

Passage I

When a substance dissolves in H_2O , heat is either absorbed from or given off to the solution. Experiments were done in which a known mass of a solute was added to a known mass of H_2O at a known initial temperature (T_i) in a closed, insulated container. When the maximum temperature change of the solution had occurred, the final temperature (T_f) was recorded. The maximum temperature change (ΔT) was then calculated as follows:

$$\Delta T = T_f - T_i$$

Figures 1 and 2 show the results for lithium chloride (LiCl) and ammonium nitrate (NH_4NO_3), respectively. In each trial, all of the solute completely dissolved.

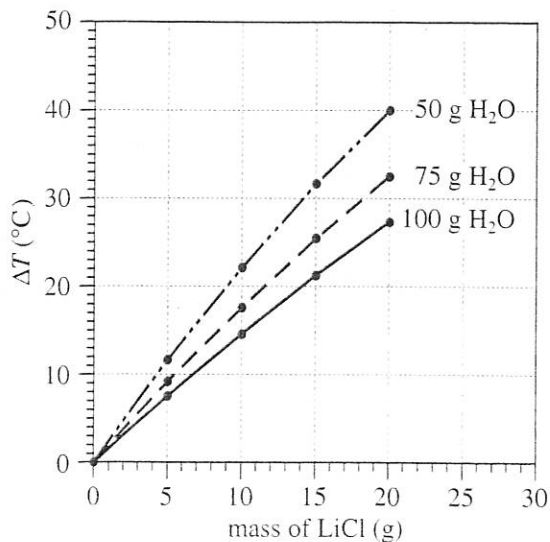


Figure 1

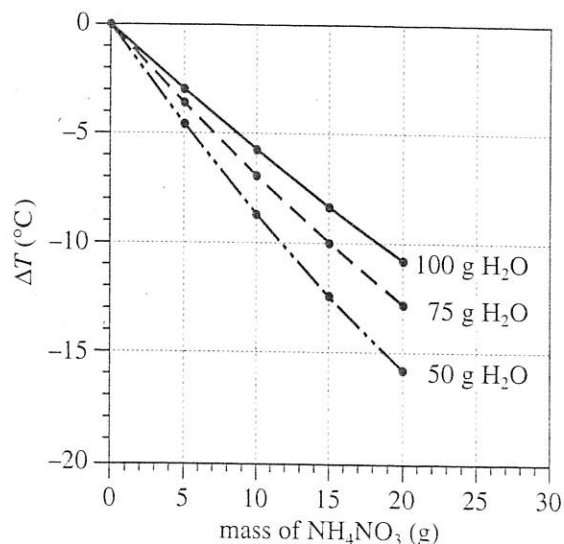


Figure 2

- Based on Figure 1, when 5 g of LiCl was added to 50 g of H_2O , the temperature:
 - decreased, because heat was removed from the solution.
 - decreased, because heat was added to the solution.
 - increased, because heat was removed from the solution.
 - increased, because heat was added to the solution.
- Consider the trials represented in Figure 1 involving 20 g of LiCl . From trial to trial, as the LiCl concentration in the resulting solutions increased, the ΔT that was observed:
 - increased only.
 - increased, then decreased.
 - decreased only.
 - decreased, then increased.
- If an additional trial had been done in which 25 g of LiCl had been added to 75 g of H_2O , ΔT would most likely have been:
 - less than 20°C .
 - between 20°C and 30°C .
 - between 30°C and 40°C .
 - greater than 40°C .
- According to Figure 2, when 5 g of NH_4NO_3 was added to 100 g of H_2O , the temperature of the solution:
 - decreased, because ΔT was positive.
 - decreased, because ΔT was negative.
 - increased, because ΔT was positive.
 - increased, because ΔT was negative.
- Based on Figures 1 and 2, which of the following combinations of a solute and H_2O at a known T_i would produce the greatest *increase* in temperature?
 - 2 g of LiCl added to 5 g of H_2O
 - 2 g of LiCl added to 10 g of H_2O
 - 2 g of NH_4NO_3 added to 5 g of H_2O
 - 2 g of NH_4NO_3 added to 10 g of H_2O