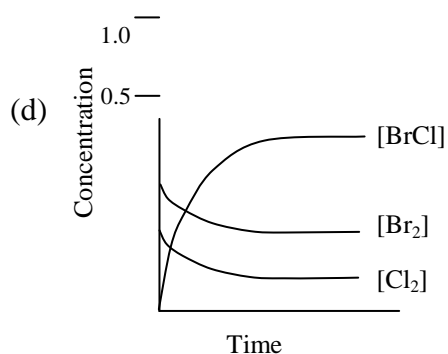**Marks**
4

- In the reaction of Cl_2 with Br_2 in CCl_4 solution, BrCl forms according to the equation:

$$Br_2 + Cl_2 \rightarrow 2BrCl \qquad K_c = 2$$

With initial concentrations of $[Br_2] = 0.6$ M, $[Cl_2] = 0.4$ M and $[BrCl] = 0.0$ M, which of the following concentration versus time graphs represents this reaction? Explain qualitatively why you rejected each of the other three graphs.
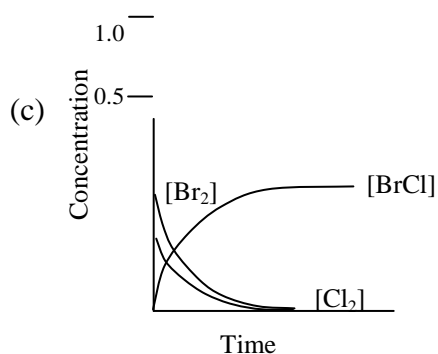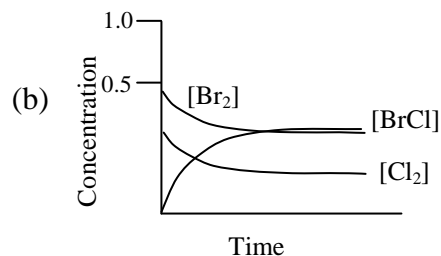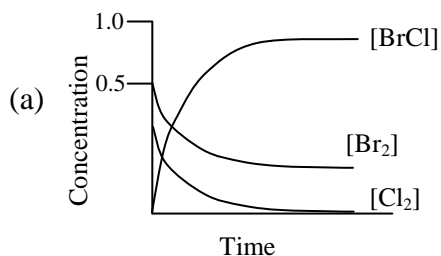
Graph B is correct.

Graphs A and C: As $K_c = 2$, the reaction does not go anywhere near to completion. At equilibrium, the concentrations of reactants and products are both significant. Graphs A and C can therefore be rejected because at least one reagent in both these graphs has dropped to 0. Also, in Graph C, the rates of change of $[Br_2]$ and $[Cl_2]$ are different, at variance with the stoichiometry of the reaction.

Graph D: Cl_2 is the limiting reagent, so the maximum [BrCl] that can form is twice the initial $[Cl_2]$. But as only half the Cl_2 has been used, the maximum [BrCl] that can form is $0.2 \times 2 = 0.4$ M.