

Friday Worksheet

Name:

Heat of reaction worksheet 3

- 1) Pure water at 25 °C has a pH of 7.00 but at 100 °C has a pH of 6.14.
Knowing that pure water is neutral, indicate True or False for the following comments.
(2 marks)
 - a) The self-ionisation of water, $2\text{H}_2\text{O}(\text{l}) \Rightarrow \text{H}_3\text{O}^+(\text{aq}) + \text{OH}^-(\text{aq})$, is endothermic.
 - b) It is impossible to measure the pH measurements at 100°C.
 - c) The pH measurements are affected by the low solubility of CO_2 gas at 100 °C.
 - d) The concentration of H_3O^+ ions is not equal to the concentration of OH^- ions at 100 °C as it is at 25 °C.

- 2) 2.30 g of glucose ($M = 180 \text{ g mol}^{-1}$) underwent complete combustion. The energy released was used to heat an unknown mass of water.
If the temperature of the water increased by 34.1 °C and it is assumed no heat was lost, what was the mass of the water heated? (3 marks)

- 3) A student used a, well insulated, vessel, containing 510.0 grams of water, to determine the molar heat of combustion of methanol. An amount of 1.004 g of liquid methanol was placed in the reaction vessel in the presence of excess oxygen and the mixture ignited by an electrical ignition heater. On this occasion, the temperature of the water increased by 9.73 °C.
 - a) Write a balanced chemical equation for the reaction of methanol and oxygen.
(2 marks)

 - b) Assuming no energy was lost to the environment, use this experimental data to determine the value of ΔH for the combustion of methanol as given by the equation in a) above. Include appropriate units in your answer. (4 marks)

 - c) The value of ΔH , calculated using the enthalpy of combustion provided in the data book, is different from the value of ΔH calculated from the experimental data provided. Provide a reason for this difference. (1 mark)