

233/1

CHEMISTRY
(Theory)
JOINT MOCK

Paper 1

JUNE 2026 – Time: 2 hours

Admission No. Class.....

School.....Date.....Signature.....

MARKING scheme

Instructions to candidates

- a) Write your Admission Number, Index Number and school in the spaces provided above.
- b) Sign and write the date of examination in the spaces provided above.
- c) Answer **all** the questions in this question paper
- d) Answer all questions in the spaces provided
- e) This paper consists of 11 printed pages.
- f) All workings must be shown clearly where necessary
- g) Mathematical tables and silent non-programmable calculators may be used

FOR EXAMINERS USE ONLY

QUESTIONS	MAXIMUM SCORE	CANDIDATES SCORE
1-27	80 MARKS	

1. Complete the table below by writing the observations made when aqueous ammonia and aqueous sodium sulphate are added to solutions containing calcium, aluminum and Iron (II) ions. (3 marks)

Ions Present	Aqueous Ammonia	Aqueous sodium sulphate
Ca^{2+}	No white ppt ✓	white ppt ✓
Al^{3+}	white precipitate ✓	no white ppt ✓
Fe^{2+}	green precipitate ✓	No white ppt ✓

2. A group of compounds called chlorofluorocarbons have a wide range of uses but they also have harmful effects on the environment.

- (i) Give one use of chlorofluorocarbons. (1 mark)

Refrigerant / Aerosol propellants / cleaning agent ✓ 01

- (ii) State one harmful effect of chlorofluorocarbons on the environment. (1 mark)

Contribute to global warming /
Cause health problems / increase UV radiation ✓ 01

3. (a) Define the term solubility. (1 mark)

maximum mass of solute that can dissolve 100g of solvent at given temp. ✓ 01

- (b) 40g of a saturated solution yields 15g of salt when evaporated to dryness.

Calculate the solubility of the salt. (2 marks)

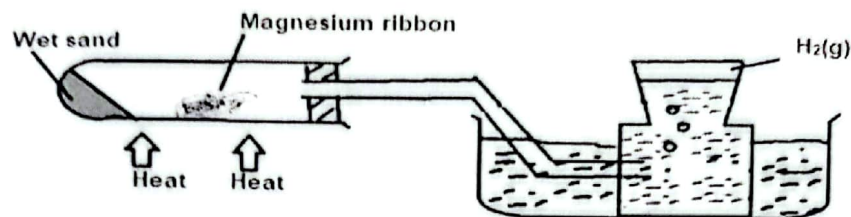
mass of H_2O = $40 - 15 = 25\text{g}$ ✓ 01

$15\text{g} \rightarrow 25\text{g H}_2\text{O}$
? $\rightarrow 100\text{g H}_2\text{O}$ ✓ = $60\text{g} / 100\text{g H}_2\text{O}$ ✓ 02

4. Element U has atomic number 12 while element V has atomic number 16. How do the melting points of their oxides compare? Explain. (3 marks)

m.p. of U higher ✓ 01 has giant ionic structure
strong ionic bond ✓ but V has
simple molecular structure held
by weak van der Waals forces ✓ 03

5. Hydrogen gas can be prepared by passing steam over heated Magnesium ribbon as shown in the figure below.



- a) Explain why the delivery tube must be removed from beneath the water before heating is stopped. (1 mark)

to prevent sucking back which could break the apparatus ✓ 01

- b) Explain why sodium metal is not suitable for this experiment. (1 mark)

React explosively ✓ 01

- c) Give two reasons why hydrogen is not commonly used as fuel. (1 mark)

Flammable & explosive ✓ 1/2
storage is difficult & expensive ✓ 01

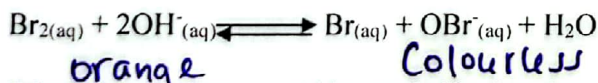
6. (a) State Graham's law of diffusion. (1 mark)

under similar conditions of temp & pressure the rate of diffusion of a gas is inversely proportional to the square root of its density ✓ 01

