Mark schemes

Q1.

This question is marked using levels of response. Refer to the Mark Scheme Instructions for Examiners for guidance on how to mark this question.	
Level 3 **5-6 marks**	**All stages are covered and each stage is generally correct and virtually complete.** (6 v 5) Answer is well structured, with no repetition or irrelevant points, and covers all aspects of the question. Accurate and clear expression of ideas with no errors in use of technical terms.
Level 2 **3-4 marks**	**All stages are covered but stage(s) may be incomplete or may contain inaccuracies OR** **two stages are covered and are generally correct and virtually complete.** (4 v 3) Answer has some structure and covers most aspects of the question. Ideas are expressed with reasonable clarity with, perhaps, some repetition or some irrelevant points. If any, only minor errors in use of technical terms.
Level 1 **1-2 marks**	**Two stages are covered but stage(s) may be incomplete or may contain inaccuracies OR** **only one stage is covered but is generally correct and virtually complete.** (2 v 1) Answer includes statements which are presented in a logical order and / or linked.
Level 0 **0 marks**	Insufficient correct chemistry to gain a mark.

Stage 1 - Single distribution curve

1a suitable axis labels:

vertical: number/proportion/fraction of molecules/particles;

horizontal: (kinetic) energy

1b suitable shape (including on LHS must start reasonably close to 0,0 and RHS must not meet x-axis or rise upwards (on each curve drawn))

Stage 2 - Distribution curve at higher temperature

2a peak moves to the right and down

2b area under the curve (roughly) the same

2c lines cross once only

Stage 3 - Why a gas reacts faster at higher temperature

3a molecules have more energy

3b more molecules have the activation energy

3c higher proportion of collisions are successful /
increases frequency of successful collisions

[6]

Q2.

(a) 111(.1)

Allow an answer to a finite number of sig figs (that is correctly rounded)

Allow 110

Do not allow answers with recurring dot above number (ignore dots after the final number)

1

(b) temperature

1

(c) Measure the temperature at the start and end of the reaction and find the mean/average

Measure the temperature at regular intervals during the reaction and find the mean/average

Allow idea of doing the reaction in a water bath

1

(d) **M1** suitable vertical scale

***M1** should use more than half the axis to cover the four points given and the point for 67°C (if plotted)*

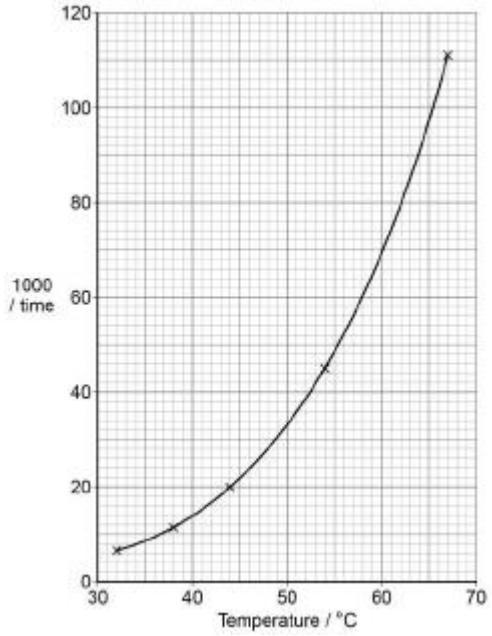
1

M2 points plotted correctly (±½ small square per point)

***M2** allow ECF for plotting of point found in part (a) (if no value found in part (a) allow graph that omits this)*

1

M3 best fit line drawn (within one small square of each point and should be a smooth curve)



M3 *allow ECF for a line based on their plotted points, but only where the line continues to rise throughout the temperature range*

1

(e) $\text{Time} = \frac{1000}{\text{value from graph at 60°C}}$

Answers should be at least 2 sf

Working needs to be shown that includes a value from the graph at 60 °C and/or construction line(s) showing 1000/t at 60 °C on the graph

Use the value their line shows at 60 °C (±½ small square)

1

(f) **M1** many more particles/ions have (energy ≥) activation energy

M1 *need the idea that it is many / much more particles; allow reference to atoms / molecules instead of particles / ions*

1

M2 more successful collisions per unit time / greater frequency of successful collisions

M2 *allow higher proportion of the collisions are successful*

1

[9]