Teaching ideas for Option B, *Human biochemistry*

Questions

Two worksheets of questions are provided:
- the first worksheet deals with the Standard Level part of the syllabus
- the second worksheet is for Higher Level only.

There are also a large number of questions available in the Coursebook and on the accompanying CD-ROM.

Teaching activities

In most cases this topic only touches on the subject of biochemistry. Students should, wherever possible, be encouraged to delve deeper into the subject. It is also important that students distinguish between the biochemistry they may learn in biology lessons and the biochemistry that they learn in chemistry lessons; the approach here should be based more on structure and bonding.

- Molecular models should be used wherever possible to show the structures of complex molecules.
- Students could construct a model of DNA.
- The importance of a balanced diet could be discussed, as well as the problems associated with poor diet and obesity. There is a great deal of opportunity to research deficiencies in diet that occurs in various countries around the world and to consider possible solutions.
- The importance of vitamins could be discussed, as well as the role of the health food industry in promoting their use/overuse. The work of Linus Pauling on the beneficial effects of vitamin C could be discussed.
- The abuse of steroids in sport could be discussed.
- The advantages and disadvantages of DNA databases could be discussed.
- The human genome project could be discussed.

Practical activities

Safety

Extreme care must be exercised when carrying out any practical activities in the classroom and a risk assessment should be conducted before carrying out the experiments.

Student practicals

- Students could carry out a simple experiment to investigate the energy content of various foods. The food is weighed and burnt, and the heat energy used to heat a known mass of water. This links to Chapter 5: *Energetics*.
- Students could investigate enzyme kinetics. Several procedures are available on the internet, including:
  http://www.saps.org.uk/students/projects/179-student-project-enzymes-and-their-activity-in-fruits-and-vegetables
  http://www.utm.utoronto.ca/~w3bio/bio204_summer/labs/catalase.pdf
  http://samson.kean.edu/~breid/enzyme/enzyme.html
  http://www.lsbu.ac.uk/biology/enzyme/practical1.html
- Students could design experiments to look at the effect of temperature, pH and heavy metals on enzyme activity.

- Students could determine the iodine number of various oils. Several procedures are available on the internet:
  http://www.drcarman.info/kem220lb/14lab220.pdf
  http://sst-web.tees.ac.uk/external/u0000747/Biomolecules/BMlabs.pdf
- Students could separate a mixture of amino acids using chromatography:
  http://web.cocc.edu/chigginbotham/ch106/ch106%20labs/ch106__aatlc_lab.htm
  http://www.macalester.edu/~kuwata/Classes/2001-02/Chem%2011/Revised%20Amino%20Acids%20(9%201%2001).pdf
  http://faculty.buffalostate.edu/wadswogj/courses/BIO211%20Page/lectures/lab%20pdf's/Amino%20Acid%20lab.pdf
- Students could extract DNA:
  http://education.sdsc.edu/teachertech/downloads/teacherlab.pdf
  http://www.funsci.com/fun3_en/dna/dna.htm
  http://ucbiotech.org/resources/display/files/dna_extraction_from_strawberrie.pdf
  http://learn.genetics.utah.edu/content/labs/extraction/howto/
  http://biotech.biology.arizona.edu/labs/DNA_Kiwifruit_teacher.html
  http://nobel.scas.bcit.ca/resource/dna/station1.htm

ICT

There are many excellent websites available that are relevant to this topic.

- Amino acids:
  http://www.mcb.ucdavis.edu/courses/bis102/Aliphatic.html
  http://cti.itc.virginia.edu/~cmg/Demo/scriptFrame.html
- Animations:
  http://www.learnerstv.com/animation/Free-biology-animations-page1.htm
  http://www.1lec.com/Biochemistry/index.html
- Protein structure:
  https://mywebspace.wisc.edu/jonovic/web/proteins.html
  http://www.stolaf.edu/people/giannini/flashanimat/proteins/protein%20structure.swf
  http://www.umass.edu/microbio/chime/hemoglob/index.htm
- Glucose structure:
  http://www.stolaf.edu/people/giannini/flashanimat/carbohydrates/glucose.swf
- Databases:
  http://www.rcsb.org/pdb/home/home.do
  http://www.ncbi.nlm.nih.gov/structure
- Enzyme kinetics:
  http://www.wellesley.edu/Biology/Concepts/Html/enzymekinetics.html
  http://www.kscience.co.uk/animations/model.swf
  http://www.chem.ucsb.edu/~molvisual/ABLE/induced_fit/index.html
  http://cti.itc.virginia.edu/~cmg/Demo/scriptFrame.html
- DNA:
  http://www.dnalc.org/
  http://www.dnai.org/index.htm
- DNA extraction animation:http://learn.genetics.utah.edu/content/labs/extraction/
- The Human Genome Project:
  http://www.ornl.gov/sci/techresources/Human_Genome/home.shtml
  http://www.ncbi.nlm.nih.gov/science96/

Theory of knowledge (TOK)

The ethical, social and legal issues associated with the Human Genome Project could be discussed.