- (b) Explain why a balloon filled with helium gas deflates faster than a balloon of the same size filled with argon gas. (He = 4.0, Ar = 40) (2 marks)

Helium is lighter/smaller ✓ 01 hence higher kinetic energy & move faster ✓ 02

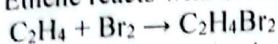
7. When bromine gas reacts with aqueous sodium hydroxide, the equilibrium represented by the equation: is established



orange colourless
What observations would be made if a few drops of Sulphuric (VI) acid were added to the equilibrium mixture? Explain (2 marks)

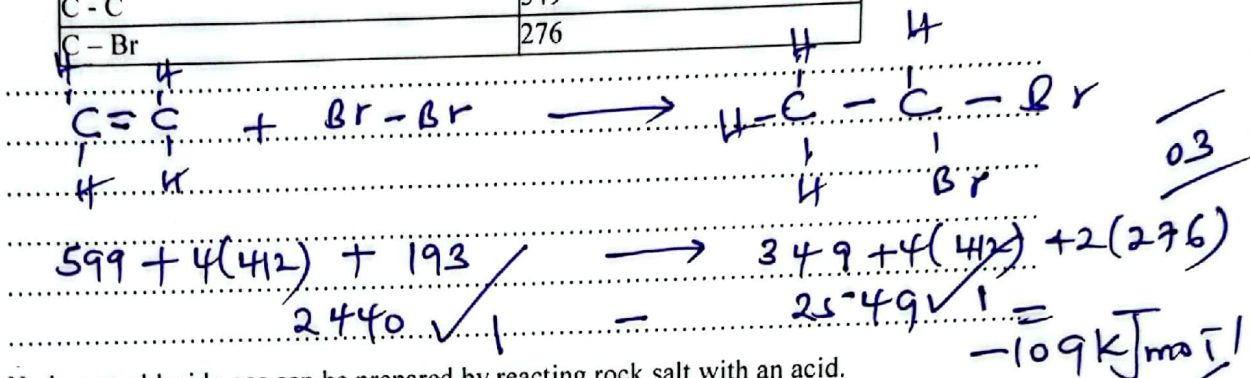
orange colour intensifies ✓ 01 equilibrium shift to the left ✓ 1/2 H₂SO₄ reduces OH⁻ ✓ 02

8. Ethene reacts with bromine as shown in the following chemical equation.



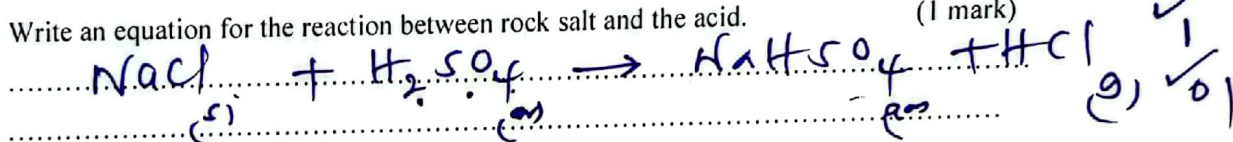
Using bond energies in the table below, calculate the enthalpy change (H) for the reaction. (3 marks)

Bond	Bond energy levels KJ/mol
C = C	599
C - H	412
Br - Br	193
C - C	349
C - Br	276



9. Hydrogen chloride gas can be prepared by reacting rock salt with an acid.

- i) Write an equation for the reaction between rock salt and the acid. (1 mark)



- ii) Give two chemical properties of hydrogen chloride gas. (1 mark)

- React with ammonia to form white fumes $\checkmark 0.5$
 - Turns moist blue litmus paper red $\checkmark 0.5$

- i) Calcium oxide can be used to dry ammonia gas. Explain why Calcium oxide is not used to dry hydrogen chloride gas. (1 mark)

HCl is acidic it will react to form calcium chloride $\checkmark 0.1$

10. The table below shows some properties of three substances. Complete the table by filling in the types of forces and structures in each substance. (3 marks)

Substance	M.P. °C	B.P. °C	Electrical conductivity		Type of forces	Structure
			Solid	Molten		
X	-101	-35	Poor	Poor	Vander Waals forces	molecular
Y	650	+1110	Good	Good	electrostatic	metallic
Z	714	+1142	Poor	Good	electrostatic	giant ionic

11. Study the table below and answer the questions that follow. The letters do not represent to actual symbols of the elements.

