

CCEA - A-Level Biology - 2017

CCEA - A-Level Biology - 2017		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
1.0 Molecules and Cells																																		
1.1 Molecules																																		
1.2 Enzymes																																		
1.3 Viruses																																		
1.4 Cells	1.4.3 demonstrate knowledge and understanding of the structure and function of eukaryotic cell components.		•						•																			•						
	1.4.4 demonstrate knowledge and understanding of the different types of eukaryotic cell structure.		•						•																			•						
	1.4.5 demonstrate knowledge and understanding of using microscopy to examine cell structure.		•						•																			•						
1.5 Cell physiology	1.5.1 demonstrate knowledge and understanding of the mechanisms by which substances move across membranes.		•						•	•	•	•	•															•						
1.6 Continuity of cells																																		
1.7 Tissues and Organs	1.7.1 demonstrate knowledge and understanding that cells in tissues and organs are specialised.	•					•								•								•					•	•	•	•	•		
2.0 Organisms and Biodiversity																																		
2.1 Transport and exchange mechanisms																																		
(a) The principles of exchange and transport																																		
(b) Gaseous exchange																																		
(c) Transport in plants and transpiration																																		
(d) Circulatory system in mammals																																		
2.2 The adaptation of organisms																																		
2.3 Biodiversity																																		
2.4 Human impact on biodiversity																																		
4.0 Physiology, Co-ordination and Control, and Ecosystems																																		
4.1 Homeostasis																																		
(a) Principles of homeostasis	4.1.1 demonstrate knowledge and understanding of the concept of homeostasis and the components of homeostatic mechanisms.			•	•																													
	4.1.10 demonstrate knowledge and understanding of the principle of negative feedback as exemplified by the role of ADH in osmoregulation in mammals.	•	•	•				•	•	•																								
(b) The kidney and excretion																																		
4.2 Immunity																																		
4.3 Co-ordination and control																																		
(a) Plants																																		
(b) Animals	4.3.3 demonstrate knowledge and understanding of the structure of a neurone, recognising the following components in photomicrographs and electron micrographs (TEM) and diagrams.	•						•																			•							
	4.3.4 demonstrate knowledge and understanding of the generation and transmission of nerve impulses.	•						•	•	•	•	•																						
	4.3.5 demonstrate knowledge and understanding of synaptic transmission and recognise the following structures in photomicrographs, electron micrographs and diagrams.	•						•	•	•	•	•																						
	demonstrate knowledge and understanding of the gross structure of the mammalian eye and the functioning of its component parts in normal vision.	•						•						•																				
	4.3.7 carry out practical work including examining prepared slides or photomicrographs of the mammalian eye to identify the conjunctiva, cornea, iris, pupil, ciliary body, suspensory ligaments, aqueous and vitreous humours, retina, choroid, sclera, blind spot, optic nerve, rods and	•						•						•																				
	4.3.8 demonstrate knowledge and understanding of the structure and function of voluntary (skeletal) muscle as an effector.													•																				
4.4 Ecosystems																																		
(a) Populations																																		
(b) Communities																																		
(c) Ecological energetics																																		
5.0 Biochemistry, Genetics and Evolutionary Trends																																		
5.1 Respiration																																		
5.2 Photosynthesis																																		
5.3 DNA as the genetic code	5.3.5 demonstrate knowledge and understanding of the concept of epigenetics.						•							•																				
	5.4.8 demonstrate knowledge and understanding of the role of transgenic organisms, such as improving desirable traits, by inserting genes.						•							•													•	•	•	•	•			
5.4 Gene technology	5.4.9 demonstrate knowledge and understanding of gene therapy.						•							•													•	•	•	•	•			
	5.4.11 demonstrate knowledge and understanding that the inactivation or replacement of genes helps to understand gene and organism function.						•							•													•	•	•	•	•			
	5.4.12 demonstrate knowledge and understanding of the term pharmacogenetics.						•							•													•	•	•	•	•			
	5.4.13 demonstrate knowledge and understanding of the social, legal, ecological and ethical issues of the benefits and risks of gene technology.						•							•													•	•	•	•	•			
Inheritance																																		
5.6 Population genetics																																		
5.7 Kingdom plantae																																		
5.8 Kingdom Animalia																																		

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.