Protein Structure

- Make sure you know the difference between these types of bonds; ionic, covalent and hydrogen. You will need to know these.

- Go online and look these up at Wikipedia and YouTube. There are some excellent videos and information. Do let your tutor know of any good sites or videos so that they can be shared with others doing this course.

You must know and understand the following;

1. ***Primary structure*** – the number and sequence of the different amino acids held together by peptide bonds in a polypeptide chain. Fig. 2.17 P 32

2. ***Secondary Structure*** – spiralling of the polypeptide chain/s into an alpha helix, which is kept in shape by hydrogen bonds between the –CO of one, the –NH of the amino acid four places ahead in the chain(fig. 2.18a).
- Alternatively it may form a pleated sheet (fig. 2.18b), this structure is again due to the formation of -H bonds.
- Other proteins have no regular arrangement.

3. ***Tertiary structure*** – this results from the bending and folding of the alpha helices into a compact shape, which is maintained by hydrogen bonds, disulphide bonds, ionic bonds and hydrophobic interactions.

1. ***Quaternary Structure*** – two or more separate polypeptide chains are joined together to form the functional protein e.g. haemoglobin is four chains held together.

- Check these notes against the text and if necessary add any other detail you feel necessary.

- Look over and understand the bonds in figure 2.19. You must understand and remember these as they are very important in protein structure and function.

- Make notes on the globular and fibrous proteins haemoglobin and collagen, and there functions on pages 34 – 37 also refer to Figure 2.22. Note that CIE often include these proteins and there functions, structure and properties in examination questions.

All proteins differ from one another in the type, number, sequence and ratio of amino acids of which they are composed and the cross-linkage and folding of the polypeptide chain. This is what imparts the different properties to each different protein whether it is an enzyme, carrier molecule or has a structural role.

Denaturing of proteins occurs when their secondary and tertiary structure is altered or changed by high temperatures (over approximately 40 degrees C except for thermophilic bacteria), and extremes of pH.

Activities

Draw into your notes the generalised structure of an amino acid.

Using appendix 1 on page 354, draw the structure of the amino acids Cystine, alanine, methionine and valine into your notes.

Draw into your notes the formation of a dipeptide as shown in fig 2.16 Page 31; however in your diagram, join the amino acids *cystine* and *alanine*.

Test For Proteins Box 2E page 37

Biuret test – add an equal volume of 5% potassium hydroxide solution to the test sample. Add a few drops of 1% copper sulphate solution and mix. A red-pink or violet colour indicates the presence of proteins or polypeptides. In the case of free amino acids and dipeptides the Biuret test will give a negative result.

Follow this link:

http://www.youtube.com/watch?v=w-ctkPUUpUc&feature=channel

OK it is not the best but is still worth watching.

Review the summary on pages 39 & 40 and make sure you can do **all** the work that is required.

Now for revision and to test yourself, go over the chapter and then turn to page 384. Answer the past examination questions 2.1 and 2.2. Use your notes and textbook to research the answers if you cannot think of the answer yourself.

Mark your answers by looking at P394. Are you doing OK? Use the forum and your tutor for help if you need it.

Enzymes p 41 – 49 in your textbook

On page forty one in your text book is a syllabus summary; read it and by the end of the chapter, *make sure you can do it all*.

Read over page 41 and 42 and make notes on enzymes as biological catalysts and how they work. Also look at this link for a basic introduction to enzymes –

http://www.youtube.com/watch?v=cbZsXjgPDLQ

This is sometimes known as the lock and key hypothesis of enzyme action.
Study figure 3.1 and 3.2 that explain how the enzymes work. Note that the reaction can be reversible and depends on the concentration of the substrate and the products. If the concentration of the products is greater than the substrate the enzyme may reform the substrate.

Think about how this is avoided in living systems.

Enzymes reduce activation energy

Activation energy is the amount of energy that needs to be put into a reaction to cause it to occur. With this in mind read over and understand this section and examine figure 3.3 a and b. You need to be able to recognise these graphs.
This is the basis of this whole section; make sure you fully understand it.

The course of a reaction

Read over this section and then make some notes on it.
Understand why it is the initial rate of reaction that is important and should be used when comparing rates of reaction under different conditions.
Answer SAQ 3.1 and then check your answer in the back of your textbook, but only once you have completed it. Add any extra notes based on the answers given.

