AQA – Kinetics – AS Chemistry P2

1. June/ 2020/Paper_2/No.2

0 2 A student investigates the effect of temperature on the rate of reaction between sodium thiosulfate solution and dilute hydrochloric acid.

$$Na_2S_2O_3(aq) + 2\,HCl(aq) \longrightarrow 2\,NaCl(aq) + SO_2(g) + S(s) + H_2O(l)$$

The student mixes the solutions together in a flask and places the flask on a piece of paper marked with a cross.

The student records the time for the cross to disappear. The cross disappears because the mixture becomes cloudy.

Table 2 shows the student's results.

Table 2

Temperature / °C	22	31	36	42	49	54
Time, t, for cross to disappear / s	87	48	36	26	44	12
$\frac{1}{t}$ / s^{-1}	0.0115	0.0208	0.0278	0.0385	0.0227	

0 2 . 1 The student uses a stopwatch to measure the time. The stopwatch shows each time to the nearest 0.01 s

Suggest why the student records the times to the nearest second and not to the nearest 0.01 s

[1 mark]

0 2 . 2 The rate of reaction is proportional to $\frac{1}{t}$

Complete **Table 2**.

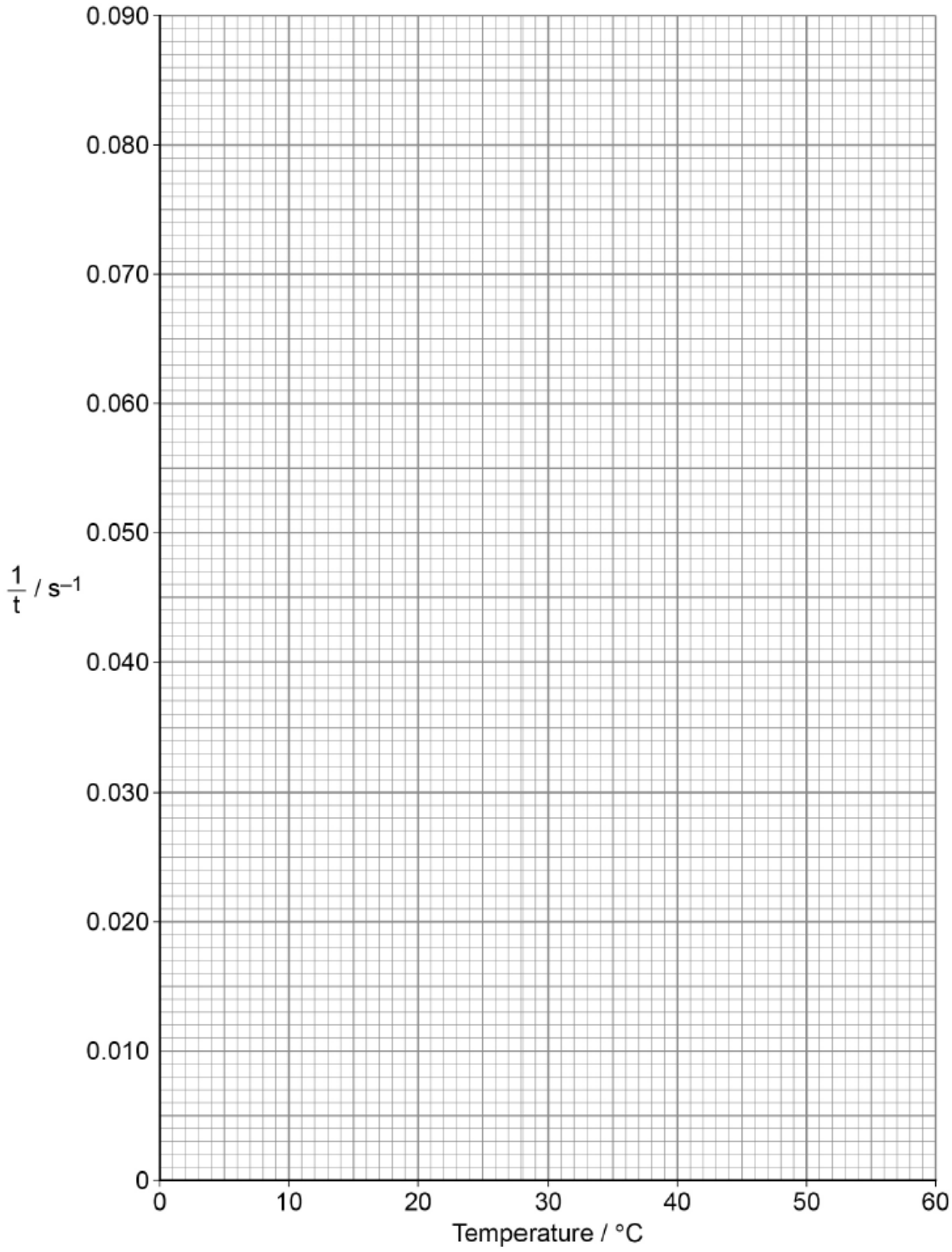
[1 mark]

0 2 . 3 Plot the values of $\frac{1}{t}$ against temperature on **Figure 1**.

Draw a line of best fit.

[2 marks]

Figure 1



0 2 . 4 Use your line of best fit to estimate the time for the cross to disappear at 40 °C
Show your working.

[1 mark]

Time _____ s

0 2 . 5 Suggest, by considering the products of this reaction, why small amounts of reactants are used in this experiment.

[1 mark]

_____

_____

_____

0 2 . 6 The student could do the experiment at lower temperatures using an ice bath.

Suggest why the student chose **not** to carry out experiments at temperatures in the range 1–10 °C

[1 mark]

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2. June/ 2020/Paper_2/No.20

Which statement about the molecules in a sample of a gas is correct?

[1 mark]

A At a given temperature they all move at the same speed. ⬭

B At a given temperature their average kinetic energy is constant. ⬭

C As temperature increases, there are more molecules with the most probable energy. ⬭

D As temperature decreases, there are fewer molecules with the mean energy. ⬭