

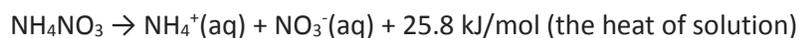
Answer on Question #57439 - Chemistry - General Chemistry

Question:

What amount of water would need to be added to 10g of ammonium nitrate to change the temperature of an instant cold pack from 20 degrees to 5 degrees?

Answer:

Upon dissolving of ammonium nitrate in water, the energy is absorbed:



Therefore 10 g of ammonium nitrate absorbs:

$Q = v \times \Delta H$, where v – the number of moles ($v = 10 \text{ g} / 80 \text{ g mol}^{-1} = 0.125 \text{ mol}$) and ΔH - the heat of solution.

Thus, $Q = 0.125 \text{ mol} \times 25.8 \text{ kJ/mol} = 3.225 \text{ kJ} = 3225 \text{ J}$

The absorbed energy is connected with the decreasing of temperature and is defined by the equation:

$Q = C_w m \Delta t$, where C_w – the specific heat capacity of water ($4.2 \text{ J/(g } ^\circ\text{C)}$), m – the mass of added water and Δt – the change of the temperature.

Hence, the mass of added water is:

$$m = Q / (C_w \Delta t) = 3225 / (4.2 \times 15) \text{ g} = 51.2 \text{ g}$$