# Teaching ideas for Topic 6: Human physiology

Both SL and HL students are likely to have a basic knowledge of human physiology from previous studies and courses so it is a good idea to build on this knowledge. HL students will need a sound knowledge of the basics for Topic **11**, *Animal physiology (HL)*.

## Ideas for the lesson

• Ask students to produce a ‘to scale’ paper model of the intestine and compare the relative lengths of each section. Encourage discussion of the function and importance of each section and relate this to the conditions found in it (this can be linked to practical work on enzymes). Some good video clips of the digestive system and its processes can be found at [**www.bbc.co.uk/learningzone/clips**](http://www.bbc.co.uk/learningzone/clips).

• Review work from Topic **2** on monomers and polymers and also on diffusion and facilitated diffusion. Students who find the concepts difficult may find the applied situation here easier to recall. Practical work with Visking tubing is suggested in Practical **4**.

• Supply students with a set of cards that name the structures of the heart and circulatory system. Ask them to put the cards in the correct order to show all the structures a blood cell would pass during one complete circulation. A simulation of the heart functioning, which can be used to introduce the exercise, is available at [**www.bbc.co.uk/learningzone/clips**](http://www.bbc.co.uk/learningzone/clips) (search for ‘heart function and health’).

• Lead a class discussion on the benefits of antibiotics. Students should research some history of antibiotics, including their discovery and early use. They can provide examples of diseases that have been controlled by antibiotics and consider the potential threat posed by their overuse and increasing resistance to them.

• Encourage students to distinguish between breathing (ventilation) and respiration, and consider how the processes change during exercise or in different environments. They can also consider these processes in different organisms.

• Students could conduct a survey amongst their family or peers to examine the extent to which smoking is prevalent in their community. The social and economic consequences of lung cancer and emphysema can then be discussed.

• Up-to-date research on memory and learning is an area students find fascinating and is a useful topic to set for individual research.

• Ask students to predict the hormonal cycle of an animal such as a sheep, which does not have a menstrual cycle but comes into season at specific times of the year. Contrast this with the human situation, comparing the levels of hormone in each case.

• Leptin and melatonin are two very interesting hormones, which affect day-to-day life. Students can discuss jet lag and the use of melatonin in alleviating symptoms. Some may have personal experience of this. Material at [**www.bbc.co.uk/news/health**](http://www.bbc.co.uk/news/health) (search for ‘full moon disturbs sleep’) provides more background, while and articles such as ‘Cheating ourselves of sleep’ available at [**well.blogs.nytimes.com**](http://well.blogs.nytimes.com) present a popular view of the issue in the press.

• Experiments with leptin are a useful introduction to discussions of obesity, incidence of type II diabetes and potential treatments. Articles at [**www.bbc.co.uk/news/health**](http://www.bbc.co.uk/news/health)(search for ‘obesity crisis’) provide good background reading on this.

## Practical activities

• Digestion and absorption can be investigated using Visking (dialysis) tubing and starch/amylase solutions, and polymer/monomers mixtures such as starch/glucose. This provides a good opportunity to review tests for protein, reducing sugar and glucose. (Visking tubing is described in the student’s book, Figure **6.4**, and in Practical **4** on this topic.)

• Provide an image or microscope slide of blood, or ask students to find one and make a scale drawing of all the components they can see. They should demonstrate the proportions of different cell types and be able to summarise the components present. It is also interesting to compare human (or mammalian) blood with frog blood and discuss the cell theory in relation to red blood cells and differences between them.

• Heart dissection and artery stretching protocol is described in Practical **3**. In addition, show students the heart and lungs of a sheep, if available, and ask them to consider how the structure of each is related to its function. Students can compare the properties of heart muscle with the diaphragm and other muscles found in the body. They can weigh similar volumes of heart and lung tissues and relate the differences to their structure.

• Provide students with the opportunity to conduct practical work on the speed of transmission of nerve impulses (see Teaching ideas for Option **A**, *Neurobiology and behaviour*). This provides useful reinforcement of the neural pathway and enables students to consider the importance of myelination in increasing the speed of transmission of impulses.

## ICT

• Data-loggers are very useful to produce continuous measurements of temperature and pH. Encourage students to design their own experiments involving enzymes. They can consider the different pH requirements for mouth, stomach and small intestinal enzymes.

• Additionally, colorimeters linked to computers or used separately can be used to monitor the digestion of starch by amylase.

• Data-loggers can be used to monitor both heart and breathing rates. Students can design investigations that consider the effect of exercise on both. If a gym is available, the level of exercise can be controlled. Practical **2** in Option **D**, *Human physiology*, describes protocols for heart rate monitoring. (Safety note: students with respiratory or other health problems should not be subjects in these investigations.)

• Students can compare measurements for heart and breathing rates made using data-loggers with those made by observation and discuss accuracy and reliability of such data.

## Common problems

• Students find the propagation of a nerve impulse a very difficult concept to grasp. Sometimes an ‘enactment’ of this in class using analogies such as the Mexican wave and opening and closing of doors for gated channels can help.

• Differences in the mode of action of psychoactive substances comprise another area that many find difficult. It can be useful to link the physiological effects of drugs at a synapse to their physical effects on behaviour. Many health organisations produce leaflets and other material on psychoactive drugs that are abused, for example, [**www.samhsa.gov**](http://www.samhsa.gov) and [**www.helpguide.org**](http://www.helpguide.org).

## Theory of knowledge (TOK)

• Students can consider the risks and benefits associated with development of new medicines and the changes in attitude to experiments with new medicines that have occurred since the time of Jenner, and Florey and Chain. News items on this topic are available at [**www.bbc.co.uk**](http://www.bbc.co.uk).

• *In vitro* fertilisation involves the injection of hormones into a woman’s body and manipulation of sperm and egg cells. Students can discuss the risks and benefits of this treatment and the ethics of selecting specific embryos for implantation or destruction.

## International mindedness

• Discussion of antibiotic use can include its worldwide significance.

• The rapid spread of disease around the world as international travel increases is of concern. Students can follow the route of influenza in a historical context (at the end of the Second World War) and in the modern world of international air travel.

• Type II diabetes is increasing worldwide and the factors influencing its occurrence can include both genetic differences between ethnic groups and the type of diet. Students can examine the distribution of type II diabetes and explore aspects of traditional and modern diets.

• Cultural and religious acceptance of *in vitro* fertilisation treatment varies considerably across the world. Students can consider their own opinions about the production of children in this way.