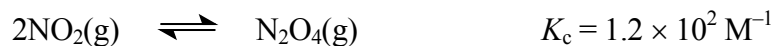


**Marks**  
**5**

- A mixture of 0.500 mol of  $\text{NO}_2(\text{g})$  and 0.500 mol of  $\text{N}_2\text{O}_4(\text{g})$  is allowed to reach equilibrium in a 10.0 L vessel maintained at 298 K. The equilibrium is described by the equation below.  $\Delta H^\circ = -15 \text{ kJ mol}^{-1}$  for the forward reaction.



Show that the system is at equilibrium when the concentration of  $\text{NO}_2(\text{g})$  is 0.023 M.

Discuss the effect an increase in temperature, at constant volume, would have on the concentration of  $\text{NO}_2(\text{g})$ .

State with a brief reason whether the concentration of  $\text{NO}_2(\text{g})$  is increased, decreased, or unchanged when argon gas (0.2 mol) is injected while the temperature and volume remain constant.