Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Mark Schemes

Q1.

(a) C_2F_4 = 0.865 mol

Award 1 mark if HCl = 2 × C_2F_4

M1

HCl = 1.73 mol

M2

(b) $K_c = \frac{[C_2F_4][HCl]^2}{[CHClF_2]^2}$

Penalise round brackets

1

(c) $K_c = \frac{[0.865/23.2][1.73/23.2]^2}{[0.27/23.2]^2}$

Allow ecf for use of their answer(s) to (a) and (b)
M1 for dividing by volume

M1

K_c = 1.5(3) must be at least 2sf Allow 1.53-1.54

If no use of volume allow M2 for 35.5
If upside down can allow all 3 marks as ECF to (b)
Leads to an answer of 0.65(3) mol^{-1} dm^3

M2

Units = mol dm^{-3}

M3

(d) Yield would increase

M1

Equilibrium opposes temperature increase

Shifts /moves to reduce temperature

M2

Moves in the endothermic direction

Ignore favours

M3

(e) Causes ozone depletion/decomposition/damage

Accept hole in the ozone layer

M1

Pentane does not have C-Cl bonds

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Accept does not produce Cl radicals
Accept does not contain chlorine

M2

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Q2.

(a)

$$K_c = \frac{[SO_3]^2}{[SO_2]^2[O_2]}$$

1

(b) M1: dividing by volume for SO_2 and SO_3 / calculation of concentrations of SO_2 and SO_3

15.0 = $$15.0 = \frac{(\frac{0.461}{1.80})^2}{\left(\frac{0.176}{1.80}\right)^2 [O_2]}$$

Or $[SO_2] = 0.0978$ mol dm^{-3} and $[SO_3] = 0.256$ mol dm^{-3}

1

M2: correct substitution into rearranged expression

$$[O_2] = \frac{(\frac{0.461}{1.80})^2}{\left(\frac{0.176}{1.80}\right)^2 (15.0)}$$

or

$$[O_2] = \frac{(0.256)^2}{(0.0978)^2(15.0)}$$

($[O_2] = 0.457$ mol dm^{-3})

1

M3 amount of oxygen = $[O_2] \times 1.80 = 0.823$ mol

At least 2sf

1

(c) (pV = nRT)

T = pV ÷ nR

M1: rearranged expression for ideal gas equation

1

n = 0.025 + 0.049 + 0.034

n = 0.108

M2: total number of moles

1

Conversions: pressure = 255000 Pa ; volume = 0.0035 m^3

M3: unit conversions

1

$$T = \frac{255000 \times 0.0035}{8.31 \times 0.108}$$

1

M4: temperature in K

T = 994.5 K

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T = 721 °C

M5: temperature in °C (allow 720 – 722)

M5 = M4 – 273

1

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