Element	No. of electrons	Mass Number
L	7	14
M	12	24
N	15	31
K	20	40

- a) Write the chemical formula of the compound formed between L and M. (1 mark)

M_3L_2 | Mg_3N_2 ✓ 0.1

- b) Given that the chemical formula of a molecule of element N is N_4 , write a balanced equation for the reaction between N and limited oxygen. (1 mark)

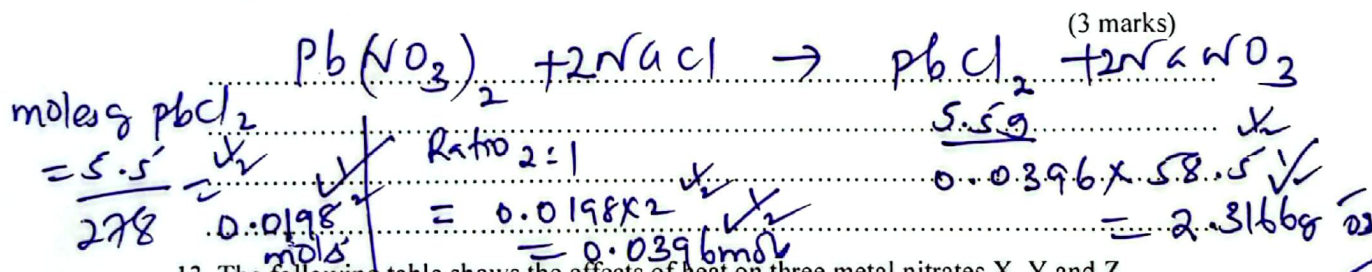
$N_{4(s)} + 3O_{2(g)} \rightarrow 2P_2O_{2(g)}$ ✓ 0.1

- c) State the family name and the period to which K belongs in the periodic table.

Family: Alkaline earth ✓ 0.1 (1 mark)

Period: 4 ✓ 0.1 (1 mark)

12. When excess lead (II) nitrate solution was added to a solution containing sodium chloride, the precipitate formed was found to weigh 5.5g. Determine the amount of sodium chloride in the solution. (Pb = 207, Cl = 35.5, Na = 23).



13. The following table shows the effects of heat on three metal nitrates X, Y and Z.

Metal nitrate	Products on heating
X	Metal oxide + oxygen + Nitrogen(IV) oxide
Y	Metal nitrite + oxygen
Z	Metal + oxygen + Nitrogen(IV) oxide

- a) Arrange the metals X, Y and Z in order of decreasing reactivity. (1 mark)

$Z \rightarrow Y \rightarrow X$ ✓ 0.1

b) Name a metal that is likely to be Z.

mercury | silver | ^{accept} Ag | Hg ✓ 01 (1 mark)

c) What is the effect of heat on Carbonate of metal Y? Give a reason.

No effect ✓ 01 (1 mark)
- Very stable Very reactive metal starts with carbonate

14. Starting with lead metal, describe how a solid sample of lead (II) carbonate can be prepared.

- heat Pb to form PbO ✓ 1/2 (3 marks)

- To PbO formed add HNO_3 until in excess & filter to remove unreacted PbO ✓ 1

- To the filtrate add sodium carbonate solution to precipitate PbCO_3 ✓ 1

- Rinse the solid with distilled water ✓ 1/2 03

15. (a) A sample of water in a beaker was found to boil at 101.5°C at 1 atmospheric pressure.

Assuming that the thermometer was not faulty, explain this observation. (1 mark)

Water was impure ✓ 1/2 impurities

raises B.p. ✓ 1/2 01

b) Describe an experimental procedure that can be used to extract oil from nut seeds.

