

Eduqas - GCSE Biology - 2016

		Nervous System Controls & Responds to Body Functions & Directs Behavior						Nervous System Structure & Function Are Determined By Both Genes & Environment Throughout Life						The Brain is the Foundation of the Mind				Research Leads to Essential Understanding for Therapies																
		1. Brain is the body's most complex organ.			2. Neurons communicate using electrical and chemical signals.			3. Genetically determined circuits are foundation of the nervous system.			4. Life experiences change the nervous system.			5. Intelligence arises as brain reasons, plans, solves problems.		6. The brain makes it possible to communicate knowledge through language.		7. Human brain endows us with a natural curiosity to understand how the world works.		8. Fundamental discoveries promote healthy living and treatment of disease.														
Topic	Learning Objective	a	b	c	d	e	f	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	a	b	a	b	c	a	b	c	d
1. Cell biology																																		
1.1 Prokaryotic and eukaryotic cells	(c) explain how the following sub-cellular structures of eukaryotic cells (plants and animals) and prokaryotic cells (bacteria) are related to their functions: nucleus/DNA, plasmids, mitochondria, chloroplasts, cell membranes, cytoplasm, vacuole, cell wall.																																	
	(d) explain how the development of the microscope (light, electron, laser imaging) increased the understanding of the sub-cellular structure of organisms and the proposal that the cell is the basic unit of life.																																	
1.2 Growth and development of cells	(b) explain the importance of cell differentiation to produce specialised cells for greater efficiency.																																	
	(d) describe the function of stem cells in embryonic and adult animals and meristems in plants; some cells, both plant and animal, do not lose the ability to differentiate and are called stem cells.																																	
	(e) discuss the potential benefits, risks and ethical issues surrounding stem cell technology in medicine including the implications for society e.g. the use of embryonic stem cells.																																	
2. Transport systems																																		
2.1 Transport in cells																																		
2.2 Transport systems in humans																																		
2.3 Transport systems in plants																																		
3. Health, disease and the development of medicine																																		
3.1 Health and disease	(c) describe the interactions between different types of disease, as exemplified by the increased risk of developing skin cancer when HIV positive and the increased risk of cardiovascular disease in diabetes patients.																																	
3.2 Communicable disease	(f) describe the process of discovery and development of potential new medicines, including preclinical and clinical testing. New drug treatments may have side effects and extensive, large scale, rigorous testing is required including risk management. Preclinical stages involve testing on human cells grown in the laboratory, then on animals and finally a group of healthy volunteers. The new medicines are then taken for clinical testing using small groups of patients.																																	
3.3 Treating, curing and preventing disease	(a) recall that many non-communicable human diseases, including cardiovascular disease, lung cancer, skin cancer, emphysema, type 2 diabetes and cirrhosis can be caused by the interaction of a number of life style factors.																																	
	(b) explain the effect of the following lifestyle factors on the incidence of noncommunicable diseases at local, national, and global levels: exercise, diet, alcohol, smoking and exposure to UV radiation.																																	
4. Coordination and control																																		
4.1 Nervous coordination and control in humans	(a) describe sense organs as groups of receptor cells, which respond to specific stimuli: light, sound, touch, temperature, chemicals, and then relay this information as electrical impulses along neurones to the central nervous system.																																	
	(b) describe the structure of the nervous system, including the brain, spinal cord, sensory neurones, motor neurones and sensory receptors and the central nervous system consisting of the brain and spinal cord.																																	
	(c) explain how the structure of the nervous system (including CNS, sensory and motor neurones and sensory receptors) is adapted to its functions.																																	
	(d) describe the properties of reflex actions. These reactions are fast and automatic and some are protective, as exemplified by the withdrawal reflex, blinking and pupil.																																	
	(e) explain how the structure of a reflex arc is related to its function and be able to label a diagram to show: receptor, sensory neurone, relay neurone in spinal cord, motor neurone, effector and synapses.																																	
	(f) explain the functions of the following parts of the eye: sclera, cornea, pupil, iris, lens, choroid, retina, blind spot and optic nerve recognise and be able to label these parts on a diagram of a vertical section through the eye.																																	
	(g) describe common defects of the eye and explain how some of these problems may be overcome as exemplified by long-sightedness, short-sightedness and cataracts.																																	
	(h) describe the structure and function of the following parts of the brain: the cerebral hemispheres, cerebellum and medulla.																																	
	(i) explain that brain function is difficult to study and involves the use of brain scans, such as MRI and electrical stimulation. Discuss the ethical implications of studying patients with brain damage.																																	
	(j) explain some of the limitations in treating damage and disease in the brain and other parts of the nervous system as exemplified by Parkinson's disease and multiple sclerosis.																																	
4.2 Hormonal coordination and control in humans	(a) describe and be able to label the positions of the following glands on a diagram of the human body: pituitary, adrenal, thyroid, pancreas, ovaries and testes.																																	
	(b) describe hormones as chemical messengers, produced by glands and carried by the blood, which control many body functions.																																	
	(c) describe the principles of negative feedback mechanisms in maintaining optimum conditions inside the body.																																	
	(d) explain the role of thyroxine in the body as an example of negative feedback. Description should be limited to effects of TRH and TSH in the release of thyroxine.																																	
	(e) explain the role of adrenaline in the body. Description should be limited to the effects of adrenaline on the heart, breathing and muscles. Adrenaline is converted into a less active compound by the liver.																																	
4.3 Homeostasis in humans	(a) explain the importance to animals of maintaining a constant internal environment in response to internal and external change.																																	
	(b) explain why and how glucose levels need to be kept within a constant range. When the blood glucose level rises, the pancreas releases the hormone insulin, a protein, into the blood. This causes the liver to reduce the glucose level by converting glucose to insoluble glycogen and then storing.																																	
	(c) explain how glucagon interacts with insulin to control blood sugar levels in the body.																																	
	(e) describe the function of the skin in the control of body temperature. Label a diagram of a vertical section through the skin to show: hair, erector muscle, sweat gland, sweat duct, sweat pore, blood vessels. Explain the role of these structures in temperature regulation: change in diameter of blood vessels, sweating, erection of hairs; shivering as a means of generating heat.																																	
	(k) describe the effect of ADH on the permeability of the kidney tubules. The kidneys regulate the water content of the blood by producing dilute urine if there is too much water in the blood or concentrated urine if there is a shortage of water in the blood. ADH increases the permeability of the collecting duct walls to water. More ADH is produced if there is a shortage of water in the blood, more water is reabsorbed and so a more concentrated urine is produced.																																	
	(m) explain the response of the body to different temperature and osmotic challenges.																																	
4.4 Plant hormones																																		
5. Photosynthesis																																		
6. Ecosystems																																		
6.1 Levels of organisation within an ecosystem																																		
6.2 The principle of material cycling																																		
6.3 Biodiversity																																		
6.4 Some of the biological challenges of increasing food yields using fewer resources																																		
7. Inheritance, variation and evolution																																		
7.1 The genome and gene expression	(i) discuss the potential importance for medicine of our increasing understanding of the human genome.																																	
7.2 Inheritance																																		
7.3 Variation and evolution																																		
7.4 Selective breeding and gene technology																																		
	(b) describe genetic engineering as a process which involves modifying the genome of an organism to introduce desirable characteristics.																																	
	(d) explain some of the possible benefits and risks, including practical and ethical considerations, of using gene technology in modern agriculture and medicine.																																	

