

Energetics – AS Chemistry P1

1. No.8

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This question is about silver nitrate.

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. 1

Define standard enthalpy of formation.

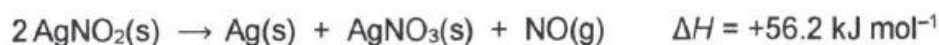
[2 marks]

Enthalpy change when one mole of a substance is formed from its constituent elements

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. 2

Silver nitrate(V) is formed when silver nitrate(III) undergoes thermal decomposition.

The standard enthalpy of formation of $\text{AgNO}_3(\text{s})$ is $-123.0 \text{ kJ mol}^{-1}$ The standard enthalpy of formation of $\text{NO}(\text{g})$ is $+90.4 \text{ kJ mol}^{-1}$ Determine the standard enthalpy of formation of $\text{AgNO}_2(\text{s})$

[2 marks]

$$\Delta H = \sum \Delta_f H \text{ products} - \sum \Delta_f H \text{ reactants}$$

$$+56.2 = (-123. + 90.4) - 2x$$

$$2x = -88.8$$

$$x = -44.4$$

Standard enthalpy of formation

-44.4kJ mol⁻¹

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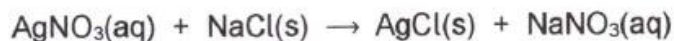
. 3

Suggest why the enthalpy change for the thermal decomposition of solid silver nitrate(III) is difficult to determine experimentally.

[1 mark]

Silver nitrate has to be heated so you cannot measure temperature change caused by the reaction.

Silver nitrate(V) solution reacts with solid sodium chloride.



A student does an experiment to determine the enthalpy change for this reaction.

The student follows this method:

1. Measure out 50 cm³ of 0.10 mol dm⁻³ aqueous silver nitrate(V) using a clean, dry measuring cylinder.
2. Pour the silver nitrate(V) solution into a glass beaker.
3. Weigh out 2.00 g of solid sodium chloride (an excess) using a weighing boat and tip the solid into the silver nitrate(V) solution. Reweigh the weighing boat to determine the mass of sodium chloride added.
4. Add a lid to the beaker that has two small holes for a stirring rod and for a thermometer.
5. Stir the mixture with a plastic stirring rod whilst recording the temperature with a thermometer.
6. Record the maximum temperature reached.

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Identify **three** aspects of this method which could cause inaccurate results.

Describe how the student could improve these three aspects of the method to obtain more accurate results.

[6 marks]

Inaccuracy 1 Used a glass beaker

Improvement 1 Use a polystyrene cup.

Inaccuracy 2 The student did not record initial temperature.

Improvement 2 Record an initial starting temperature before adding sodium chloride.

Inaccuracy 3 Used low concentration of silver nitrate.

Improvement 3 Use a higher concentration of AgNO₃ so that temperature change become larger.