

Answers to end-of-chapter questions

Chapter 5: Enzymes

- 1 a a protein catalyst, which speeds up the rate at which metabolic reactions take place.
- b a term used to describe the state of a protein molecule that has lost its shape – often caused by high temperature or extremes of pH; a denatured enzyme molecule is unable to catalyse its reaction because the substrate no longer fits into its active site.
- c the substance that is changed into products by an enzyme; the substrate fits into the enzyme's active site.
- d a new substance formed in an enzyme-catalysed reaction.
- e the part of an enzyme molecule into which a substrate molecule fits.
- 2 a About 37°C – human body temperature.
- b About 2 – hydrochloric acid has a very low pH.
- c At low temperatures, molecules have low kinetic energy and move slowly. This means that the frequency of collisions between enzyme molecules and substrate molecules is also low.
- d Above the enzyme's optimum temperature, the enzyme molecule begins to lose its shape – it is denatured. This means that the substrate molecule does not fit into the active site, so the enzyme cannot catalyse the change of the substrate into products.

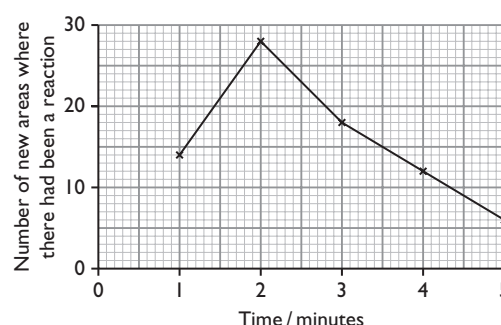
- 3 a blue-black; [1]
- b the blue-black colour would have disappeared from parts of the plain paper; [1]

c i

Time/ minutes	Number of new areas where there had been a reaction	Total number of areas where there had been a reaction
1	14	14
2	28	42
3	18	60
4	12	72
5	6	78

[2]

ii



- time on x -axis and number of new areas on y -axis;
- scales on both axes go up in even steps (e.g. 1, 2, 3 etc. on x -axis, 10, 20, 30 etc. on y -axis);
- both axes fully labelled including units;
- all points accurately plotted with small, neat crosses or circles with a ring around them;
- straight lines drawn between the points / good best fit line drawn; [5]

- iii any **two** sensible suggestions about differences between the goats, e.g. different ages, different genders, different breeds, different concentrations of enzyme in their saliva, how hungry they were when the saliva was collected; [2]

- d continue for longer;
take readings more often than one minute intervals;
include some discs that have no enzyme in them / have boiled enzyme in them;
repeat the experiment two more times; [max 3]
- 4 a sucrose molecules and enzyme molecules move randomly;
sucrose molecule collides with enzyme's active site;
enzyme causes sucrose molecule to split into glucose and fructose;

reference to involvement of water in this reaction;
products / glucose and fructose, leave the active site;

[max 3]

- b i optimum temperature for enzymes;
temperature kept constant because, pH is the independent variable / temperature is a control variable. [2]
- ii no activity below pH 3;
optimum / greatest activity, is at pH 7;
no activity above pH 11; [3]