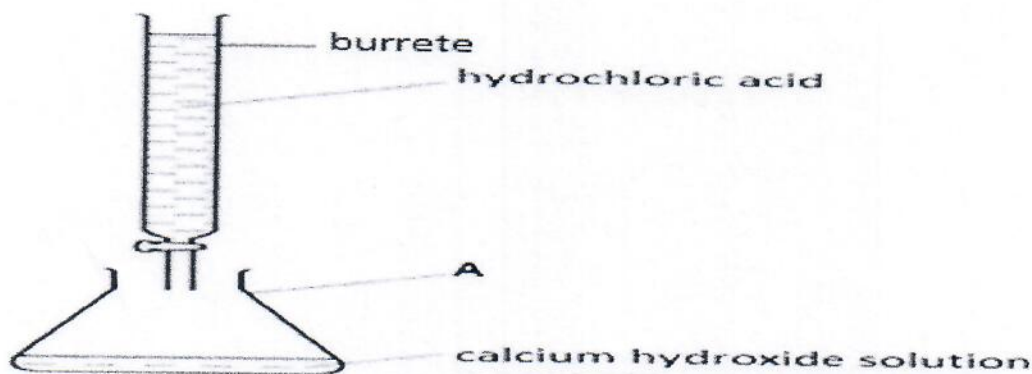
- b) Element **Q** is in Period 2 of the Periodic Table, Li ___ Na.
The successive ionization energies of an element Q are shown below:

ionisation number	1 st	2 nd	3 rd	4 th	5 th
ionisation energy KJ/mol	800	2420	3660	25000	32800

- i. Suggest the group in the Periodic Table to which '**Q**' element belongs.
(1M)
- ii. Why is there a big difference between the 3rd and 4th ionisation energies of Q?
(1M)
- c) Write the electronic configuration (s,p,d,f) of each ion in sodium chloride (2M)
Na⁺ _____
Cl⁻ _____
- d) Which block of the periodic table do group 7 elements occupy? Give a reason for your answer.
(2M)

Question 4 (8 marks)

4- The apparatus below is used to prepare a salt from calcium hydroxide solution with hydrochloric acid



a) What is the name of apparatus **A**?

_____ (1M)

b) What is the name of the reaction when the acid reacts with the alkali?

_____ (1M)

c) Write two properties of an alkalis

_____ (2M)

d) Write two properties of an acid

_____ (2M)

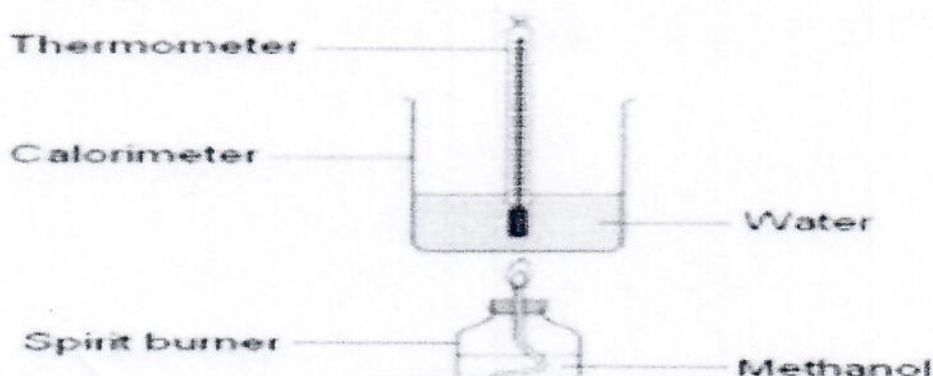
e) Write a balanced equation for the reaction between hydrochloric acid and calcium hydroxide solution.

_____ (2M)



Question 5 (10 marks)

1. A student did an experiment to find the energy released when methanol burns in a burner.

**Result obtained by an experiment:**

- Volume of water in the Calorimeter = 200cm^3
- Mass of empty spirit burner = 20g
- Mass of empty spirit burner + methanol before burning = 32g
- Mass of empty spirit burner + methanol after burning = 24g
- Initial temperature of the water = 20°
- Final temperature of the water = 40°

- a) What is the mass of methanol after burning?