- crush using pestle & mortar ✓ 1/2 (2 marks)
add propanone / ethanol

- sieve / decant / filter to obtain a mixture of oil & ethanol ✓ 1/2

- leave the mixture in the sun ethanol propanone will evaporate due to lower B.p. ✓ 1/2 02

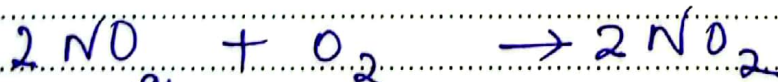
16. a) State Gay-Lussac's Law.

When gases react they do so in volume that bear simple ratio to one another as long as temp & pressure is kept constant ✓ 01 (1 mark)

b) 180cm^3 of Nitrogen (II) oxide gas was reacted with 400cm^3 of Oxygen gas. Calculate

the total volume of the gases at the end of the reaction.

(2 marks)



(9)
 180cm^3

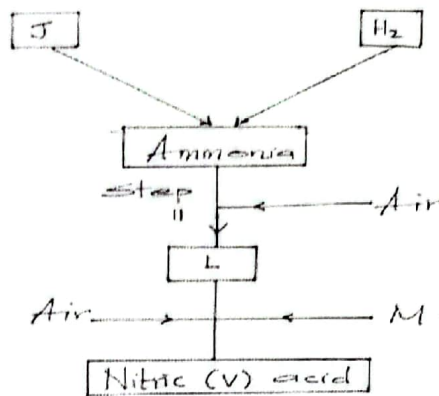
(9)
 400cm^3
90
90

(9)
 80cm^3

180cm^3 of NO_2 ✓ 1
 310cm^3 of excess O_2 ✓ 1

total of = 490\text{cm}^3 ✓ 02

17. The flow chart below shows the process that occurs in the manufacture of nitric (V) acid.



a) Name the substances. L, M [1, mark]

L..... Nitrogen (II) oxide $\frac{1}{2}$ ✓ NO

M..... water $\frac{1}{2}$ ✓ H₂O

b) In the industrial manufacture of ammonia, ground iron is used as a catalyst. State two other conditions for the process. [1, mark]

..... - Temp of 450°C $\frac{1}{2}$ ✓

..... - pressure of 200 atm $\frac{1}{2}$ ✓ 01

c) Identify a catalyst that can be used in Step II. [1, mark]

..... platinum $\frac{1}{2}$ ✓ 01

18. When a sample of concentrated sulphuric (VI) acid was left in an open beaker in a room for two days, the volume was found to have increased slightly.

a) What property of concentrated sulphuric (VI) acid is shown by the above reaction?

..... hygroscopic $\frac{1}{2}$ ✓ 01 (1 mark)

b) State one use of concentrated sulphuric (VI) acid that depends on the property named above. (1 mark)

..... Drying agent / drying gases $\frac{1}{2}$ ✓ 01

19. Name the apparatus that can be used to:

i) Measure fixed volume of solutions. (1 mark)

..... pipette / volumetric flask $\frac{1}{2}$ ✓ 01

ii) Lower a burning piece of magnesium ribbon into a gas jar. (1 mark)

..... Deflagrating spoon $\frac{1}{2}$ ✓ 01

iii) Store and keep substances free from moisture. (1 mark)

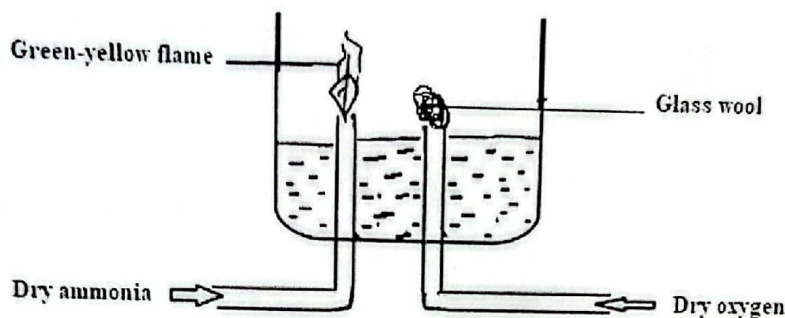
..... Desiccator $\frac{1}{2}$ ✓ 01

08

20. a) Explain why a high temperature is required for nitrogen to react with oxygen.

