Candidate's Examination Number ……

THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
FORM TWO SECONDARY EDUCATION EXAMINATION, 2009

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) The scientific method used to confirm a hypothesis is:
A. Observation
B. Data analysis
C. Experimentation
D. Conclusion
Correct: C
Reason: Experimentation tests a hypothesis by providing evidence, unlike observation (data collection) or data analysis (interpretation).

(ii) A substance that turns anhydrous cobalt(II) chloride from blue to pink is:
A. Ethanol
B. Water
C. Nitric acid
D. Ammonia
Correct: B
Reason: Water hydrates anhydrous cobalt(II) chloride, changing it from blue to pink, unlike ethanol, nitric acid, or ammonia.

(iii) The valency of an element with atomic number 8 is:
A. 1
B. 2
C. 3
D. 4
Correct: B
Reason: Element with atomic number 8 is oxygen (electron configuration 2:6), needing 2 electrons to complete its octet, giving it a valency of 2.

(iv) The method used to separate a mixture of salt and sand is:
A. Sublimation
B. Filtration
C. Evaporation
D. Dissolving and filtration
Correct: D
Reason: Dissolving salt in water, followed by filtration to remove sand, and evaporating the filtrate to recover salt, is the correct method.

(v) A Bunsen burner produces a blue flame when:
A. Air holes are closed
B. Air holes are fully open
C. Gas supply is low

D. Flame is sooty
Correct: B
Reason: Open air holes allow sufficient oxygen for complete combustion, producing a blue (non-luminous) flame.

(vi) Which of the following is a non-metal?
A. Sodium
B. Magnesium
C. Sulphur
D. Potassium
Correct: C
Reason: Sulphur is a non-metal, lacking metallic properties like conductivity, unlike sodium, magnesium, and potassium.

(vii) The bond formed between carbon and oxygen in carbon dioxide is:
A. Ionic
B. Covalent
C. Metallic
D. Electrovalent
Correct: B
Reason: Carbon and oxygen, both non-metals, share electrons to form covalent bonds in CO_2.

(viii) A substance that catches fire easily is classified as:
A. Corrosive
B. Toxic
C. Flammable
D. Irritant
Correct: C
Reason: Flammable substances ignite easily, unlike corrosive (causes burns), toxic (poisonous), or irritant (causes discomfort) substances.

(ix) The electronic configuration of chlorine (atomic number 17) is:
A. 2:8:7
B. 2:8:6
C. 2:7:8
D. 2:8:8
Correct: A
Reason: Chlorine (17 electrons) has configuration 2:8:7 (2 in first shell, 8 in second, 7 in third).

(x) The gas that forms a white precipitate with lime water is:
A. Oxygen
B. Hydrogen
C. Carbon dioxide
D. Nitrogen
Correct: C

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 used in welding	A. Nitrogen
(ii) Prevents rusting by coating iron	B. Zinc
(iii) Separates liquids with different boiling points	C. Fractional distillation
(iv) Element with atomic number 12	D. Magnesium
(v) Turns brown in iodine test	E. Starch
(vi) Apparatus for heating solids	F. Crucible
(vii) Liquid used in thermometers	G. Mercury
(viii) Method to obtain pure water	H. Distillation
(ix) Gas that does not support combustion	I. Carbon dioxide
(x) Supports combustion	J. Oxygen

Correct:

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

3. (a) Define the term "atom".
The smallest unit of an element that retains its chemical properties, consisting of a nucleus and surrounding electrons.
(b) Name three subatomic particles found in an atom.
Proton, Neutron, Electron
(c) State the charge and location of each particle named in (b).
(i) Proton: Positive charge, located in the nucleus.
(ii) Neutron: No charge, located in the nucleus.
(iii) Electron: Negative charge, located in shells around the nucleus.

4. (a) What is meant by the term "ionic bond"?
A chemical bond formed by the transfer of electrons from a metal to a non-metal, resulting in oppositely charged ions.

(b) Draw diagrams to show the electron arrangement in:
(i) A fluorine atom (atomic number 9)
2 electrons in first shell, 7 in second (2:7).
(ii) A fluoride ion
2 electrons in first shell, 8 in second (2:8), after gaining one electron.

(c) State the type of bond formed between magnesium and oxygen.
Ionic bond
Magnesium (metal) transfers electrons to oxygen (non-metal), forming Mg^{2+} and O^{2-} ions in MgO.

5. (a) Define the term "solution".
A homogeneous mixture of a solute dissolved in a solvent, with uniform composition.

(b) List three differences between a solution and a suspension.
(i) Solution is clear and transparent; suspension is cloudy.
(ii) Solution particles do not settle; suspension particles settle over time.
(iii) Solution particles pass through filter paper; suspension particles are trapped.

(c) Name one method to separate a solution of sugar and water.
Evaporation
Evaporation removes water, leaving sugar behind, as sugar does not vaporize.

6. (a) What is meant by the term "fire triangle"?
A model representing the three elements needed for a fire: fuel, oxygen, and heat.

(b) State three components of the fire triangle.
Fuel, Oxygen, Heat

(c) Name one method to extinguish a fire caused by burning paper.
Water extinguisher
Water cools the fire and removes heat, suitable for paper (Class A fire).

7. (a) Define the term "valency".
The combining capacity of an element, determined by the number of electrons it gains, loses, or shares.

(b) Calculate the oxidation number of the underlined elements:
(i) Na_2SO_4 (S underlined)
Na = +1 ($2 \times +1 = +2$), O = -2 ($4 \times -2 = -8$), let S = x. Neutral: $2 + x - 8 = 0$, $x = +6$.
(ii) $HClO_4$ (Cl underlined)
H = +1, O = -2 ($4 \times -2 = -8$), let Cl = x. Neutral: $1 + x - 8 = 0$, $x = +7$.

(c) State one example of a reduction reaction in daily life.
Photosynthesis
Plants reduce carbon dioxide to glucose, gaining electrons, a common reduction process.

8. (a) What is meant by the term "first aid"?
Immediate care given to an injured person to stabilize their condition before professional help arrives.

(b) List three items found in a first aid kit in a chemistry laboratory.
Bandages, Antiseptic wipes, Gloves

(c) State one use of a splint in first aid.
Immobilizing a fractured limb
A splint stabilizes broken bones to prevent further injury during transport.

9. (a) Define the term "oxygen".
A colorless, odorless gas (O_2), essential for respiration and combustion, with atomic number 8.

(b) Describe a laboratory test for oxygen gas.
Insert a glowing splint into a gas sample; oxygen relights the splint due to its combustion-supporting property.

(c) Name one use of oxygen in everyday life.
Medical oxygen for respiratory support
Oxygen is used in hospitals to aid patients with breathing difficulties.

10. (a) What is meant by the term "non-renewable resource"?
A resource that cannot be replenished naturally within a human timescale, such as fossil fuels.

(b) Name two non-renewable fuels used in Tanzania.
Coal, Petroleum

(c) State one environmental impact of using non-renewable fuels.
Air pollution
Burning fossil fuels releases pollutants like carbon dioxide, contributing to climate change.