Model Answers: Hard

1

The correct answer is **C** as the rate of oxygen production is the dependent variable, therefore it cannot be a control variable.

The **independent** variable is the factor being **changed** (in this case the independent variable would be pH). The **dependent** variable is the factor being **measured** (in this case the dependant variable would be rate of reaction which is a calculation determined by the amount of oxygen produced in a certain time). Control variables are the factors that need to be kept the same in order to ensure a fair test (often things like the temperature, volume and concentration of substrates), but crucially, control variables can't be one of the other two variable types!

2

The correct answer is **A** as, in this quite unusual case, a single amino acid is acting as an enzyme. A single amino acid is not a protein and so doesn't have a secondary, tertiary or quaternary structure.

3

The correct answer is **B** as this statement should be the other way around - the activation energy of the uncatalysed reaction is double the catalysed reaction. It is 10 for the uncatalysed reaction and only 5 with a catalyst. The activation energy of the uncatalysed reaction will always be greater than the same reaction with a catalyst.

4

The correct answer is **D** as to get a build-up of reactant, enzyme 1 must be inhibited. This would also then explain the decrease in intermediate X and hormone. The fact that intermediate Y slightly increases even though the amount of intermediate X has decreased shows us that enzyme 3 has also been inhibited (otherwise we would expect the amount of intermediate Y to decrease the same as X and the hormone). Another proof of this is the fact that the hormone has undergone a **large** decrease, whereas X only decreased. The production of the hormone is being inhibited twice, whereas the production of X is only inhibited once – therefore the amount of hormone is reduced by a greater extent

5

The correct answer is **C** as it is important not to disrupt all proteases found in the hosts body. Our own cells need to make many different types of protease as part of their normal functioning, so we need to make sure to only target this specific viral protease and not disrupt the normal cellular function (this therefore also rules out B and D). A could potentially make good a broad-spectrum antibiotic (i.e. an antibiotic that can work on a range of different bacterial infections), however, it will have no effect on the HIV virus as viral and bacterial enzymes are different

6

The correct answer is **D** as the active site is present on the enzyme (**lipase**) and not on glycerol (which is a substrate or product depending on which way the reaction is going). In the direction of **1** the reaction is a **hydrolysis** reaction (water is used to break up a molecule) and the reverse (2) is a **condensation** reaction (water is produced in the formation of a larger molecule). The pH will **decrease** in the direction of reaction 1 as the fatty acids being produced will lower pH.

7

The correct answer is **D** as the information in the question states that several different polypeptide chains (subunits) come together to form the active site. Each individual 4-Oxalocrotonate tautomerase is not able to act as an enzyme, therefore the correct answer cannot be tertiary structure (and therefore also no primary or secondary structure).