Nitrogen has a triple bond which require alot of energy to break ✓ (1 mark)

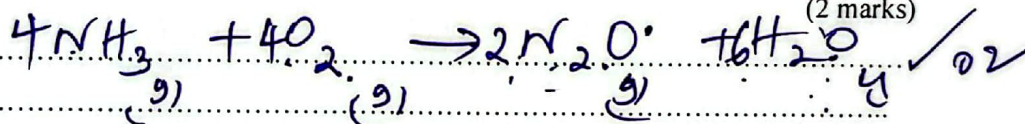
b) Dry ammonia and dry oxygen were reacted as shown in the diagram below.



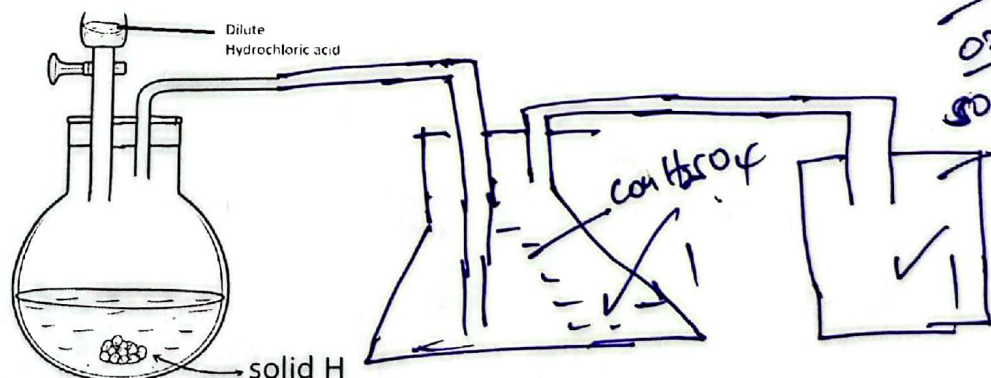
i) What is the purpose of the glass wool? (1 mark)

Increase the surface area for reaction with ammonia ✓

ii) Write an equation for the reaction that leads to the production of the green-yellow flame. (2 marks)



21. The diagram below shows an incomplete set up used to prepare sulphur(IV) oxide in the laboratory.



a) Complete the set up diagram above to show how dry Sulphur(IV) oxide gas would be collected. (2 marks)

b) Identify solid H. (1 mark)

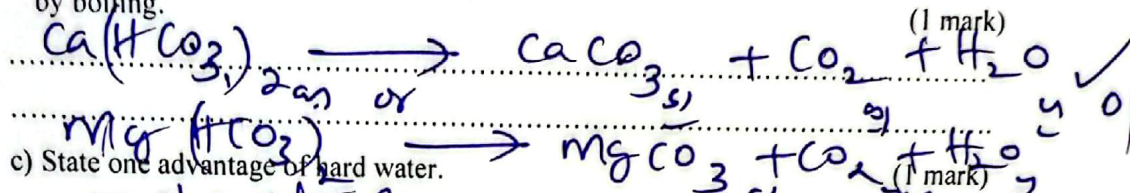
Na_2SO_3 | sodium sulphite ✓

22. Temporary water hardness can be removed by boiling

a) What is hard water.

Water containing Mg^{2+} or Ca^{2+} (1 mark) ✓

b) Write an equation to show how temporary hardness in water can be removed by boiling.



c) State one advantage of hard water.

