

**QUESTION**

1. The following data were obtained from a study of the effect of temperature on the rate of reaction between hydrogen peroxide and potassium iodide:

Temperature (°C)	Rate of reaction (mol dm <sup>-3</sup> s <sup>-1</sup> )
10	0.002
20	0.005
30	0.012
40	0.028
50	0.065

(a) Plot a graph of  $\log_{10}$  rate of reaction against temperature. (b) Determine the activation energy of the reaction from your graph. (c) Calculate the rate of reaction at 60°C.

**SOLUTION**

(a) The graph is plotted as follows:

(b) The activation energy is determined from the slope of the line in the Arrhenius plot. The slope is calculated as follows:

$$\text{slope} = \frac{\log_{10} \text{rate at } T_2 - \log_{10} \text{rate at } T_1}{T_2 - T_1}$$

$$= \frac{\log_{10} 0.065 - \log_{10} 0.002}{50 - 10}$$

$$= \frac{1.813 - 0.004}{40}$$

$$= \frac{1.809}{40} = 0.0452$$

The activation energy ( $E_a$ ) is given by:

$$E_a = 2.303 RT \times \text{slope}$$

$$= 2.303 \times 8.314 \times 300 \times 0.0452$$

$$= 25.5 \text{ kJ mol}^{-1}$$

(c) The rate of reaction at 60°C is calculated as follows: