

Exercise 4.25 – Enthalpy of solution

Examples use the following values: specific heat capacity = $4.2 \text{ kJ kg}^{-1} \text{ }^{\circ}\text{C}^{-1}$ and the density of all solutions = 1 g cm^{-3}

Q425-01 Calculate the enthalpy of solution of sodium hydroxide, if 5g produces a temperature increase of 12.5°C in a 100g sample of water when dissolved completely.

Q425-02 An experiment was carried out to measure the enthalpy change of solution of sodium hydroxide when a small amount of it is dissolved in water. x mol sodium hydroxide was dissolved in y g of water giving a temperature rise of z $^{\circ}\text{C}$. The specific heat capacity of water is $c \text{ J g}^{-1}\text{K}^{-1}$. Which expression should be used to calculate the molar enthalpy change in J mol^{-1} ?

- A. xyz/c
- B. xy/cz
- C. c/xyz
- D. cyz/x

Q425-03 When sodium hydroxide is dissolved in water the temperature of the solution rises. Which of the following statements about this process is correct?

- A. the lattice enthalpy of the sodium hydroxide is higher than the sum of the hydration enthalpies of sodium and hydroxide ions.
- B. The energy released is equal to the sum of the hydration enthalpies of sodium and hydroxide ions.
- C. the lattice releases a lot of energy when it breaks apart
- D. sum of the hydration enthalpies plus the lattice enthalpy equals the energy change per mole

Q425-04 When ammonium nitrate is dissolved in water there is a decrease in temperature. Which of the following best explains this?

- A. the lattice enthalpy is very high compared to the hydration enthalpies of ammonium and nitrate ions.
- B. the hydration enthalpy of the ammonium ion is very high compared to the lattice enthalpy
- C. the hydration enthalpy of the nitrate ion is very high compared to the lattice enthalpy
- D. ammonium nitrate displays a large degree of covalent character

Q425-05 6.0g of sodium chloride dissolved in 50g of water produces a temperature change of -2.1°C . If the lattice enthalpy of sodium chloride is 760 kJ mol^{-1} and the hydration enthalpy of sodium ions is -406 kJ mol^{-1} calculate the hydration enthalpy of the chloride ion in kJ mol^{-1} .
