STARTER FOR 10...

7.2.1. Sketching Maxwell-Boltzmann

1. (a) Without using your notes, sketch on the axes below the Maxwell-Boltzmann distribution of molecular energies. Label this curve A. Make sure you include axes labels.

(4 marks)

(b) Add a line into the diagram to show the likely position of the activation energy for the reaction. Label this E_a. (1 mark)

2. Now consider what would happen to the distribution if the temperature of the system was raised. Sketch a new distribution onto the axes and label this curve B. (3 marks)

3. Using the two distributions you have drawn, explain why increasing the temperature of a reaction results in an increase in the rate of the reaction.

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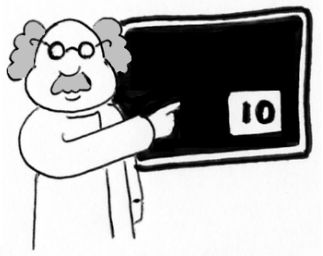
(2 marks)



STARTER FOR 10...

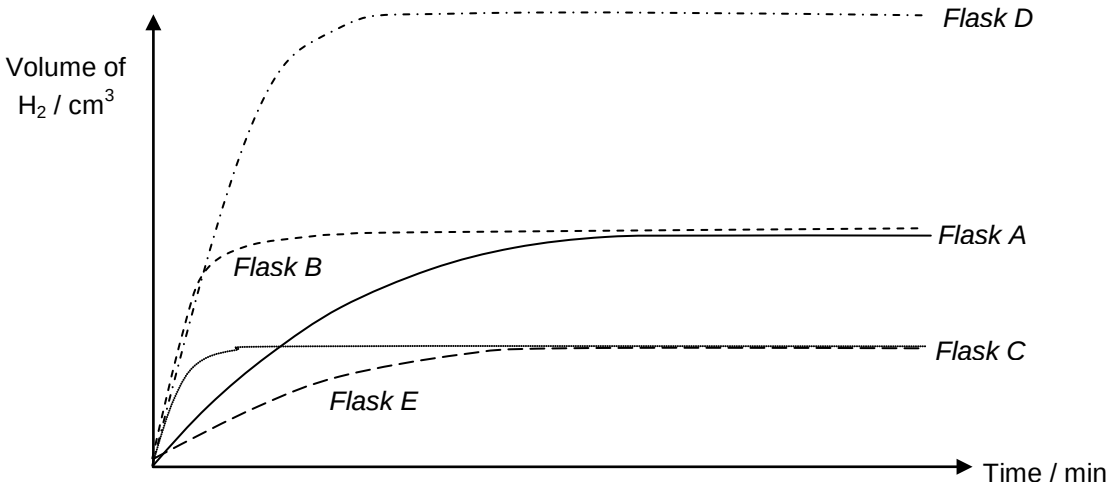
7. Kinetics answers

7.1. Collision theory

1. $Zn + 2\,HCl \rightarrow ZnCl_2 + H_2$ (1 mark)

2. (a) Flask E would go the slowest. (1 mark)

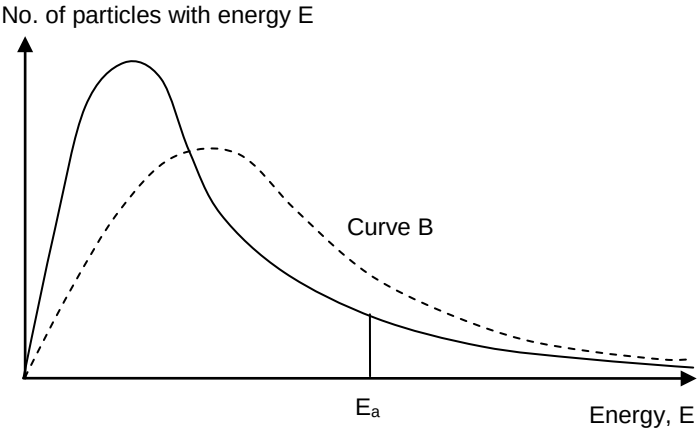
(b)



(2 marks for each of the curves for flasks B, C, D and E; 1 for the correct initial gradient, 1 for the correct finishing point)

7.2.1. Sketching Maxwell-Boltzmann

1.



1 mark – both axes correctly labelled

1 mark – curve starts at origin

1 mark – curve never touches x-axis

1 mark – correct shape

1 mark – drawing of E_a

2. For the drawing of curve B above;

1 mark – peak to the right of original curve

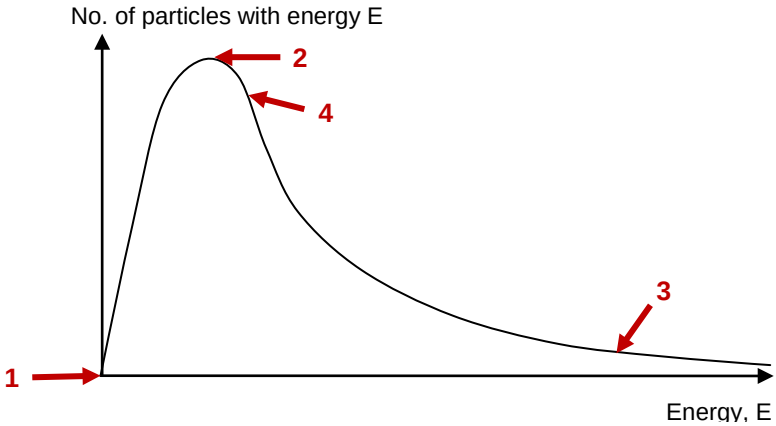
1 mark – peak height is lower

1 mark – approximately the same area under the two curves

3. At a higher temperature many more of the particles will have an energy greater than the activation energy (1 mark) resulting in a higher percentage of particle collisions resulting in a reaction (1 mark)

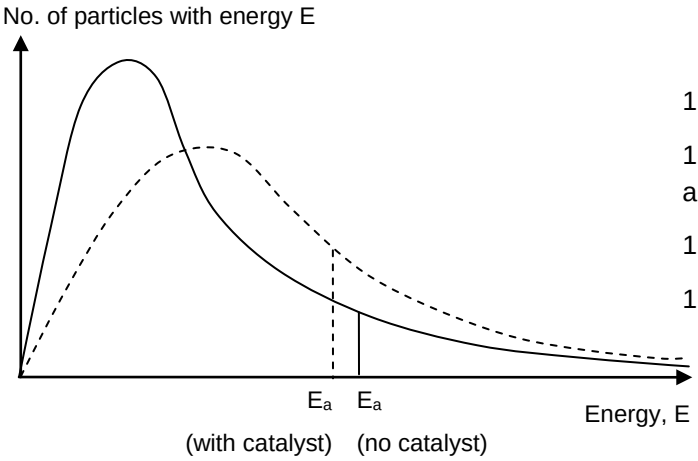
7.2.2. The Importance of Maxwell-Boltzmann

1.



(4 marks)

2. (a)



1 mark – approximate same area

1 mark – most probable energy is lower and to the right

1 mark – the lines never cross

1 mark – E_a lower in energy

(b) It is important that catalytic converter reaches its operating temperature quickly because at higher temperatures and with the catalyst active many more particles have sufficient energy to react. Hence the catalytic converter is much more efficient (removes more polluting gases) at operating temperature. (2 marks)