- strengthen Bone
 Beer brewing (1 mark) ✓

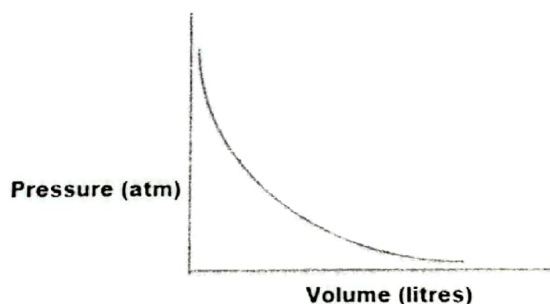
23. a) Without using hydroxide solution, explain how you can distinguish carbon (II) oxide and carbon (IV) oxide gases. (2 marks)

CO_2 extinguishes a burning flame ✓ while
 CO supports burning ✓

b) State one use of carbon (IV) oxide which is also a use of ammonia. (1 mark)

used in the manufacture of sodium carbonate ✓

24. The graph below shows the behavior of a fixed mass of a gas at constant temperature



a) What is the relationship between the volume and pressure of the gas. (1 mark)

indirect proportional ✓

b) 3 litres of oxygen gas at one atmosphere pressure were compressed to two atmospheres at constant temperature. Calculate the new volume occupied by the oxygen gas. (2 marks)

$$V_1 = 3$$

$$P_1 = 1$$

$$P_2 = 2$$

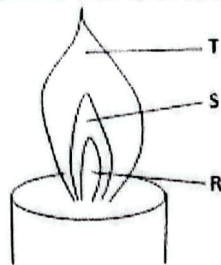
$$V_2 = ?$$

$$\frac{P_1 V_1}{P_2} = \frac{P_2 V_2}{P_2}$$

$$V_2 = \frac{1 \times 3}{2} = 1.5 \text{ litres} \quad \checkmark$$

09

25. The figure below shows a flame obtained from a Bunsen burner.



(a) Name the type of flame. (1 mark)

Non-luminous ✓ 01

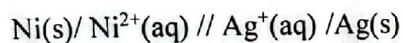
(b) A matchstick head placed at region R will not ignite. Explain. (1 mark)

less hot & contains unburnt carbon atoms due to insufficient air ✓ 01

(c) Name region S. (1 mark)

Green Blue zone ✓ 01

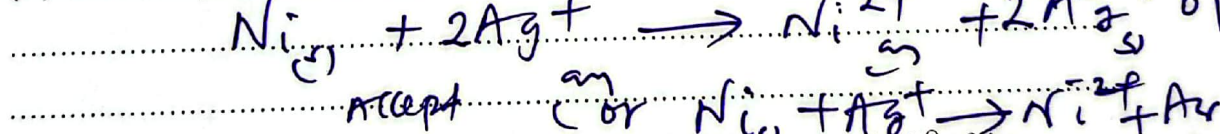
26. Use the cell representation below to answer the questions that follow.



(i) State what the symbol // represents in the diagram. (1 mark)

Salt bridge ✓ 01

(ii) Write the equation for the reaction that occurs in the cell. (1 mark)



(iii) Given that the $E^{\ominus}$ of $\text{Ag}^{+}(\text{aq}) / \text{Ag(s)}$ half-cell is $+0.80\text{V}$ calculate the $E^{\ominus}$ of the $\text{Ni}^{2+}(\text{aq}) / \text{Ni(s)}$ half-cell given that the e.m.f. of the cell is 1.06V . (2 marks)

$$E_{\text{cell}}^{\ominus} = E_{\text{red}}^{\ominus} - E_{\text{ox}}^{\ominus} \quad \checkmark$$

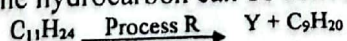
$$1.06 = 0.80 - x \quad \checkmark$$

$$x = 0.80 - 1.06$$

$$= -0.26\text{V} \quad \checkmark 02$$

27. The molecular formula of a hydrocarbon is $\text{C}_{11}\text{H}_{24}$.

The hydrocarbon can be converted into other hydrocarbons as shown below.



(a) Name process R. (1 mark)

cracking ✓ 01

(b) Draw the structural formula of Y and give its name. (1 mark)

