

- 7 When 1.0 mol of ethanoic acid, CH_3COOH , in aqueous solution is neutralised by an excess of aqueous sodium hydroxide, 55 kJ mol^{-1} of energy is released.

Which statement about this reaction is correct?

- A The reaction is exothermic because only bond breaking takes place.
- B The reaction is exothermic because only bond forming takes place.
- C The reaction is exothermic because more energy is given out in breaking bonds than is taken in to form bonds.
- D The reaction is exothermic because more energy is given out in forming bonds than is taken in to break bonds.

- 8 In an experiment, 1.60 g of a fuel is burnt. 45.0% of the energy released is absorbed by 200 g of water. The temperature of the water rises from 18.0°C to 66.0°C .

What is the total energy released per gram of fuel burnt?

- A 25 100 J B 55 700 J C 89 200 J D 143 000 J

- 9 When 0.47 g of a hydrocarbon is completely burnt in air, the energy released heats 200 g of water from 23.7°C to 41.0°C .

What is the amount of energy absorbed, in Joules, by the water?

- A $0.47 \times 4.18 \times 17.3$
- B $0.47 \times 4.18 \times (273 + 17.3)$
- C $200 \times 4.18 \times 17.3$
- D $200 \times 4.18 \times (273 + 17.3)$

- 10 One commercially available 'heat pad' contains iron, activated carbon and water. The 'heat pad' is activated by air. This causes the pad to get hotter.

Which statement describes the chemical reaction occurring in the 'heat pad' when it is exposed to air?

- A The reaction is endothermic and iron gains electrons.
- B The reaction is endothermic and iron loses electrons.
- C The reaction is exothermic and iron gains electrons.
- D The reaction is exothermic and iron loses electrons.

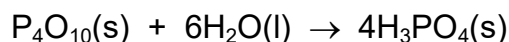
- 9 The data shown are needed for this question.

$$\Delta H_f^\ominus(\text{P}_4\text{O}_{10}(\text{s})) = -3012 \text{ kJ mol}^{-1}$$

$$\Delta H_f^\ominus(\text{H}_2\text{O}(\text{l})) = -286 \text{ kJ mol}^{-1}$$

$$\Delta H_f^\ominus(\text{H}_3\text{PO}_4(\text{s})) = -1279 \text{ kJ mol}^{-1}$$

What is $\Delta H^\ominus$ for the reaction shown?



- A** $-9844 \text{ kJ mol}^{-1}$
B -388 kJ mol^{-1}
C -97 kJ mol^{-1}
D $+2019 \text{ kJ mol}^{-1}$
- 10 In an experiment to measure the enthalpy change of neutralisation of hydrochloric acid, 20 cm^3 of solution containing 0.04 mol of HCl is placed in a plastic cup of negligible heat capacity.

A 20 cm^3 sample of aqueous sodium hydroxide containing 0.04 mol of NaOH , at the same initial temperature, is added and the temperature rises by 15 K .

If the heat capacity per unit volume of the final solution is $4.2 \text{ J K}^{-1} \text{ cm}^{-3}$, what is the enthalpy change of neutralisation of hydrochloric acid?

- A** $\frac{20 \times 4.2 \times 15}{0.04} \text{ J mol}^{-1}$
B $40 \times 4.2 \times 15 \times 0.08 \text{ J mol}^{-1}$
C $\frac{40 \times 4.2 \times 15}{0.04} \text{ J mol}^{-1}$
D $\frac{20 \times 4.2 \times 15}{0.08} \text{ J mol}^{-1}$