TANZANIA HEADS OF ISLAMIC SCHOOL COUNCIL

FORM IV INTER ISLAMIC MOCK EXAMINATION 2026

CHEMISTRY 1

MARKING SCHEME

SECTION A (16 Marks)

1.

(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
C	D	C	B	D	A/B	C	A	B	C

01 mark @ = 1 Mark

2.

COLUMN A	(i)	(ii)	(iii)	(iv)	(v)	(vi)
COLUMN B	B	D	F	G	H	C

01 mark @ = 06 marks

SECTION B (54 Marks)

3. (a) (i) Because Hydrogen gas is lighter than air./Less dense than air

(ii) Because it is slightly soluble in water, or because it is lighter than water, or because it is less dense than water. Insoluble in water

(iii) Because Hydrogen is a very reactive element. **(03 Marks) @ 01 Mark**

(b) (i) Electrolysis of water.

(ii) Steam reforming of natural gas (methane). **(02 Marks) @ 01 Mark**

(c) (i) Hydrogen is used in the manufacturing of margarine (hardening of oil) by bubbling it through liquid oil in the presence of Nickel as a catalyst. This process is called Hydrogenation. – reducing agent

(ii) Hydrogen combines with oxygen to produce the oxy-hydrogen flame. This flame is very hot and the temperature can rise up to 3000˚C. This flame can be used for welding and metal cutting. **(04 Marks) @ 02 Marks**

4. (a) Onion

- The smell of onion diminishes or disappears when it is added to a base, but persists when it is added to an acid. **($01\frac{1}{2}$ Mark)**

Vanilla essence

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- Garlic - in acid gives smell – in base no smell
- Clove – in acid it gives smell – in base no smell
- The smell of vanilla essence disappears when it is added to a base, but persists when it is added to an acid. **(01 $\frac{1}{2}$ Mark)**

(b) (i) Neutralization reaction/double decomposition/double displacement **(01 Mark)**

(ii) $CaCO_{3(s)} + 2HCl_{(aq)} \rightarrow CaCl_{2(aq)} + H_2O_{(l)} + CO_{2(g)}$ **(01 Mark)**

(iii) $CaCO_{3(s)} + 2HCl_{(aq)} \rightarrow CaCl_{2(aq)} + H_2O_{(l)} + CO_{2(g)}$ **(01 Mark)**

$CaCO_{3(s)} + 2H^+_{(aq)} + 2Cl^-_{(aq)} \rightarrow Ca^{2+}_{(aq)} + 2Cl^-_{(aq)} + H_2O_{(l)} + CO_{2(g)}$

$CaCO_{3(s)} + 2H^+_{(aq)} + 2Cl^-_{(aq)} \rightarrow Ca^{2+}_{(aq)} + 2Cl^-_{(aq)} + H_2O_{(l)} + CO_{2(g)}$

Net ionic equation

1. $CaCO_{3(s)} + 2H^+_{(aq)} \rightarrow Ca^{2+}_{(aq)} + H_2O_{(l)} + CO_{2(g)}$ **(01 Mark)**

(iv) **Treating insect stings and bites**

- Insects such as bees, have stings that inject an acidic liquid in the blood through the skin. The sting can be neutralized by rubbing baking soda on the affected area.
- Wasp stings are alkaline and can be neutralized with vinegar, which contains acetic acid.

Relieving indigestion

- Indigestion is a discomfort in the stomach that is associated with difficulties in digesting food. It is caused by the presence of excess acid like hydrochloric acid in the stomach.
- The excess acid can be neutralized by taking a liquid or tablets that contain Magnesium or sodium hydrogen carbonate (Antacids).

Soil treatment

- Most plants grow well in soils that have optimum pH values. When soils are too acidic, for example due to application of ammonium based fertilizers, chemical such as Calcium oxide (quicklime) and Calcium hydroxide (slaked lime) are added to adjust the soil pH. Such chemicals that neutralise the soil acidity are called liming materials.

Treating factory wastes

- Liquid wastes from factories often contain acids and bases. If the wastes get into water bodies such as lakes, ponds and rivers, they can harm aquatic organisms like fish.
- Acidic wastes can be controlled by adding bases such as Calcium hydroxide to neutralise them.

Preventing formation of acid rain

- When the pH of rainwater falls below 5.6, it is called acid rain. Acid rain increases the acidity of the soil, rivers and lakes and adversely affects vegetation and aquatic organisms.
- To reduce this problem, air pollutant devices containing bases are fitted

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in exhaust pipes and chimneys to neutralise the acidic compounds before reaching the atmosphere.

Neutralising accidental spills

- If an acid or an alkali spills on the floor or work surface in the laboratory it can be neutralized. For example, sulphuric acid which is very corrosive, can be neutralized by adding sodium hydroxide.

Manufacture of fertilizers

- The production of ammonium fertiliser is done through the neutralisation of ammonia with a mineral acid.
- Ammonium nitrate for example is produced by the reaction of ammonia with nitric acid.

