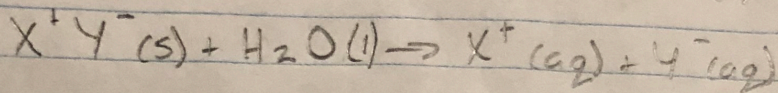


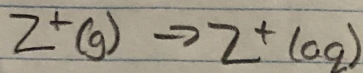
Experiment 2 - Pre-lab Exercise

- 1) a) The ionic compound would be completely dissolved in H_2O , and would form a change in heat energy.

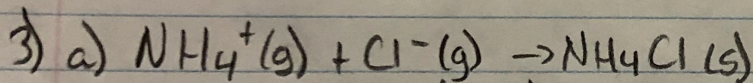


- b) Gaseous ions \rightarrow lattice energy of the ionic compound would form the enthalpy change $X^+(g) + Y^-(g) \rightarrow X^+ Y^- (s)$

- c) The enthalpy change when gaseous ions of the compound are dissolved in H_2O forms aqueous ions



- 2) Each enthalpy change is related because each one is formed from different conditions and states of matter, but they all relate to a change in energy. Enthalpy of solution can be calculated using enthalpy hydration and lattice energy

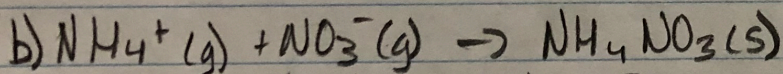


$$\Delta H (\text{hydration}) (NH_4^+) = -307 \text{ kJ/mol}$$

$$\Delta H (\text{hydration}) (Cl^-) = -381 \text{ kJ/mol}$$

$$\Delta H (\text{lattice}) (NH_4Cl) = -705 \text{ kJ/mol}$$

$$\Delta H (\text{solution}) (NH_4Cl) = -(-705) + (-307) + (-381) = +17 \text{ kJ/mol}$$



$$\Delta H (\text{hydration}) (NH_4^+) = -307 \text{ kJ/mol}$$

$$\Delta H (\text{hydration}) (NO_3^-) = -314 \text{ kJ/mol}$$

$$\Delta H (\text{lattice}) (NH_4NO_3) = -646 \text{ kJ/mol}$$

$$\Delta H (\text{solution}) (NH_4NO_3) = -(-646) + (-307) + (-314) = +25 \text{ kJ/mol}$$

4) $Q = m C \Delta T$

$$m = 210 \text{ g}$$

$$C = 4.18 \text{ J K}^{-1} \text{ g}^{-1}$$

$$T = 40^\circ \text{C}$$

$$Q = (210 \text{ g}) (4.18 \text{ J K}^{-1} \text{ g}^{-1}) (40^\circ \text{C}) = 35112 \text{ J or } 35.1 \text{ kJ}$$

$$\text{minimum mass of CaO} = 35.1 \text{ kJ} \div 82 \text{ kJ mol}^{-1} = 0.43 \text{ mol}$$

$$0.43 \text{ mol} \times 56.1 \text{ g mol}^{-1} = 24.0 \text{ g of CaO}$$