

# 8. Reaction kinetics

## 8.2 Activation energy

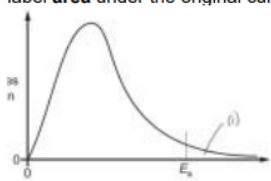
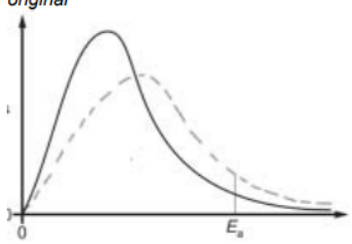
### Paper 2

Marking Scheme

## Q1.

(c)(i)	rate = total change in concentration of Br <sub>2</sub> divided by time taken <i>calculation dependent on graph</i> $(100 \times 10^{-5} - 12 \times 10^{-5}) / 600$ <b>M1</b> average rate of reaction $1.47 \times 10^{-6}$	<b>1</b>
	<b>M2</b> units mol dm <sup>-3</sup> s <sup>-1</sup>	<b>1</b>
(c)(ii)	graph shown on same axes has steeper initial gradient AND reaches the same final [Br <sub>2</sub> ]	<b>1</b>
(c)(iii)	<b>M1</b> (at increased temp the average kinetic) energy of particles / species / molecules increases.	<b>1</b>
	<b>M2</b> (many) more/greater proportion of particles with energy $\geq E_a$	<b>1</b>

## Q2.

(b)(i)	label <b>area</b> under the original curve to the right of E <sub>a</sub> . 	<b>1</b>
(b)(ii)	<b>M1</b> curve starts at the origin but peak lies to the right of original.	<b>1</b>
	<b>M2</b> peak at higher temperature is lower than the original AND graph crosses the original once only – beyond the peak of original 	<b>1</b>
(b)(iii)	no change / none	<b>1</b>

## Q3.

(c)	<b>M1</b> nitrogen has a triple bond <b>M2 EITHER</b> high energy is needed to break the bond <b>OR</b> at normal temperatures there is not enough energy to break the bond / to overcome the activation energy	<b>2</b>
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