Factors affecting the rate of enzyme action

It is crucial that you get a good grasp of these next few sections as it is regularly examined in all three AS papers. The shape of the graphs in particular comes up in paper 1. So take some time, make sure your notes from page 45 to 47 are clear and you fully understand. Contact the course tutor with any questions.

The rate of an enzyme reaction is measured by the amount of substrate converted or by the amount of product formed per unit time.

A]	**Enzyme concentration**	Figure 3.5 p44
B]	**Substrate concentration**	Figure 3.6 p45
C]	**Temperature**	Figure Fig 3.7 P45/6
D]	**pH**	Figure Fig. 3.9 p46/7

Answer the Self Assessment Questions 3.1 to 3.6 after you have completed your notes. Only once you have answered them all look up the answers in the back of the book.

It is important that you are able to read a graph. Always look at the title and the titles to the axes carefully. These will tell you what it is all about. The lines or blocks on the graph will them show the change. It gives a picture of the data.

Activities

The link below is a Catalase enzyme experiment write up showing the effect of enzyme concentration on rate of reaction. Take particular note of how the tables are laid out and the graph is drawn.

http://www.neiljohan.com/projects/biology/enzymes.htm

Work your way carefully through the experiment to make sure you follow the procedures check the conclusions and extension works well as possible improvements to the procedure. You need to try and visualise the experiment.

Activities

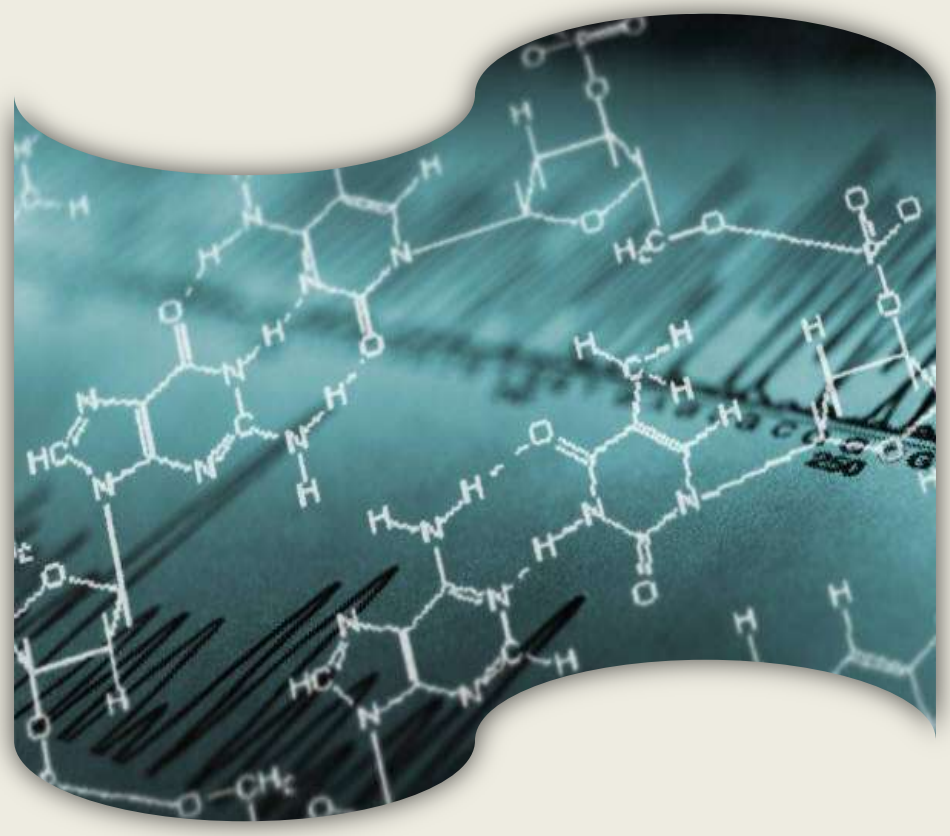
Continued:

Do you agree with the author, or are there other possibilities? These are critical skills you will need for paper 3 work slowly and thoroughly through this experiment and understand all the stages.

The action of Catalase in this experiment is a catabolic reaction not an anabolic reaction as the experimental write up states. Did you spot that?

