Concentration-Time Graphs - Worksheet

1. In a solution of copper(II) chloride, the following equilibrium exists:

$$CuCl_4^{2-}{}_{(aq)} + 4 H_2O_{(I)} = Cu(H_2O)_4^{2+}{}_{(aq)} + 4 Cl^{1-}$$
 dark green blue

Predict the shift in the equilibrium and draw a graph of concentration versus time for relevant reactants to communicate the shift after the following stresses are applied to the system:

- a. Hydrochloric acid is added
- b. Silver nitrate is added
- 2. The two oxyanions of chromium(IV) are the orange dichromate ion, $\operatorname{Cr_2O_7}^{2-}_{(aq)}$, and the yellow chromate ion, $\operatorname{CrO_4}^{2-}_{(aq)}$. Explain why a solution containing the following equilibrium system turns yellow when sodium hydroxide is added.

$$Cr_{2}O_{7}^{2-}{}_{(aq)}$$
 + $H_{2}O_{(I)}$ \rightleftharpoons $2 \ CrO_{4}^{2-}{}_{(aq)}$ + $2 \ H^{+}{}_{(aq)}$ orange

3. Identify the nature of the change imposed on the equilibrium system, shown below, at each of the times indicated A, B, C, D, and E.