_____ (1M)

- b) What is the temperature rise of the water?

_____ (1M)

- c) Calculate the moles of methanol burnt.

(C=12, H=1 O=16).

_____ (2M)

- d) Calculate the energy transfer of the reaction? In KJ.

(Specific heat capacity of water = $4.2\text{Jg}^{-1}\text{ }^\circ\text{C}^{-1}$).

_____ (2M)



- e) Calculate the molar enthalpy change of combustion for burning one mole methanol.

_____ (2M)

- f) Write a balanced chemical equation for the combustion of methanol.

_____ (2M)

Question 6 (6marks)

Complete the following paragraph using the words below.

Electrolysis	Electrolyte	Negative	Loss	Anode	Reduction
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The positive electrode is called _____ and is made of carbon rod.

The _____ electrode is called cathode and is made of Zinc.

The _____ allows electrons to flow about. Decomposition cause by electricity is called _____

Two types of chemical reactions can take place, oxidation is the _____ of electrons and _____ is the gain of electrons.

Question 7 (14 marks)

- a) Complete the table below for each of the given hydrocarbons:- (5M)

Compound:-	Propane	Propene
Homologous Series:-		Alkene
Molecular Formulae:-	C ₃ H ₈	
Structural formulae:-		$\begin{array}{c} \text{H} & & \text{H} \\ & & \\ \text{H} - \text{C} - & \text{C} = & \text{C} \\ & & \\ \text{H} & \text{H} & \text{H} \end{array}$
Type of Covalent Bonding:-	Single	
Is the Carbon to Carbon bonding saturated or unsaturated?	Saturated	



b) Name the following structures

(5 marks)



c) Complete the reactions below and name the product

**Question 8 (7 marks)**

When sodium thiosulphate reacted with hydrochloric acid, a precipitate forms. The time taken for the solution to become opaque (cross disappears) was recorded. Four experiments were carried out, only the concentration of the sodium thiosulphate solution was changed each time. The results were:

Experiment	A	B	C	D
Time taken/seconds	42	71	124	63

a) Name the precipitate that forms.

_____ (1M)

b) In which experiment was the reaction:

Fastest _____ (1M)

Slowest _____ (1M)

c) In which experiment was the sodium thiosulphate solution most concentrated?

_____ (1M)

d) Suggest other way of speeding up this reaction.

_____ (1M)

e) Complete the sentence below:

A reaction goes _____ when the concentration of a reaction
is _____ (2M)



Question 9 (14 marks)

- a) Complete the diagram below to show how an ammonia molecule forms a **hydrogen bond** with a water molecule by using line. (1M)



- b) How many lone pairs and bonding pairs do water and ammonia have? (4)

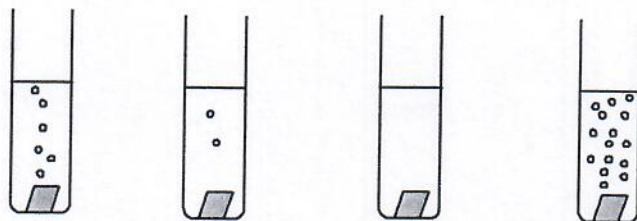
Molecule	H ₂ O	NH ₃
Number of bonding pairs of electrons		
Number of lone pairs of electrons around central atom		

- c) Write down the three types of intermolecular forces. (3M)

- d) Explain why a water molecule has a different shape from a carbon dioxide molecule

(2M)

- e) Small pieces of four different metals were placed in identical amounts of hydrochloric acid. The results are shown below.



Metal A

metal B

metal C

metal D

- i) Which metal of the above experiment is most reactive, give a reason for your choice?

_____(2M)

- f) The metal elements have metallic bonding in their structures.

How many electrons do the atoms of each metal (Na, Mg) donate into the sea of electrons?

_____(2M)

End.

