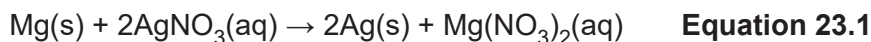


AS Level Chemistry A
H032/01 Breadth in chemistry

Question Set 15

1. This question is about energy changes and rate of reaction.

(a) Magnesium reacts with aqueous silver nitrate, $\text{AgNO}_3(\text{aq})$, as in **equation 23.1**.



A student carries out an experiment to determine the enthalpy change of this reaction, $\Delta_r H$.

- The student adds 25.0 cm^3 of $0.512 \text{ mol dm}^{-3}$ AgNO_3 to a polystyrene cup.
- The student measures the temperature of the solution.
- The student adds a small spatula measure of magnesium powder, stirs the mixture and records the maximum temperature.

Temperature readings

Initial temperature	= 19.5°C
Maximum temperature	= 47.5°C

(i) Calculate $\Delta_r H$, in kJ mol^{-1} , for the reaction shown in **equation 23.1**.

Give your answer to an **appropriate** number of significant figures.

Assume that the density and specific heat capacity, c , of the solution are the same as for water and that all the aqueous silver nitrate has reacted.

[4]

① a) i)

$$q = mc\Delta T$$
$$q = 25 \times 4.18 \times 28$$
$$q = 2926 \text{ J}$$
$$\Delta H = \frac{2.926}{0.0128} = -229 \text{ kJ mol}^{-1}$$

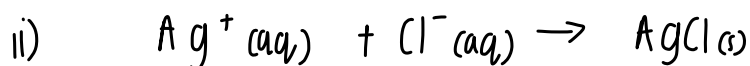
Moles of $\text{AgNO}_3 = 0.025 \times 0.512$
 $= 0.0128$

(ii) At the end of the experiment, the student adds a few drops of aqueous sodium chloride to the reaction mixture in the polystyrene cup to test whether all the aqueous silver nitrate has reacted.

Explain how the results would show whether all the aqueous silver nitrate has reacted.

Include an equation with state symbols in your answer.

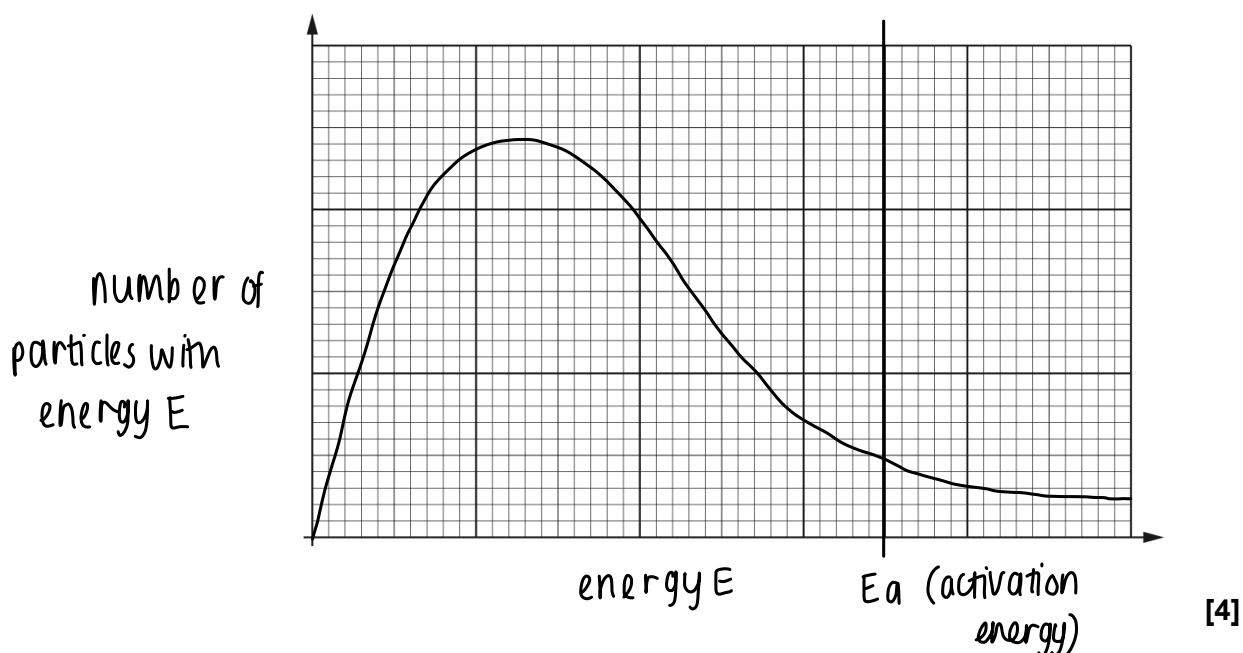
[2]



if there was still some AgNO_3 left in the mixture, a white precipitate of AgCl would form.

- (iii) Using the Boltzmann distribution model, explain how the rate of a reaction is affected by temperature.

You are provided with the axes below, which should be labelled.



As the temperature increases the curve shifts to the right so the number of particles with $E \geq E_a$ increases and so there are more frequent successful collisions so the rate of reaction increases.

Total Marks for Question Set 15: 10

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