Any three (3) points @ 01 Marks = 03 Marks

5. (a) (i) Evaporation/ simple distillation
(ii) Layer separation
(iii) Fractional distillation
(iv) Magnetism / Magnetic separation/ magnetization/using magnet
(v) Chromatography
(vi) Winnowing

Any six (6) points @ 01 Marks = 06 Marks

(b) - **Independent variable** – Is the temperature of water, as it is deliberately changed to observe effects.
- Dependent variable – Is the solubility of Sodium Chloride, measured as the outcome.
- Controlled variable – Including the fixed volume of water and the quantity of Sodium Chloride used for each trial. **(03 Marks) @ 01 Mark**

6. (a) (i) **To produce a luminous flame**
- Close air holes completely to restrict oxygen gas supply.

(02 Marks)

(ii) **To produce a non-luminous flame**
- Open the air hole fully to allow maximum oxygen supply, this will produce a steady blue flame. **(02 Marks)**

(b) **Luminous flame** produces soot because the fuel does not burn completely due to insufficient Oxygen, leaving behind unburnt carbon particles (Soot). **(01 Mark)**

Non-luminous flame gets when Oxygen is enough to complete combustion of the gas completely and no soot is formed. **(01 Mark)**

(c) (i) High temperature. (it is very hot)
(ii) Do not produce smoke/soot (Clean)
(iii) More stable. (steady) **(03 Marks) @ 01 Mark**

7. (a) (i) **Producer gas** – Is a mixture of flammable gases and non-flammable gases made by the combustion of carbonaceous substances in an atmosphere of air and steam. The term "producer gas" originates from the specific apparatus used to generate the gas, known as a "gas producer" or gasifier**.**

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Is the fuel composed of mixture of nitrogen gas **(00½ Mark)**

Uses of producer gas:

- Used as fuel to heating open hearth furnace in steel and glass manufacturing.
- Used as fuel to heating muffle furnace and retorts in production of coke and coal gas.
- Used to reducing atmosphere in certain metal extraction operation.

Any one (1) point = 01 Mark

(ii) **Water gas** – Is a mixture of carbon monoxide and hydrogen gas with a small amount of Carbon dioxide. It is called water gas because it is produced by passing steam (water) over hot carbon fuel. **(00½ Mark)**

Uses of Water gas:

- Used as an industrial fuel especially in making steel.
- Used in preparation of hydrogen

Any one (1) point = 01 Mark

(b) Recall

Energy value = $\frac{\text{Total energy liberated Q}}{\text{Mass of the fuel used}}$ **(00½ Mark)**

But Energy, Q = $M_W C_W \Delta T_W$ **(00½ Mark)**

Where

Q = Quantity of heat or energy liberated

M_W = Mass of water (Kg)

C_W = Specific heat capacity of water

ΔT_W = Change in temperature of water

Mass of water (M_W) = Density of water × Volume of water

Volume of water = 20L = $0.02m^3$

Mass of water (M_W) = $1000Kg/m^3 \times 0.02m^3$

= 20Kg **(00½ Mark)**

Change in temperature $\Delta T_W = T_f - T_i$

= 100℃ – 24℃

= 373.15K − 297.15K

= 76K **(00½ Mark)**

$Q = M_W C_W \Delta T_W$

$Q = 20Kg \times 418KJKg^{-1}K^{-1} \times 76K$ **(00½ Mark)**

Q = 6353.6KJ **(01 Mark)**

Then

Energy value of kerosene = $\frac{\text{Total energy liberated Q}}{\text{Mass of kerosene used}}$

$\frac{43400KJKg^{-1}}{1} = \frac{6353.6KJ}{\text{Mass of Kerosene used}}$ **(00½ Mark)**

Mass of kerosene = 0.146Kg

But

Density of kerosene = $\frac{\text{Mass of kerosene}}{\text{volume of kerosene}}$

$810Kgm^{-1} = \frac{0.146Kg}{\text{volume of kerosene}}$

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Volume of kerosene = 0.00018m^3 or 0.18Litres. **(01 Mark)**

8. Given
Mass of pure calcium carbide, CaC_2 = 4Kg = 4000g Molecular
Molecular mass of CaC_2 = 64g/mol
Molecular mass of H_2O = 18g/mol
Molecular mass of $Ca(OH)_2$ = 74g/mol
G.M.V = 22.4dm^3/mol

$$CaC_{2(s)} + 2H_2O_{(l)} \rightarrow C_2H_{2(g)} + Ca(HO)_{2(aq)}$$

(a) (i) From

$$CaC_{2(s)} + 2H_2O_{(l)} \rightarrow C_2H_{2(g)} + Ca(HO)_{2(aq)}$$

If
64g of CaC_2 → 36g of H_2O
4000g of CaC_2 → X
X = $\frac{4000g \times 36g}{64g}$ = 2250g or 2.25Kg
Therefore the mass of water required = 2250g or 2.25Kg **(01 Mark)**

