Name of the Student:_____
Max. Marks : 22 Marks **Time : 22 Minutes**

Mark Schemes

Q1.

(a) (i) chlorotrifluoromethane

Spelling must be correct but do not penalise "flouro"
Ignore use of 1–

1

(ii) CF_3•

May be drawn out with dot on C
OR if as shown dot may be anywhere

1

(iii) An unpaired/non-bonded/unbonded/free/a single/one/lone electron

NOT "bonded electron" and NOT "paired electron"
NOT "pair of electrons"
NOT "electrons"
Ignore "(free) radical"

1

(b) **M1** Cl• + $O_3 \rightarrow$ ClO• + O_2

M2 ClO• + $O_3 \rightarrow$ **2**O_2 + Cl•

Mark independently
Equations could gain credit in either position
The dot can be anywhere on either radical
Penalise the absence of a dot on the first occasion that it is seen and then mark on. Do not make the same penalty in the next equation, but penalise the absence of a dot on the other radical.
Apply the list principle for additional equations

2

(c) (i) (If any factor is changed which affects an equilibrium), the (position of) equilibrium will shift/move so as to oppose the change.

OR

(When a system/reaction in equilibrium is disturbed), the equilibrium shifts/moves in a direction which tends to reduce the disturbance

Must refer to equilibrium
Ignore reference to "system" alone

Downloaded from www.merit-minds.com

A variety of wording will be seen here and the key part is the last phrase.

An alternative to shift/move would be the idea of <u>changing/altering the position</u> of equilibrium

1

(ii) **M1** The (forward) reaction/to the right is <u>endothermic</u> or <u>takes in heat</u>

OR The reverse reaction/to the left is <u>exothermic</u> or <u>gives out heat</u>

M2 The <u>equilibrium moves/shifts</u> to <u>oppose the increase in temperature</u>

M2 depends on a correct statement for M1

For M2 accept

The <u>equilibrium moves/shifts</u>

- *to <u>take in heat/lower the temperature</u>*
- *to promote the endothermic reaction and <u>take in heat/ lower the temperature</u>*
- *to oppose the change and <u>take in heat/lower the temperature</u>*

(leading to the formation of more ozone)

2

(d) Any one of

- Pentane <u>does not contain chlorine</u> OR <u>C–Cl</u> (bond)
- Pentane is <u>chlorine-free</u>
- Pentane <u>does not release chlorine</u> (atoms/radicals)

Ignore reference to F OR C–F OR halogen

Ignore "Pentane is not a CFC"

Ignore "Pentane is a hydrocarbon"

Ignore "Pentane only contains C and H"

Ignore "Pentane is C_5H_{12}"

1

[9]

Downloaded from www.merit-minds.com

Q2.

(a) mol CH_3OH = 0.07(0)

1

mol H_2 = 0.24(0)

1

(b) (i)

$$\frac{[CH_3OH]}{[CO][H_2]^2} \text{ or } \frac{(0.082/1.5)}{(0.210/1.5)(0.275/1.5)^2}$$

allow ( ) but expression using formulae must have brackets alternative expression using numbers must include volumes

1

(ii) **M1** divides by vol

Mark independently from (b)(i)
any AE is –1
if volume missed, can score only M3 and M4

1

M2 $\frac{(0.082/1.5)}{(0.210/1.5)(0.275/1.5)^2} \quad \left(= \frac{(0.05467)}{(0.14)(0.1833)^2}\right)$

mark is for correct insertion of correct numbers in correct Kc expression in b(ii)
If Kc expression wrong, can only score M1 & M4
If numbers rounded, allow M2 but check range for M3

1

M3 11.6 or 11.7

mark for answer
above 11.7 up to 12.2 scores 2 for M1 and M2
if vol missed, can score M3 for 5.16 (allow range 4.88 to 5.21)

1

M4 $mol^{-2}\ dm^6$

Units conseq to their Kc in (b)(ii)

1

(iii) no effect or no change or none

1

(c) **M1** T_1

if wrong - no further marks

1

M2 (forward) reaction is exothermic **OR** gives out heat

backward reaction is endothermic

only award M3 if M2 is correct

1

M3 shifts to RHS to replace lost heat

OR to increase the temperature

OR to oppose fall in temp

backward reaction takes in heat

Downloaded from www.merit-minds.com

OR to lower the temperature

not just to oppose the change

1

(d) fossil fuels used

OR

CO_2 H_2O produced/given off/formed which are <u>greenhouse gases</u>

OR

SO_2 produced/given off/formed which causes acid rain

OR

Carbon produced/given off/formed causes global dimming

not allow electricity is expensive
ignore just global warming
ignore energy or hazard discussion

1

(e) $C_{17}H_{35}COOCH_3$ **or** $C_{17}H_{31}COOCH_3$ or $C_{17}H_{29}COOCH_3$

OR

$CH_3OOCC_{17}H_{35}$ or $CH_3OOCC_{17}H_{31}$ or $CH_3OOCC_{17}H_{29}$

1

[13]

Downloaded from www.merit-minds.com