I am able to:

1 Explain what you understand by the term *dynamic equilibrium*.

2 Explain what is meant by a *closed system*.

3 Describe, on a molecular level, how equilibrium is established when a liquid is placed in a closed container.

4 Write expressions for the equilibrium constant, K_c, for

$CH_4(g) + 2H_2O(g) \rightleftharpoons CO_2(g) + 4H_2(g)$
$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$
$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$

5 Write expressions for the equilibrium constant, Kc_1, for the reactions shown and state the relationship between the values of Kc_1 and K_c in 4

$CO_2(g) + 4H_2(g) \rightleftharpoons CH_4(g) + 2H_2O(g)$
$^1/_2N_2(g) + {}^3/_2H_2(g) \rightleftharpoons NH_3(g)$
$SO_3(g) \rightleftharpoons SO_2(g) + {}^1/_2O_2(g)$

6 Explain the connection between the value of the equilibrium constant and the position of equilibrium.

7 Predict, for each of the reactions shown, the effect of the changes below on the position of equilibrium and the value of the equilibrium constant

$CH_4(g) + H_2O(g) \rightleftharpoons CO(g) + 3H_2(g)$	$\Delta H = +206$ kJ mol^{-1}
$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$	$\Delta H = -92$ kJ mol^{-1}
$H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$	$\Delta H = +52$ kJ mol^{-1}

- increasing the pressure
- decreasing the temperature
- adding hydrogen
- adding a catalyst

8 Explain whether the reaction $A \rightleftharpoons B$ is endothermic or exothermic from the values of the equilibrium constant.

$K_c = 1.2 \times 10^4$ at 500 K and $K_c = 5.6 \times 10^5$ at 1000 K

9 Write expressions for the reaction quotient, Q, for the following reactions

$2A(g) + Q(g) \rightleftharpoons 2X(g) + 3D(g)$
$A(g) + 3Q(g) \rightleftharpoons 4X(g) + D(g)$

10 Given the value of K_c and the value of Q deduce whether

A the system is at equilibrium
B proceeds to the right towards equilibrium
C proceeds to the left towards equilibrium

(a) $A(g) + X(g) \rightleftharpoons 2Q(g) + Z(g)$

Value of $K_c = 0.0300$	Value of $Q = 0.100$

(b) $2A(g) + X(g) \rightleftharpoons 2Q(g) + 2Z(g)$

Value of $K_c = 0.0200$	Value of $Q = 0.0100$

(c) $A(g) + 2X(g) \rightleftharpoons Q(g) + 3Z(g)$

Value of $K_c = 0.160$	Value of $Q = 0.160$