WJEC - GCSE Biology - 2016			Nervous System Controls & Responds to Body Functions & Directs Behavior									Nervous System Structure & Function Are Determined By Both Genes & Environment Throughout Life									Ву	The Brain is the Foundation of the Mind				Research Leads to Essential Understanding for Therapies						
		1. Br	rain is t	he body's r organ.	nost co	omplex	2. Neui	rons c		icate usin cal signals		cal and				ined circu ervous sys		4. Life	experi	iences change t system.	he nerv	ous		gence ari asons, p s probler	ises as plans,	6. The brain makes it possible to communicate knowledge through language.	7. Hur us curios	nan brain with a na sity to und the world	derstand	discov healt	Fundamen veries pror Ithy living a nent of dis	mot and
Topic 2.1 Unit 1: Cells, Organ systems and Ecosystems	Learning Objective	а	b	c d	е	f	а	b	с	d e	f	g	а	b	c	d e	f	al	0	c d e	f	g	a b	c	d	a b	а	b	С	а	b c	Ι
L.1 Cells and movement across nembranes	 (a) the structure of animal and plant cells, including drawing and labelling diagrams and the function of the following parts: cell membrane, cytoplasm, nucleus, mitochondria, cell wall, chloroplast, vacuole. (b) the use of a light microscope to view animal and plant 		•						•																							
	cells.(c) the differentiation of cells in multicellular organisms to become adapted for specific functions - specialised cells.(d) the levels of organisation within organisms: tissues are groups of similar cells with a similar function and organs	•											•						•			•										
.2 Respiration and the respiratory	may comprise several tissues performing specific functions; organs are organised into organ systems, which work together to form organisms.	•	•																													
vstem in humans																																
.3 Digestion and the digestive ystem in humans																																
.4 Circulatory system in humans .5 Plants and photosynthesis																																
.6 Ecosystems, nutrient cycles and uman impact on the environment																																4
.2 Unit 2: Variation, Homeostasis																																
nd Micro-organisms .1 Classification and biodiversity																																
.2 Cell division and stem cells	(e) stem cells: the cells in mature tissues have generally lost the ability to differentiate; some cells, in both plants and animals, do not lose this ability and these are called stem cells.	•				•							•					•				•					•			•	• •	
	(f) the potential of both adult and embryonic stem cells to replace damaged tissue.	•				•							•					•				•					•			•	• •	•
3 DNA and inheritance	(k) the artificial transfer of genes from one organism to another; the potential advantages, disadvantages and issues involved with this technology.					•							•					•									•			•	• •	
Variation and evolution	(i) the potential importance for medicine of our increasing understanding of the human genome.					•							•					•									•			•	• •	
Response and regulation	(a) 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		•	•			•	•	•		•	•	•	•	•	•	•		•	•												
	<u>system.</u> (b) the brain, spinal cord and nerves forming the nervous system; the central nervous system consisting of the brain	•	•	•			•	•	•		•			•		•	•			•			•		•							
	 <u>and spinal cord.</u> (c) the properties of reflex actions: fast, automatic and some are protective, as exemplified by the withdrawal reflex, blinking and pupil size. 		•				•	•	•	•				•	•	•																
	(d) the components of a reflex arc: stimulus, receptor, coordinator and effector; be able to label a diagram of a reflex arc to show: receptor, sensory neurone, relay neurone in spinal cord, motor neurone, effector and		•				•	•	•	•				•	•	•																
	(e) the structure and function of the following parts of the eye: sclera, cornea, pupil, iris, lens, choroid, retina, blind spot and optic nerve and be able to label these on a diagram.		•				•							•																		
	 (f) the reasons why animals need to regulate the conditions inside their bodies to keep them relatively constant and protected from harmful effects – homeostasis. (g) hormones as chemical messengers, carried by the blood, 			•																												
	which control many body functions. (h) the need to keep blood glucose levels within a constant			•																												
	range, so that when the blood glucose level rises, the pancreas releases the hormone insulin, a protein, into the blood, which causes the liver to reduce the blood glucose level by converting glucose to insoluble glycogen and then storing it.			•																												
	 (I) the principles of negative feedback mechanisms to maintain optimum conditions inside the body as illustrated by the control of blood glucose levels by insulin and glucagon and by the control of body temperature. 			•																												
	(m) the fact that some conditions are affected by lifestyle choices; the effects that alcohol and drug abuse have on the chemical processes in people's bodies the incidence of diabetes (type 2) and the possible relationship with lifestyle.			•		•																										
Kidneys and homeostasis	(g) how the kidneys regulate the water content of the blood: 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; the role of anti-diuretic hormone (ADH).			•																												
' Micro-organisms and their plications																																,
	(m) how new drug treatments may have side effects and that extensive, large scale, rigorous testing is required; the associated risks, benefits and ethical issues involved in the development of new drug treatments, including the use of animals for testing drugs and whether this is superseded by new technologies.					•																								•	• •	
	(n) the process of discovery and development of potential new medicines, including preclinical and clinical testing: 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.					•																								•	•	

KEY			Description							
Nervous System Controls	1. The brain is the body's most	а	There are a hundred billion neurons in the human brain, all of which are in use.							
and Responds to Body complex organ.		b	Each neuron communicates with many other neurons to form circuits and share information.							
Functions and Directs		с	Proper nervous system function involves coordinated action of neurons in many brain regions.							
Behavior		d	The nervous system influences and is influenced by all other body systems (e.g., cardiovascular, endocrine, gastrointestinal and immune systems).							
		е	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.							
		с	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.							
		е	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		a	Neuronal circuits are formed by genetic programs during embryonic development and modified through interactions with							
and Function are	circuits are foundation of the	b	the internal and external environment. Sensory circuits (sight, touch, hearing, smell, taste) bring information to the nervous system, whereas motor circuits send							
Determined by Both	nervous system.	a	information to muscles and glands.							
Genes and Environment		с	The simplest circuit is a reflex, in which sensory stimulus directly triggers an immediate motor response.							
Throughout Life		d	Complex responses occur when the brain integrates information from many brain circuits to generate a response.							
, C		е	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.	а	Differences in genes and environments make the brain of each animal unique.							
		b	Most neurons are generated early in development and survive for life.							
		с	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."							
		е	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	5. Intelligence arises as brain reasons, plans, and solves	a	The brain makes sense of the world by using all available information, including senses, emotions, instincts, and remembered experiences.							
Foundation of the Mind	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.							
		с	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	а	Languages are acquired early in development and facilitate information exchange and creative thought.							
	to communicate knowledge through language.	b	Communication can create and solve many of the most pressing problems humankind faces.							
Research Leads to	7. The human brain endows us	a	The nervous system can be studied at many levels, from complex behaviors such as speech or learning, to the interactions							
Essential Understanding	with a natural curiosity to		among individual molecules.							

		understand how the world	b	Research can ultimately inform us about mind, intelligence, imagination, and consciousness.									
	for inerapies	works.	c	Curiosity leads us to unexpected but surprising discoveries that can benefit humanity.									
		8. Fundamental discoveries	а	Experiments on animals play a central role in providing insights about the human brain and in helping to make healthy									
		promote healthy living and		lifestyle choices, prevent disease, and find cures for disorders.									
		treatment of disease.	b	Research on humans is an essential final step before new treatments are introduced to prevent or cure disorders.									
			С	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.									