

Edexcel core science - Biology B1b

Items in **bold** are for higher tier only

Topic 3 — Electrical and Chemical Signals

People have always wanted to know how the brain works. Speedy responses are possible through electrical impulses in nerve cells, and some are linked to muscles by reflex arcs. Hormones can co-ordinate body functions, including the female menstrual cycle. The contraceptive pill and fertility treatments are examples of the ways in which sex hormones can be used medically. Some hormones can be produced by genetic modification of bacteria for medical purposes, eg in insulin production. In this topic there are opportunities to measure and interpret data on body reactions such as reaction times and reflex actions. The development of a scientific explanation of diabetes through experiments on animals can be demonstrated and its ethical implications discussed. The application of science in controlling fertility and helping infertile couples to conceive can be considered, and the benefits, risks and drawbacks discussed.

Have you ever wondered?

- How does my brain tell my body what to do?
- How do my hormones ‘know’ where to go?
- How do contraceptive pills work?
- Why do people with diabetes inject themselves with products from bacteria?
- When travelling in a car, why do I duck down when a bird flies low over me?

Some facts:

- The body needs to be maintained in an optimum state.
- The central nervous system lets your body respond to changes in its surroundings.
- Hormones regulate the functions of cells and organs.
- Artificial hormones can be used to control reproduction and alter body functions.

Glossary

bacteria	peripheral nervous	tumour	reflex
hormone	system (PNS)	electrical impulse	genetically
pancreas	stroke	iris	modified organism
sensory	contraception	reflex reaction	(GMO)
neurone	in-vitro fertilization	voluntary	muscle
brain	(IVF)	follicle stimulating	reflex arc
infertility	pregnancy	hormone (FSH)	glucose
Parkinson’s disease	target organ	menstrual cycle	nerve
stimulus	diabetes	receptor	relay neurone
central nervous	luteinising hormone	genetically	grand mal epilepsy
system (CNS)	(LH)	modified	oestrogen
insulin	progesterone	motor neurone	sense organs

You should be able to:

- explore ways of measuring reaction times
- demonstrate an understanding of the structure of the central and peripheral nervous systems, including the main regions of the brain and their functions (memory and thinking, hearing, touch, smell, taste, vision)
- explain how nerves carry electrical impulses from sense organs to muscles

- **describe how strokes, brain tumours, Parkinson's disease and grand mal epilepsy disrupt the functioning of the brain**
- explain that receptors in sense organs detect internal and external changes, allowing the body to respond to these stimuli
- describe the difference between voluntary and reflex responses and the advantages of reflex responses in helping to safeguard the body:
 - the iris reflex
 - accommodation
 - 'ducking' reaction to objects travelling close to the head
- explain how the composition and function of the blood is related to its function
- explain how hormones act as chemical messages affecting target organs and/or cells
- **demonstrate understanding of the role and interpret data to explain that oestrogen causes the lining of the uterus to thicken during the early part of the menstrual cycle**
- **demonstrate understanding of the role and interpret data to explain that progesterone maintains the lining of the uterus during the middle part of the menstrual cycle and during pregnancy**
- explain how manufactured sex hormones can be used for contraception and to treat infertility in women, including the roles of follicle stimulating hormone (FSH) and luteinising hormone (LH)
- discuss the social and ethical implications of IVF treatment, including its use in mature clients
- explain how insulin produced by the pancreas regulates glucose concentrations in the blood
- explain how human insulin is produced from genetically modified bacteria and the advantages of this method compared to extracting insulin from mammals.

Topic 4 — Use, Misuse and Abuse

Young people in Britain are offered the opportunity of a ‘BCG’ vaccination to protect them from Tuberculosis (TB). The body can be attacked and disrupted by the actions of disease-causing organisms (pathogens), such as the bacteria that cause TB. The body has three lines of defence against pathogens — physical, non-specific mechanisms and the immune system. Natural defences can be assisted with drugs. Some drugs affect the pathogen, others change the reactions of the body. Some drugs may be misused to alter the state of mind or body.

This topic will look particularly at the use of pain-relieving drugs and the difficulties associated with them. There are opportunities to interpret data on the effectiveness of different drugs. Students can present information and develop arguments on the use of drugs in a range of contexts. They can also collect and interpret data from secondary sources and discuss the social, economic and ethical implications of drug misuse and abuse.

Have you ever wondered?

- Are there more ‘good’ microorganisms than disease-causing ones?
- What is the difference between an infection and a disease?
- Why is TB in the news again?
- Why won’t your doctor give you antibiotics for a cold?
- Why is it so expensive to produce a new drug?
- Why are the uses of some substances controlled by law?
- Why are some drugs considered good for your body and others bad?
- How do different drugs affect people differently?

Some facts:

The human body has three lines of defence against invading microorganisms.

Immunisation and antibiotics are used against diseases caused by microorganisms.

The use and misuse of substances can affect the normal functioning of the body systems, affecting mental and physical health.

There are socio-economic reasons that contribute to ill health and ethical considerations for the development of treatments.

Glossary

addiction	neurone	barbiturate	vector-borne
circulatory system	stimulant	gaseous exchange	cannabis
microbe	antigen	overdose	inflammation
sedative	drug	transmission barrier	pathogen
alcohol	opiate	immune system	viral infection
depressants	synapse	pain-relief	cilia
microorganism	bacteria	tuberculosis	lysozyme
solvent	foreign body	caffeine	reaction time
antibody	organism	infection	white blood cell
disease	tobacco	paracetamol	

You should be able to:

- describe the main physical and mental effects of:
 - solvents (on lungs and neurones)
 - alcohol (on reaction times, liver and brain)
 - tobacco (on gaseous exchange and circulatory systems)
- describe how the use of drugs may:
 - affect activities such as driving

- produce abnormal behaviour
 - create the risk of viral infections
- explain the effects on nerve transmission (including synapses) on reaction times of:
 - stimulants, including caffeine
 - sedatives, including barbiturates
 - painkillers, including paracetamol
 - depressants, including alcohol and solvent
- discuss the use of opiates and cannabinoids in pain-relief for terminally ill patients, and the dangers of addiction
- describe the uses of paracetamol and the dangers of overdose
- discuss why medical opinion on the use of cannabis for pain-relief has fluctuated over the years
- describe a pathogen as a disease-causing organism
- explore, using secondary data, the main physical and mental effects of the misuse of drugs and their impact on behaviour
- explain that microbes can be transmitted by direct contact (including vertical (mother to fetus) and horizontal), and indirect contact (vehicle and vector-borne)