Candidate's Examination Number ……

THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
FORM TWO SECONDARY EDUCATION EXAMINATION, 2010

0032 **CHEMISTRY**

Time: 2½ HOURS **ANSWERS**

INSTRUCTIONS

1. This paper consists of sections A, B and C.
2. Answer **ALL** questions.
3. Write your examination number at the top right corner of every page.
4. **ALL** writing must be in black or blue ink **EXCEPT** diagrams which must be in pencil.
5. Cellphones and calculators are not allowed in the examination room.
6. The following atomic masses may be used: $H = 1$, $O = 16$, $C = 12$, $Na = 23$, $S = 32$, $Ca = 40$

FOR EXAMINER'S USE ONLY		
QUESTION NUMBER	**SCORE**	**INITIALS OF EXAMINER**
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
TOTAL		

SECTION A (10 MARKS)

1. Questions (i) - (x) are multiple choice items. Select the best answer in each case and write its letter (A, B, C, or D) in the box provided.

(i) In scientific study, the tentative explanation for the observed chemical phenomenon can be proved by:
A. Data analysis
B. Experimentation
C. Hypothesis
D. Observation
Correct: B
Reason: Experimentation tests and proves a hypothesis by providing evidence, unlike observation (data collection) or data analysis (interpretation).

(ii) A certain liquid dissolves copper (II) sulphate to form a blue solution. This liquid is likely to be:
A. Hydrochloric acid
B. Liquid oxygen
C. Nitric acid
D. Water
Correct: D
Reason: Water dissolves copper (II) sulphate to form a blue solution due to the formation of hydrated copper ions, unlike acids or liquid oxygen.

(iii) When a chemist studies a substance he/she is interested in its:
A. Force of attraction
B. Properties
C. Shape
D. Smell
Correct: B
Reason: Chemists study properties (physical and chemical) to understand a substance's behavior, composition, and reactions, beyond just smell or shape.

(iv) The boiling point of pure water at sea level is 100°C and that of ethanol is 78°C. The mixture of ethanol and water can be separated by:
A. Filtration process
B. Fractional distillation process
C. Layer separation process
D. Sublimation process
Correct: B
Reason: Fractional distillation separates liquids with different boiling points, like ethanol (78°C) and water (100°C), by heating and condensing them separately.

(v) The boiling point of pure water at sea level is 100°C and that of ethanol is 78°C. The mixture of ethanol and water can be separated by:
A. Filtration process
B. Fractional distillation process

C. Layer separation process
D. Sublimation process
Correct: B
Reason: Same as (iv); fractional distillation is used for miscible liquids with differing boiling points.

(vi) Which group among the following elements are metals?
A. Calcium, magnesium, and sodium
B. Calcium, hydrogen, and nitrogen
C. Calcium, carbon, and magnesium
D. Oxygen, potassium, and sodium
Correct: A
Reason: Calcium, magnesium, and sodium are metals (shiny, conductive), while hydrogen, nitrogen, carbon, and oxygen are non-metals.

(vii) An electrovalent bond is formed by:
A. Arrangement of electrons
B. Sharing of electrons
C. Transfer of electrons
D. Vibrations of electrons
Correct: C
Reason: An electrovalent (ionic) bond involves the transfer of electrons from a metal to a non-metal, unlike covalent bonds (sharing).

(viii) Petrol is an example of:
A. Corrosive substance
B. Flammable substance
C. Irritating substance
D. Toxic substance
Correct: B
Reason: Petrol ignites easily, making it flammable, though it can also be toxic or irritating, its primary hazard is flammability.

(ix) The electronic configuration of silicon is:
A. 2:7:3
B. 2:8:2
C. 2:8:3
D. 2:8:4
Correct: D
Reason: Silicon (atomic number 14) has 14 electrons: 2 in the first shell, 8 in the second, and 4 in the third (2:8:4).

(x) The most abundant element on the earth is:
A. Carbon
B. Iron
C. Nitrogen
D. Oxygen

Correct: D
Reason: Oxygen is the most abundant element in Earth's crust (about 46%), found in compounds like silicates and water.

2. Match each item in List A with a correct response in List B by writing its letter below the number of the corresponding item in the table provided.