Anabolic is a building up and catabolic a breaking down of molecules.

An easy way to remember this is to think of anabolic steroids illegally used to *build up* muscle.



Enzyme Co-factors

Some enzymes require a co-factor, for their activity, this is a non-protein substance and may be simple inorganic ions, e.g. Mg2+ and K+, which are activators. Alternatively they may be organic molecules, e.g. NAD and NADP, in which case they are called coenzymes. The enzyme co-factor complex is called a holo-enzyme and the enzyme portion without its co-factor is called an apo-enzyme. Co-enzymes are loosely associated with enzymes and often act as temporary carriers of atoms or electrons, e.g. NAD and NADP function as hydrogen carriers in respiration and photosynthesis respectively. Essential to the synthesis of co-enzymes is the availability of many vitamins.

Enzyme Inhibition - Page 47 and 48

You will need to be able to recognise the effect of these on the course of a reaction shown as a graph. This again is often examined.

Read over the text and understand it, then make your notes and click on the given links. Follow what is happening and make sure you understand it. There is no point in just watching, watch and learn!

Competitive inhibition – p 47 Figure 3.1 and p 48 Table 3.1

Yes well if you can find a better one please let us all know

http://www.youtube.com/watch?v=ec2SBpXErPg&feature=PlayList&p=573B70BA2385319B&playnext=1&playnext_from=PL&index=21

Non-Competitive inhibition – p 47 Figure 3.1 and p 48 Table 3.1

End Product Inhibition – p 48 fig 3.11

http://highered.mcgraw-hill.com/olc/dl/120070/bio10.swf This is an excellent illustration of the process.

*Review the summary on page 49 and make sure you can do **all** the work that is required*

Now for revision and to test yourself, go over the chapter and then turn to page 385. Answer the past examination questions 2.1 and 2.2. Use your notes and textbook to research the answers if you cannot think of the answer yourself.

Mark your answers by looking at P394.

Are you doing OK? Use the forum and your tutor!

Cell Membranes and Transport

p 50 – 63 in your textbook

On page fifty in your text book is a syllabus summary; read it and by the end of the chapter, *make sure you can do it all*.

Phospholipids

Read over this section and understand the structure of phospholipids. Make some notes.
Phospholipids are formed when one of the fatty acid tails in a triglyceride is replaced by a phosphate group to form phospholipids (refer to Chapter 1 on molecules and the formation of lipids for revision).
Follow through figure 4.1 and make sure you understand it.

Activities

Follow these links:
http://www.youtube.com/watch?v=JvKpJhEMb60 is a basic video on the formation of Micelles that you may like to look at.

Also have a look at http://en.wikipedia.org/wiki/Micelle this also has plenty of links to other areas of this section that are well worth looking at. Follow several and gather the information and write it into your notes.

NB if there is a difference between what you see in any of the links and what you see in the textbook; ***use the information/terms in the textbook*** that is how CIE want it!

Activities

Also refer to the following, which will help you to understand:

http://en.wikipedia.org/wiki/Fluid_mosaic_model#Fluid_mosaic_model

http://www.youtube.com/watch?v=ULR79TiUj80&feature=related

This video on the Fluid mosaic model, it lacks all the CIE detail necessary but is ok to illustrate it. The detail is in the textbook.

http://www.youtube.com/watch?v=vh5dhjXzbXc&feature=related

Bit more detail of fluid mosaic mode and well worth watching

Do not get more detail than is in your textbook but pick out the important facts and look at the diagrams. The point is to help you to grasp the ideas.

Roles of the components of Cell Membranes

Make notes on the roles of the components that make up the cell membrane and identify the component in the diagrams on page 52. You will need to be able to remember the function of each of these.

Diffusion and facilitated diffusion

The diffusion information should be revision but make sure the definition you have is the CIE - A level version. Make sure you use this one.

Take notes on the factors that affect the rate of diffusion and make sure you remember these.

Make sure you understand the difference between normal passive diffusion and facilitated diffusion. If you look at a graph of rate of diffusion vs. concentration, then as the concentration doubles so the rate of diffusion would also double giving a straight line graph. This is also true for facilitated diffusion until all the protein channels are fully occupied, the graph would then level out. This is an important way of recognising the difference between the two from data.