

Model Answers: Medium

1

The correct answer is **D** as silk is a protein and therefore will be broken down by protease. This would damage the silk clothing so biological washing powder should not be used to wash silk. A 90°C cycle would denature the enzymes and therefore render them ineffective, so again would not be recommended. The washing powder could be used to remove blood stains as blood is comprised predominantly of proteins, carbohydrates and lipids (all things the washing powder can hydrolyse)

2

The correct answer is **A** because breaking down triglycerides will produce glycerol and three fatty acids. The fatty acids will lower the pH of the solution which would denature the lipase if measures weren't taken to maintain a constant pH.

3

The correct answer is **B** as the **independent** variable is the factor that is being **changed** in the experiment. The experiment wants to determine how temperature affects the rate of reaction, so it will be the temperature that is being altered.

The **dependant** variable is the factor being **measured** (in this case the dependant variable would be option **D** – the volume of oxygen produced). **Control** variables are factors that need to be kept the **same** in order to ensure a fair test (option **C** – the mass of liver added at the start - is an example of a control variable).

4

The correct answer is **B** because the dotted line shows the energy for an enzyme catalysed reaction. The activation energy is the energy needed for the reaction to occur and it is reduced by the presence of an enzyme. The dotted line goes from 20 to 25 so this is the activation energy.

After the reaction, the products end up with an energy of 15, this is less than before the reaction so we can deduce that this was an exothermic reaction (i.e. it has given out energy/heat)

5

The correct answer is **A** as not all enzymes have a quaternary structure (meaning they are made of more than one polypeptide chain)

The tertiary and quaternary structures are usually the structures that form the actual shape of the active site, however, as all protein structures depend on the preceding structures (i.e. the tertiary structure depends on the secondary structure, which in turn depends on the primary structure) they are all important in determining enzyme specificity

6

The correct answer is **C** as there are no ester bonds present in any level of protein structure (and therefore also enzyme structure). Ester bonds are found in lipids (e.g. triglycerides and phospholipids).

The bonds in proteins are as follows:

- **Primary** structure = peptide bonds
- **Secondary** structure = hydrogen bonds
- **Tertiary** structure = hydrogen bonds, disulphide bridges, ionic bonds, hydrophobic interactions
- **Quaternary** structure = hydrogen bonds, disulphide bridges, ionic bonds, hydrophobic interactions

7

The correct answer is **D** as disulfide bridges are essentially covalent bonds (i.e. the same type of bond as the peptide bonds between the amino acids). Covalent bonds involve the sharing of electrons and are substantially stronger than all the other types of bonding listed - they would therefore be the last to break.

8

The correct answer is **D** as statement 3 is not affected by either pH or temperature. Hydrophobic interactions are the tendency of hydrophobic amino acids to orientate themselves on the inside of the molecule to avoid interacting with water; this helps to stabilise the enzyme's globular structure. The bonding arises due to the presence of an aqueous environment surrounding the enzyme and therefore won't be increased by increases in temperature or pH (and most likely will be decreased as the other bonds are broken). Statements 1 and 4 are both responsible for the effect mentioned in statement 2.

9

The correct answer is **C** as the dotted line is showing the energy for an enzyme catalysed reaction and the solid line is showing the same reaction without the enzyme (i.e. the solid line is the uncatalyzed reaction). The activation energy is the energy needed for the reaction to occur - in this case is represented by the solid line going from 20 to 30.

After the reaction, the products end up with an energy of 15, this is less than before the reaction (where it was 20) so we can deduce that this was an exothermic reaction (i.e. it has given out energy/heat).