Name of the Student:_____
Max. Marks : 18 Marks **Time : 18 Minutes**

Mark Schemes

Q1.

(a) **M1** mol P = 0.0145 + (2 × 0.0115) = 0.0375

M2 $[P] = \frac{M1}{0.025} = 1.50 \text{ mol dm}^{-3}$

ECF from incorrect M1

2

(b)

M1 $K_c = \frac{[R][S]^3}{[P]^2[Q]}$

M1 Must be square brackets in expression

M2 $K_c = \frac{\left(\frac{0.0115}{0.045}\right)\left(\frac{0.0345}{0.045}\right)^3}{\left(\frac{0.0145}{0.045}\right)^2\left(\frac{0.0275}{0.045}\right)}$ or $= \frac{(0.256)(0.767)^3}{(0.322)^2(0.611)}$

M2 Inserts values and divides by volume in dm^3

M3 = 1.81 to 1.82

M3 Evaluates expression
If no use of volume lose M2 but can score M3 for 0.0817

M4 units mol dm^{-3}

M4 Allow consequential to their expression

4

(c) **M1** <u>equilibrium</u> shifts to side with most moles

M2 to oppose decrease in concentration of all reactants and products / dilution of everything

Allow
M2 oppose the decrease in concentration of S

OR

M1 K_c is expressed as a function of concentrations and concentration equals amount over volume.

$K_c = RS^3/P^2Q \times 1/V$ (where R,S etc are amounts)
So, if V increases R and S must increase relative to P and Q to keep K_c constant

M2 If Volume increases the amount of **R** and **S** must increase in order to keep K_c constant.

2

[8]

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Q2.

(a) **M1** + 3 C_2H_6

M2 Zeolite/Aluminosilicate/Aluminium oxide

2

(b) Option B

1

(c) Alkenes

1

(d) **M1** Initial volume $O_2 = 0.21 \times 1350 = 283.5$ (cm^3)

Alternative route:
M1 Vol Air decreases by 6.5 × 20 = 130 cm^3

M2 Volume of O_2 remaining = M1 - (6.5 × 20) = 153.5 cm^3

M2 = 1220 cm^3

M3 Volume of CO_2 formed = 20 × 4 = 80 cm^3

M3 Vol CO_2 produced = 4 × 20 = 80 cm^3

M4 Total volume of gas left = M2 + M3 + (0.79 × 1350) = 1300 cm^3

M4 Total Vol Air + CO_2 = 1220 + 80 = 1300 cm^3

4

(e) **M1** Acid rain

M1 Allow damages (limestone) buildings or statues/death of aquatic organisms/air pollution

M2 CaO or $CaCO_3$

2

[10]

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