(ii) From

$$CaC_{2(s)} + 2H_2O_{(l)} \rightarrow C_2H_{2(g)} + Ca(HO)_{2(aq)}$$

If
64g of CaC_2 → 74g of $Ca(OH)_2$
4000g of CaC_2 → X **(01 Mark)**
X = 4625g
Therefore the mass of $Ca(OH)_2$ required = 4625g **(01 Mark) or 4.625 Kg**

(b) Given % purity of CaC_2 = 50%
From
% purity of CaC_2 = $\frac{\text{Pure mass}}{\text{Impure mass}} \times 100\%$
50% = $\frac{x}{4000g} \times 100\%$
x = 2000Kg **(01 Mark)**
From

$$CaC_{2(s)} + 2H_2O_{(l)} \rightarrow C_2H_{2(g)} + Ca(HO)_{2(aq)}$$

If
64g of CaC_2 = 22.4dm^3 of C_2H_2
4000g of CaC_2 = x **(01 Mark)**
x = $\frac{4000g \times 22.4dm^3}{64g}$
x = 1400dm^3
Therefore the volume of ethylene produced = 1400dm^3 **(01 Mark)**

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SECTION C (30 Marks)

9. **INTRODUCTION**

Soil fertility – Is the ability of the soil to provide nutrients in proper quantities and in a balanced proportion for proper growth of the plants.

Soil productivity – Is the capacity of the soil in its normal environment to support plant growth.

(Any Relevant Introduction (02 Mark))

MAIN BODY

Causes for fertile soil not necessarily be productive;

- Low soil depth
- Poor drainage
- Poor water holding capacity
- Pests and diseases
- Accumulation of waste salts
- Change in soil pH
- Burning of vegetation
- Unfavorable weather condition for crop production
- Invasion of pests or birds
- Domination of the weeds in the farm
- Suitability of the soil for the type of crop grown
- If it is located at the steep slope or hilly area
- Viability of the seed sown

(Any six (6) points with relevant explanation @ 02 Marks = 12 Marks)

Any Relevant and Good Conclusion (01 Mark)

10. (a) Molecular formula of X is C_2H_4 **(02 Marks)**

IUPAC name of X (C_2H_4) is Ethene or Eth – 1 ene **(02 Marks)**

(b) The process is cracking **(02 Marks)**

Cracking is process where a large hydrocarbon molecules breaking down into smaller hydrocarbon molecules either by heat or catalyst.

(c) Compound X is C_2H_4 – Ethene (unsaturated hydrocarbon)

Compound Y is obtained by Hydrogenation reaction of X

$$CH_2{=}CH_2(g) + H_2(g) \xrightarrow[130\ ^\circ C]{\text{nickel}} CH_3CH_3(g)$$

Hence Y is Ethane (saturated hydrocarbon)

Difference between X and Y

- Compound X (Ethene) decolourise bromine water from reddish brown to colourless **WHILE** compound Y (Ethane) does not decolourise the bromine water.
- Compound X (Ethene) decolourise potassium permanganate from purple to colourless **WHILE** compound Y (Ethane) does not decolourise the colour of potassium permanganate.

(Any one (1) difference ($01\frac{1}{2}$ Mark) = 03 Marks)

(d) Compound Y is obtain by hydrogenation reaction of Ethene

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$$CH_2{=}CH_2(g) + H_2(g) \xrightarrow[130\ °C]{\text{nickel}} CH_3CH_3(g)$$

IUPAC name of (C_2H_4) is Ethene **(03 Marks)**

(e) The reaction is Hydrogenation reaction where hydrogen is added into the alkene in presence of Nickel or Platinum as a catalyst. **(03 Marks)**

11. (a) **A** is Graphite, its shape is hexagonal rings that form flat parallel layers **(02 Marks)**

B is Rhombic Sulphur, its shape is octahedral **(02 Marks)**

C is Diamond, its structure is tetrahedral **(02 Marks)**

(b) (i) - Manufacturing of fungicides
- Manufacturing of chemicals such as sulphuric acid by contact process
- Manufacturing of Match sticks
- Vulcanization of rubber
- Manufacturing of genetic materials e.g. DNA molecules

(Any four (04) points @ ($01\frac{1}{2}$ Mark = 03 Marks)

(ii) $S_{(l)} + H_{2(g)} \rightarrow H_2S_{(g)}$ **($01\frac{1}{2}$ Mark)**

(c) $C_{(s)} + 2H_2SO_{4(l)} \rightarrow 2SO_{2(g)} + CO_{2(g)} + H_2O_{(l)}$ **($01\frac{1}{2}$ Mark)**

(d)

A (Graphite)	C (Diamond)
Good conductor of heat and electricity	Poor conductor of heat and electricity
It is soft and slippery	It is hardest substance ever known
It has density of 2.26g/cm^3	It has density of 3.53g/cm^3
Its boiling point is 4827°C	Its boiling point is 4027°C
Its melting point is 3600°C	Its melting point is 4830°C

(Any Two points 02 Marks @ $\left(01\frac{1}{2}\text{ Mark}\right)$ = 03 Mark)

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