Question 12 (Answer: **C**)

- A competitive inhibitor binds the active site itself, so more substrate can out-compete it.
- So the maximum rate can still be reached: V_{max} is unchanged.
- But more substrate is needed to get halfway there, so K_m increases.

Question 14 (Answer: **B**)

- K_m is the substrate concentration that gives half the maximum rate.
- A low K_m means the enzyme reaches half speed at low substrate – a high affinity.
- So it is used to compare how strongly different enzymes bind their substrates.

Question 15 (Answer: **C**)

- Work out the rate as amount of starch divided by the time taken.
- Keep the units consistent – the starch mass is given in grams and the time in seconds.
- Compare rates between pH values only when everything else was kept the same.

Question 16 (Answer: **D**)

- A non-competitive inhibitor binds away from the active site, so extra substrate cannot displace it – statement 1 is wrong.
- It has no effect on the activation energy – statement 2 is wrong.
- It does permanently take enzyme molecules out of action, so the maximum rate falls – statement 3 is right.

Question 16 (Answer: **D**)

- Look at both the final amount of product and the initial gradient.
- The highest initial rate is not necessarily the best temperature – a higher temperature may denature the enzyme part-way.
- The optimum is the temperature that gives the most product overall, not just the fastest start.

Question 17 (Answer: **A**)

- More enzyme means more active sites, so the rate rises.
- More substrate raises the rate until the active sites are saturated.
- End-product inhibition is a standard control mechanism, so all three are involved.

Question 15 (Answer: **B**)

- Graph J peaks at the optimum pH, with the rate falling away on both sides as the enzyme denatures.
- Graph K rises then levels off, because at high substrate all active sites are occupied.
- The plateau on K is limited by enzyme concentration, not by substrate.

1(a)(i)	1 states 1%, 0.5%, 0.25% and 0.125% under the appropriate beaker ; 2 shows transfer of 10cm^3 to each beaker from the previous beaker ; 3 shows 10 cm^3 of **W** added to each beaker ;
1(a)(ii)	1 (heading for independent variable) concentration of H_2O_2 and % and to the left of the dependent variable ; 2 (heading for dependent variable) time / seconds ; 3 result for each concentration ; 4 expected pattern of results (the highest concentration has the shortest time) ; 5 results recorded to the nearest whole second ;
1(a)(iii)	the times for **U1**, **U2** and **U3** recorded and seconds ;
1(a)(iv)	shows the three times added and divided by 3 ;
1(a)(v)	estimates the concentration of hydrogen peroxide in sample **U** according to results ;
1(a)(vi)	shows that there are no anomalies ;
1(a)(vii)	states that using smaller intervals between concentrations of hydrogen peroxide around the estimate would allow a more accurate estimate ;
1(b)(i)	1 *x*-axis: time / hours and *y*-axis: percentage of bacterial cells able to produce hydrogen peroxide ; 2 scale on *x*-axis: 40 to 2 cm, labelled at least every 2 cm and *y*-axis: 4 to 2 cm, labelled at least every 2 cm ; 3 correct plotting of points using small dots in circles or crosses ; 4 plots joined with thin line passing through all points ;
1(b)(ii)	1 percentage increases as time progresses (for both temperatures) ; 2 greater increase at lower temperature ;
1(b)(iii)	1 value estimated from graph ; 2 suitable line shown on the graph ;
1(b)(iv)	states one of these variables – species of bacteria / pH / nutrient status / oxygen ;