Marking scheme for AHL Worksheet – Chapter 7

1 **a** $K_c = \dfrac{[B]^2}{[A]}$ [1]

$K_c = 0.4$ (mol dm^{-3}) [1]

b $K_c = \dfrac{[Z]^3[E]^2}{[Q]^3[X]}$ [1]

$K_c = 4.52 \times 10^{-8}$ (mol dm^{-3}) [1]

2 **a** number of moles of Z = 0.1500 mol [1]

b number of moles of A = 0.800 mol [1]

number of moles of B = 1.90 mol [1]

3 **a** $K_c = \dfrac{[Q]^2}{[A][X]}$ [1]

b **i** number of moles at equilibrium: X = 0.31 mol, Q = 0.18 mol [1]

concentrations at equilibrium:
A = 0.010 mol dm^{-3}, X = 0.31 mol dm^{-3}, Q = 0.18 mol dm^{-3}

$K_c = 10.5$ [1]

ii number of moles at equilibrium: X 0.050 mol, Q = 0.160 mol [1]

concentrations at equilibrium:
A = 0.0120 mol dm^{-3}, X = 0.0050 mol dm^{-3}, Q = 0.0160 mol dm^{-3}

$K_c = 4.27$ [1]

c as temperature increases the value of K_c decreases [1]

forward reaction is exothermic [1]

position of equilibrium shifts to left as temperature increases [1]

4 **a** $K_c = \dfrac{[Q]^4[Z]}{[A]^2[X]}$ [1]

b number of moles at equilibrium: X = 0.500 mol, Q = 0.400 mol, Z = 0.600 mol [1]

concentrations at equilibrium:
A = 0.0800 mol dm^{-3}, X = 0.0500 mol dm^{-3},
Q = 0.0400 mol dm^{-3}, Z = 0.0600 mol dm^{-3} [1]

$K_c = 4.80 \times 10^{-4}$ mol^2 dm^{-6} [1]

c this is the reverse reaction, $K_c = \dfrac{[A]^2[X]}{[Q]^4[Z]}$ [1]

$K_c = \dfrac{1}{4.80 \times 10^{-4}} = 2080$ (mol^{-2} dm^6) [1]

5 $A(g) + Z(g) \rightarrow X(g) + Q(g)$

	A(g)	**Z(g)**	**X(g)**	**Q(g)**
initial number of moles / mol	0.200	0.200		
equilibrium number of moles / mol	$0.200 - y$	$0.200 - y$	y	y
equilibrium concentration / mol dm^{-3}	$0.200 - y$	$0.200 - y$	y	y

[1]

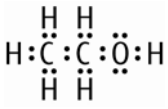
$K_c = \dfrac{[X(g)][Q(g)]}{[A(g)][Z(g)]}$ [1]

$4.00 = \dfrac{y^2}{(0.200 - y)^2}$ [1]

$y = 0.133$ mol [1]

equilibrium concentration of X / number of moles of X is 0.133 mol dm^{-3} [1]

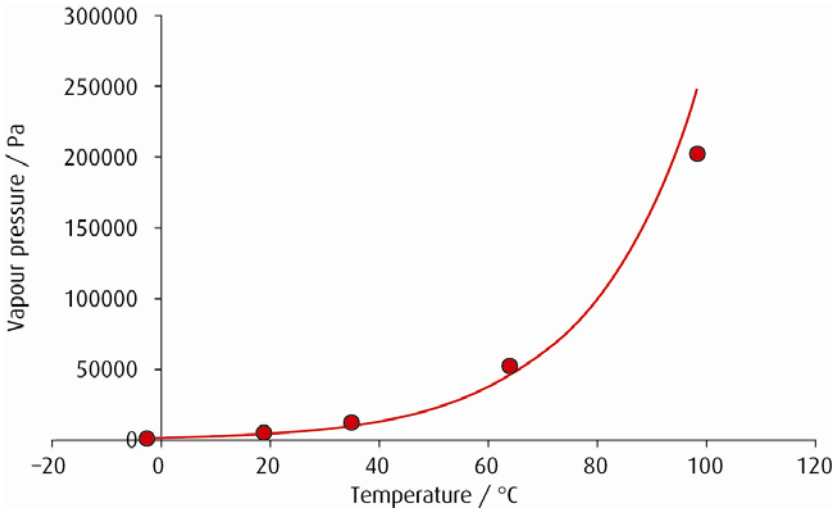
6 **a**



[1]

b the pressure exerted by a vapour in equilibrium with its liquid [1]

c



2 marks for all points correctly plotted; lose 1 mark for each mistake [2]

line of best-fit drawn [1]

boiling point of ethanol approximately 80 °C [1]

d vapour pressure of methoxymethane would be higher [1]

ethanol has hydrogen bonding between molecules but methoxymethane does not [1]

hydrogen bonding is a stronger intermolecular force than dipole–dipole interactions between methoxymethane molecules [1]