LIST A	LIST B
(i) Gas that relights a glowing splint	A. Hydrogen
(ii) Process of coating iron with zinc	B. Nitrogen
(iii) Separates immiscible liquids	C. Galvanization
(iv) Element with atomic number 7	D. Oxygen
(v) Turns lime water cloudy	E. Carbon dioxide
(vi) Used to measure precise volumes of liquids	F. Burette
(vii) Liquid at room temperature	G. Mercury
(viii) Method to separate salt from seawater	H. Evaporation
(ix) Gas used in electric bulbs	I. Argon
(x) Prevents direct heating of glassware	J. Wire gauze

LIST A	i	ii	iii	iv	v	vi	vii	viii	ix	x
LIST B	D	C	B	B	E	F	G	H	I	J

3. (a) Define the term "element".

A pure substance made of one type of atom, which cannot be broken down into simpler substances by chemical means.

(b) Name three elements found in the earth's crust.

Oxygen, Silicon, Aluminium

(c) Classify the following as metals or non-metals:

(i) Sodium: Metal

(ii) Chlorine: Non-metal

(iii) Carbon: Non-metal

4. (a) What is meant by the term "chemical bond"?

A force of attraction between atoms or ions that holds them together in a molecule or compound.

(b) Draw diagrams to show the electron arrangement in:

(i) A sodium atom (atomic number 11)

2 electrons in first shell, 8 in second, 1 in third (2:8:1).

(ii) A sodium ion

2 electrons in first shell, 8 in second (2:8), as it loses one electron.

(c) State the type of bond formed between sodium and chlorine.

Ionic bond

5. (a) Define the term "mixture".

A combination of two or more substances that retain their individual properties and can be separated by physical means.

(b) List three differences between a homogeneous and a heterogeneous mixture.

(i) Homogeneous has uniform composition; heterogeneous has non-uniform composition.

(ii) Homogeneous appears as one phase; heterogeneous has visible separate phases.

(iii) Homogeneous components are evenly mixed; heterogeneous components can be seen distinctly.

(c) Name one method to separate sand from a sand-water mixture.

Filtration

6. (a) What is meant by the term "combustion"?

A chemical reaction between a substance and oxygen, producing heat and often light.

(b) State three conditions necessary for combustion to occur.

Fuel, Oxygen, Heat

(c) Name one product formed when carbon undergoes combustion.

Carbon dioxide

Combustion requires a fuel source, oxygen to react, and sufficient heat to initiate the reaction. Carbon burns in oxygen to form carbon dioxide ($C + O_2 \rightarrow CO_2$).

7. (a) Define the term "oxidation number".

A number assigned to an element in a compound, indicating the number of electrons lost or gained.

(b) Calculate the oxidation number of the underlined elements:

(i) K_2CO_3 (C underlined)

K = +1 (2 × +1 = +2), O = -2 (3 × -2 = -6), let C = x. Neutral: 2 + x - 6 = 0, x = +4.

(ii) HNO_3 (N underlined)

H = +1, O = -2 (3 × -2 = -6), let N = x. Neutral: 1 + x - 6 = 0, x = +5.

(c) State one example of an oxidation reaction in everyday life.

Rusting of iron

Oxidation numbers reflect electron distribution in compounds. Rusting involves iron losing electrons to oxygen, forming iron oxide.

8. (a) What is meant by the term "laboratory safety"?

Practices and precautions taken to prevent accidents and ensure safe handling of chemicals and equipment in a laboratory.

(b) List three safety rules to follow when handling acids in the laboratory.

(i) Wear protective gloves and goggles.

(ii) Add acid to water, not water to acid.

(iii) Work in a fume hood to avoid inhaling fumes.

(c) Name one piece of equipment used for personal protection in the laboratory.

Lab coat

Safety rules for acids prevent burns and inhalation risks. A lab coat protects skin and clothing from chemical spills.

9. (a) Define the term "fuel".

A substance that releases energy, usually as heat, when burned or reacted, used for power or heating.

(b) Name two fuels commonly used in Tanzanian households.

Charcoal, Firewood

(c) Explain one disadvantage of using firewood as a fuel.

Deforestation due to cutting trees for firewood.

Firewood's reliance on trees leads to environmental degradation, reducing forest cover and affecting ecosystems.

10. (a) What is meant by the term "water purification"?

The process of removing impurities from water to make it safe for use, such as drinking or experiments.

(b) Describe two methods used to purify water in a laboratory.

(i) Distillation: Boiling water to produce steam and condensing it to remove impurities.

(ii) Filtration: Passing water through a filter to remove solid particles.

(c) State one importance of purifying water for domestic use.

Prevents waterborne diseases

Purification methods like distillation and filtration remove contaminants, ensuring water safety. Clean water is critical to avoid health risks like cholera.