17.1 The Equilibrium Law

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Course	DP IB Chemistry
Section	17. Equilibrium (HL only)
Topic	17.1 The Equilibrium Law
Difficulty	Medium

To be used by all students preparing for DP IB Chemistry HL
Students of other boards may also find this useful

1

The correct answer is **D** because:

- The calculation is as follows:

	$2N_2O_5$	$4NO_2$	O_2
t= 0	2	0	0
change	-1	+1 x 2	+1 x ½
t= eqm	1	2	0.5

$$K_c = \frac{[NO_2]^4[O_2]}{[N_2O_5]^2} = \frac{2^4 \times 0.5}{1^2} = \frac{8}{1} = 8$$

A, **B** & **C** are incorrect as	they give incorrect values for *Kc*. In these type of calculations common errors include inverting the fraction, forgetting the coefficients which appear as powers and getting the stoichiometry wrong for the amounts at equilibrium

2

The correct answer is **A** because:

- The calculation is as follows:

	$3O_2$	$2O_3$
t= eqm	4	4

$$K_c = \frac{[O_3]^2}{[O_2]^3} = \frac{4^2}{4^3} = \frac{1}{4} = 0.25$$

B, **C** & **D** are incorrect as	they give incorrect values for K_c. You should be able to do these problems without a calculator

3

The correct answer is **B** because:

- Following Le Chatelier's Principle, removing the product, NO_2 (g), will cause the equilibrium to shift to the right to replace it
- The reaction is endothermic, so decreasing the temperature will cause it to shift in the exothermic direction, which is to the left, so this statement is not correct
- There are five moles of gas on the right and two on the left. Decreasing the pressure will cause the equilibrium to shift to the side which restores the pressure. That means the side with the most gas moles, which is the right

A, **C** & **D** are incorrect as	statement II is incorrect

4

The correct answer is **D** because:

- Decreasing the volume of the container has the same effect as increasing the pressure
- A gaseous equilibrium responds by shifting to the side with the fewer gas molecules
- In this reaction there are the same number of gas molecules so there is no effect on the amount of any of the gases present
- K_c only changes with temperature

A is incorrect as	although the amount of H_2 (g) remains the same the concentration will increase when reducing the volume of the container
B & **C** are incorrect as	neither side of the reaction is favoured by a change in pressure or volume

5

The correct answer is **C** because:

- The calculation is as follows:

	$2SO_2$	O_2	$2SO_3$
t= 0	0.40	0.40	0
change	-0.15 × 2 =-0.30	-0.15	+0.15 × 2
t= eqm	0.40-0.30 =**0.10**	0.25	**0.30**

A, **B** & **D** are incorrect as	they do not have the right number of moles of SO_2 and SO_3