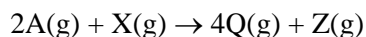


AHL Worksheet – Chapter 7

- 1** Given the equilibrium concentrations, calculate the value of the equilibrium constant for each reaction.
- a** $A(g) \rightarrow 2B(g)$ [2]
equilibrium concentrations are:
 $[A] = 0.100 \text{ mol dm}^{-3}$ $[B] = 0.200 \text{ mol dm}^{-3}$
- b** $3Q(g) + X(g) \rightarrow 3Z(g) + 2E(g)$ [2]
equilibrium concentrations are:
 $[Q] = 2.50 \times 10^{-3} \text{ mol dm}^{-3}$ $[X] = 2.00 \times 10^{-3} \text{ mol dm}^{-3}$
 $[Z] = 5.40 \times 10^{-4} \text{ mol dm}^{-3}$ $[E] = 9.47 \times 10^{-5} \text{ mol dm}^{-3}$
- 2** In each of the following reactions use the given data to calculate equilibrium number of moles of each substance.
- a** $A(g) \rightarrow Z(g)$ [1]
initial number of moles of:
 $A = 0.100 \text{ mol}$ $Z = 0.100 \text{ mol}$
number of moles of A at equilibrium = 0.0500 mol
- b** $2A(g) + B(g) \rightarrow 2C(g)$ [2]
initial number of moles of:
 $A = 1.00 \text{ mol}$ $B = 2.00 \text{ mol}$ $C = 0.00 \text{ mol}$
number of moles of C at equilibrium = 0.200 mol
- 3** Consider the reversible reaction:
 $A(g) + X(g) \rightarrow 2Q(g)$
- a** Write the expression for K_c for this reaction. [1]
- b** In each of the following situations calculate a value for the equilibrium constant from the data given:
- i** initial number of moles of:
 $A = 0.100 \text{ mol}$ $X = 0.400 \text{ mol}$ $Q = 0.000 \text{ mol}$
number of moles of A at equilibrium = 0.010 mol
volume of container = 1.00 dm^3 temperature = 300 K [2]
- ii** initial number of moles of:
 $A = 0.150 \text{ mol}$ $X = 0.080 \text{ mol}$ $Q = 0.100 \text{ mol}$
number of moles of A at equilibrium = 0.120 mol
volume of container = 10.0 dm^3 temperature = 400 K [2]
- c** Use the values of K_c that you have calculated to work out whether this reaction is exothermic or endothermic. [3]

4 Consider the reversible reaction:



a Write the expression for K_c for this reaction. [1]

b Calculate a value for the equilibrium constant from the data given:

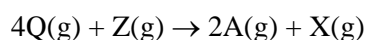
initial number of moles of:

A = 0.000 mol X = 0.100 mol Q = 2.000 mol Z = 1.000 mol

number of moles of A at equilibrium = 0.800 mol

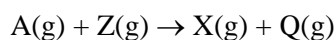
volume of container = 10.0 dm³ temperature = 300 K [3]

c Calculate a value for the equilibrium constant for the reaction:



at 300 K. [2]

5 Consider the equilibrium:



At a certain temperature the value of the equilibrium constant for this reaction is 4.00.

0.200 mol of A and 0.200 mol of Z are placed in a container of volume 1.00 dm³ and allowed to come to equilibrium at this temperature. Calculate the number of moles of X present at equilibrium. [5]

6 The data in the table shows the variation of the vapour pressure of ethanol (CH₃CH₂OH) with temperature.

Temperature / °C	Vapour pressure / Pa
-31	133
-2	1330
19	5330
35	13300
64	53300

a Draw a Lewis structure for ethanol. [1]

b Explain what is meant by **vapour pressure**. [1]

c Plot the data on a graph and use your graph to estimate the boiling point of ethanol. [4]

d Explain how the vapour pressure of ethanol at 0 °C would compare with that of its isomer methoxymethane (CH₃OCH₃) at the same temperature. [3]