KEY		Description	
Nervous System Controls and Responds to Body Functions and Directs Behavior	1. The brain is the body's most complex organ.	a	There are a hundred billion neurons in the human brain, all of which are in use.
		b	Each neuron communicates with many other neurons to form circuits and share information.
		c	Proper nervous system function involves coordinated action of neurons in many brain regions.
		d	The nervous system influences and is influenced by all other body systems (e.g., cardiovascular, endocrine, gastrointestinal and immune systems).
		e	Humans have a complex nervous system that evolved from a simpler one.
		f	This complex organ can malfunction in many ways, leading to disorders that have an enormous social and economic
	2. Neurons communicate using electrical and chemical signals.	a	Sensory stimuli are converted to electrical signals.
		b	Action potentials are electrical signals carried along neurons.
		c	Synapses are chemical or electrical junctions that allow electrical signals to pass from neurons to other cells.
		d	Electrical signals in muscles cause contraction and movement.
		e	Changes in the amount of activity at a synapses can enhance or reduce its function.
		f	Communication between neurons is strengthened or weakened by an individual's activities, such as exercise, stress, and drug use.
		g	All perceptions, thoughts, and behaviors result from combinations of signals among neurons.
	Nervous System Structure and Function are Determined by Both Genes and Environment Throughout Life	3. Genetically determined circuits are foundation of the nervous system.	a
b			Sensory circuits (sight, touch, hearing, smell, taste) bring information to the nervous system, whereas motor circuits send information to muscles and glands.
c			The simplest circuit is a reflex, in which sensory stimulus directly triggers an immediate motor response.
d			Complex responses occur when the brain integrates information from many brain circuits to generate a response.
e			Simple and complex interactions among neurons take place on time scales ranging from milliseconds to months.
f			The brain is organized to recognize sensations, initiate behaviors, and store and access memories that can last a lifetime.
4. Life experiences change the nervous system.		a	Differences in genes and environments make the brain of each animal unique.
		b	Most neurons are generated early in development and survive for life.
		c	Some injuries harm nerve cells, but the brain often recovers from stress, damage, or disease.
		d	Continuously challenging the brain with physical and mental activity helps maintain its structure and function - "use it or lose it."
		e	Peripheral neurons have greater ability to regrow after injury than neurons in the brain and spinal cord.
		f	Neuronal death is a natural part of development and aging.
		g	Some neurons continue to be generated throughout life and their production is regulated by hormones and experience.
		The Brain is the Foundation of the Mind	5. Intelligence arises as brain reasons, plans, and solves problems.
b	Emotions are based on value judgments made by our brains and are manifested by feelings as basic as love and anger and as complex as empathy and hate.		
c	The brain learns from experiences and makes predictions about best actions in response to present and future challenges.		
d	Consciousness depends on normal activity of the brain.		
6. The brain makes it possible to communicate knowledge through language.	a		Languages are acquired early in development and facilitate information exchange and creative thought.
	b		Communication can create and solve many of the most pressing problems humankind faces.
Research Leads to Essential Understanding for Therapies	7. The human brain endows us with a natural curiosity to understand how the world works.	a	The nervous system can be studied at many levels, from complex behaviors such as speech or learning, to the interactions among individual molecules.
		b	Research can ultimately inform us about mind, intelligence, imagination, and consciousness.
		c	Curiosity leads us to unexpected but surprising discoveries that can benefit humanity.
	8. Fundamental discoveries promote healthy living and treatment of disease.	a	Experiments on animals play a central role in providing insights about the human brain and in helping to make healthy lifestyle choices, prevent disease, and find cures for disorders.
		b	Research on humans is an essential final step before new treatments are introduced to prevent or cure disorders.
		c	Neuroscience research has formed the basis for significant progress in treating a large number of disorders.
		d	Finding cures for disorders of the nervous system is a social imperative.