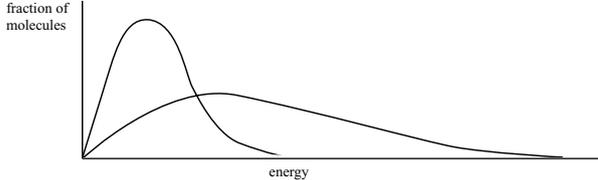


Answers to examination-style questions

Answers	Marks	Examiner's tips
1 (a) (i) graph starts at origin	1	You must remember to do all these things. This is worth 3 marks here.
graph skewed to left and has decreasing gradient to maximum	1	
graph after maximum decreases in steepness, never touches x -axis, levels out less than 5 mm from x -axis	1	
(b) minimum energy to start a reaction	1	Remember that the curve has a decreasing gradient on the left. It is not 'bell-shaped'.
(c) molecules gain energy when they collide with each other	1	
(d) decreases	1	
reaction goes by an alternative route which has a lower E_a (therefore more molecules have energy $>E_a$)	1	When two particles collide, one gains energy and the other loses energy. In this way particles pass on energy.
2 (a) the minimum energy required for a reaction to occur	1	
(b) axes labelled: y : number (or fraction or %) of molecules; x : energy curve starts at origin skewed to right approaches x -axis as an asymptote	1 1 1 1	
second curve displaced to the left and peak higher many fewer molecules have $E > E_a$	1 1 1	
(c) molecules do not have enough energy	1	
increase the pressure	1	The question talks about molecules so don't label the axis atoms!
increases the collision frequency	1	A curve that levels off $>10\%$ of max. peak height or a curve that crosses the energy axis will not score this last mark.
add a catalyst this lowers the activation energy	1 1	A curve that levels off $>10\%$ of max. peak height or a curve that crosses the energy axis will not score this last mark.
		Curve must not cross T_1 curve twice.
		This can also be shown on a correctly labelled diagram.
		You could also say that the orientation may be wrong.
		Alternatively you can refer to an increase in the concentration or a reduction in the volume.
		This mark is not allowed if implied that more collisions come from a temperature increase.

Answers to examination-style questions

Answers	Marks	Examiner's tips
3 (a) minimum energy for a reaction to occur	1	You could say for a successful collision.
(b) few molecules / particles have the required activation energy	1	
(c) molecules are closer together	1	Because there are more particles in a given volume.
therefore they collide more often	1	
(d) many more molecules have energy greater than the activation energy	1	You need to explain in full what a catalyst is (2 marks) although there is only one mark available.
(e) speeds up a reaction but is chemically unchanged at the end	1	
(f) increases the surface area	1	
4 (a) (i) Z	1	
(ii) collisions cause some molecules to slow down or lose energy	1	When particles collide they pass on energy which means some gain and some lose. If they lose energy they slow down.
(b) curve starts at origin and is displaced to the right curve lower and does not touch energy axis	1	
(c) (i) only a small percentage of collisions have $E > E_a$	1	There are 2 things needed for each mark so practise drawing these curves.
(ii) add a catalyst lowers E_a	1	
more collisions (or molecules) have energy $> E_a$	1	
5 (a)	2	
		
(b) the curve should be higher and displaced to the left (see above) it should start at the origin and cross the other curve only once and not cross the x-axis	1	Or increase the pressure.
(c) particles have energy $< E_a$	1	
(d) increase concentration	1	

Answers to examination-style questions

Answers	Marks	Examiner's tips
(e) many more molecules have $E > E_a$	1 1	You must not say KE increases with T.
(f) lowers E_a provides an alternative route	1 1	