CHEMISTRY
FORM 4
MID TERM 2 2025 MARKING SCHEME

1a) Define term Dynamics Equilibrium, (2mks)

is an equilibrium in which rate of forward reaction is equal to rate of backward reaction. ✓✓

b) State Le Chateliers principles. (1mks)

If stress/change is applied to system in equilibrium system moves so as to oppose that change ✓

c) Nitrogen and oxygen gas react according to the equation below.

$N_{2(g)} + O_{(g)} \rightleftharpoons 2NO_{(g)} + heat$

i) Explain the effect of increasing the temperature on the field of Nitrogen II oxide. (1mk)

high temperature ~~more~~ less yield since there are more atoms less more rate of reaction. ✓

ii) If 200cm³ of Nitrogen were used, determine the volume of Nitrogen II oxide gas produced. (1mk)

200X2 = 400cm³ ✓

iii) State the position of equilibrium if pressure is reduced? (1mk)

No effect ✓ Volume of reactants and products is the same ✓

2. a) State Graham's law of diffusion. (2mks)

Under similar conditions of temp & pressure, rate of diffusion is inversely proportional to square root of its density ✓

b) A certain volume of gas x diffuses through a porous boundary in 30 seconds. How much time is required for an equal volume of gas Y to diffuse through the same medium under the same condition (RMM of X = 28, Y = 7)(3MKS)

$\frac{T_H}{T_X} = \sqrt{\frac{Y}{X}}$ ✓

$\therefore T_Y = T_X\left(\sqrt{\frac{Y}{X}}\right)$ ✓

$T_Y = 30\left(\sqrt{\frac{7}{28}}\right)$

$= 15$ ✓

3. a) Define bond energies? (1mk)

Energy required to break/form a bond ✓

c (i) less yield ✓ forward reaction is exothermic hence favoured by lowering temp. ✓

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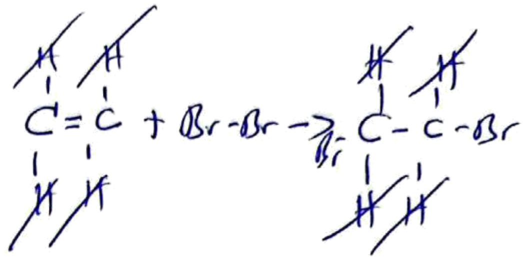
b) Study the information given below and answer the equation.

Bond	Bond energy kJmol
C – C	346
C = C	610
C – Br	280
Br - Br	193
C – H	413



Calculate the enthalpy change for the following reaction, and identify type of reaction. (3mks)

$C_2H_{4(g)} + Br_{2(l)} \rightarrow C_2H_4Br_{2(g)}$

Bond breaking: C=C 610, Br–Br 193, +703kJ ✓

Bond formation: C–C 346, C–Br 280x2, –906kJ.

$\Delta H = +703 + -906$

$= -203kJ$ ✓

4. a) Define hard water. (1mk)

Water that does not lather with soap due to presence of Ca^{2+}/Mg^{2+} ✓

b) State two methods of removing permanent hardness. (2mks)

- Ion exchange resin ✓
- Use of washing soda ✓ // distillation

5. 12cm³ of 0.05M HCl react with calcium hydrogen carbonate.

a) Write the equation for reaction. (1mk)

$Ca(HCO_3)_{2(aq)} + 2HCl_{(aq)} \rightarrow CaCl_{2(aq)} + CO_{2(g)} + 2H_2O_{(l)}$

b) Calculate; (4mks)

i) Moles of HCl used.

$\frac{12 \times 0.05}{1000}$ ✓

$= 0.0006$ moles ✓

iii) No. of moles of calcium hydrogen carbonate.

Mole ratio 1:2 ✓

$= 0.0006/2 = 0.0003$ moles ✓

6. a) Define molar heat of solution. (1mk)

Enthalpy change when 1 mole of substance dissolves in water giving an infinite dilute solution ✓

b) The heat of solution of sulphuric V acid in water is -70kJmol⁻¹

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i) Write a thermo chemical equation for the dissolution of sulphuric VI acid. (2mks)

$H_2SO_{4(l)}$ + water → $H_2SO_{4(aq)}$ ΔH = −70kJ/mol

ii) Given that the molecular mass of sulphuric VI acid is 98, calculate the rise in temperature (DT), when 4.9g of the acid are dissolved in water to give 250cm³ of solution. Density of solution is 1gcm⁻³ specific heat capacity of solution is 4.8kJkg⁻¹k⁻¹. (3mks)

H_2SO_4 = 98
98g ⇒ −70kJ
4.9g → ?

$\frac{4.9 \times 70}{98}$ = 3.5kJ

ΔH = mcθ ∴ θ = $\frac{\Delta H}{mc}$

θ = $\frac{3.5kJ}{0.25 \times 4.2}$ = 3.33°C

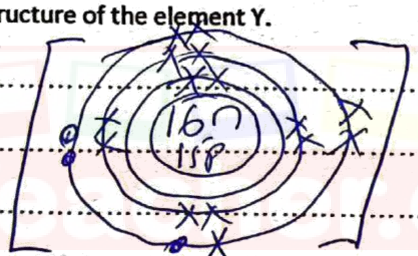
7. A certain element Y has atomic number 15 and mass number of 31.

(a) Calculate the number of neutrons in the element. (1 mark)

31 − 15 = 16

(b) Draw the ionic structure of the element Y. (3 marks)

E.C = 2:8:5



8. The following grid represents parts of the periodic table elements are represented by letters which are not their actual symbols. Study the grid and answer questions that follow.

							M	V
				N		Y	K	
	G					X	H	
P	T							S
	Z							
			W					

(a) (i) An element M has atomic number 1. Indicate its position on the grid. (1 mark)

(ii) Where else can element M fit on the grid. Explain. (2 marks)

It can also gain one electron to have max no of electrons

(b) Name the family of elements to which the following elements belong.

(i) G and T. (1 marks)

Alkaline earth metals ✓

(ii) K and H. (1 mark)

Halogens ✓

(c) Choose a letter from the grid which represents the lightest noble gas. (1 mark)

V ✓

(d) With a reason compare the reactivity of H and K. (2 mark

K more reactive than H ✓, K readily gains electrons ✓

(e) Compare the atomic radius of G and X. Explain. (2 marks)

G > X ✓

X has more protons hence e- strongly attracted towards nucleus results in decrease in size. ✓

(f) Element Q belongs to the same group as element P. Write down the formula of the compound formed when element Q and oxygen combine. (1 mark)

$Q^+ + O^{2-} \rightarrow Q_2O$ ✓

9. State **two** methods of preventing rusting of metallic spatula (2mks)

- Alloying ✓
- electroplating ✓ galvanising.

10. (a) Write the formula of the chemical used in the laboratory preparation of oxygen ~~of oxygen gas~~ (2mks)

Na_2O_2 & H_2O // H_2O_2 & MnO_2 ✓✓

(b) State **two** commercial use of oxygen gas (2mk)

- mixed with acetylene & used in cutting metals. ✓
- In purification of iron to make steel ✓

IP