



STARTER FOR 10!!!

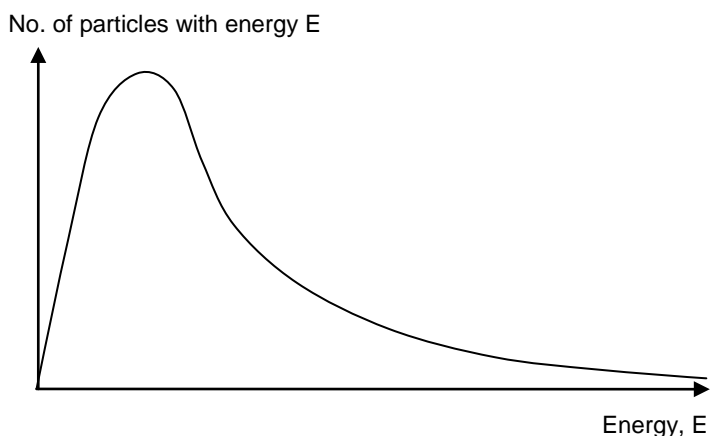
7.2.2. The importance of Maxwell-Boltzmann

The distribution of energy amongst the particles in a gas is represented by the **Maxwell Boltzmann** distribution. The key characteristics are;

1. No particles have zero energy
2. Most particles have intermediate energies
3. A few particles have very high energies indeed
4. The average energy is not the same as the most probable energy

1. The sketch opposite shows a typical Maxwell Boltzmann distribution. Indicate where on the curve each of the above characteristics 1 - 4 is shown.

(4 marks)

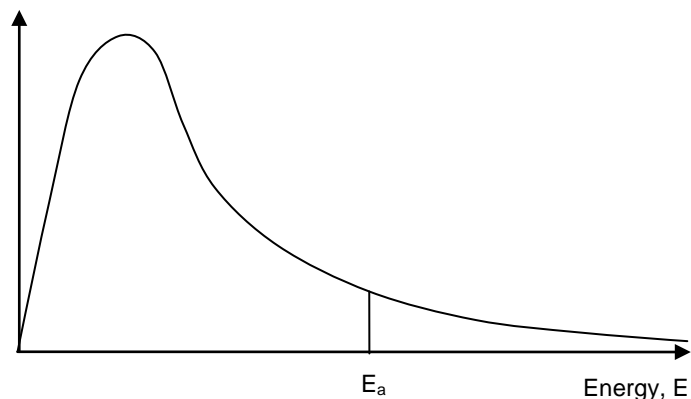


2. Catalytic converters in cars reduce pollution by removing toxic gases from exhaust fumes. The gases pass over a ceramic honeycomb coated with platinum and rhodium metals. As the car warms up, the ceramic honeycomb reaches its operating temperature and catalyses the reaction between the gases.

- (a) The distribution of energies of particles of gas at the start of the car journey is shown on the graph below. Draw a second line on the graph to indicate how the distribution will have changed 30 minutes into the journey when the catalyst has reached its operating temperature. (4 marks)



No. of particles with energy



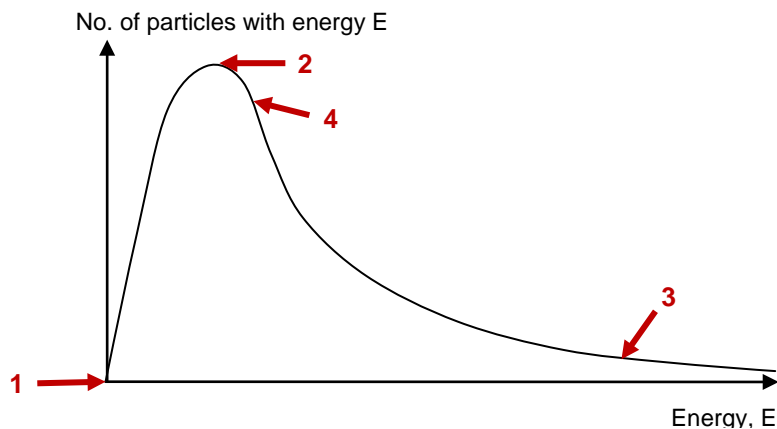
- (b) Why is it very important that the catalytic converter reaches its operating temperature as quickly as possible?

(2 marks)

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)

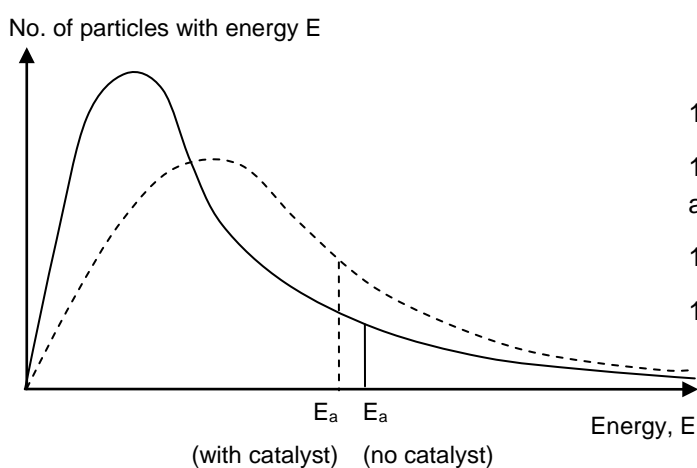
7.2.2. The Importance of Maxwell-Boltzmann

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)