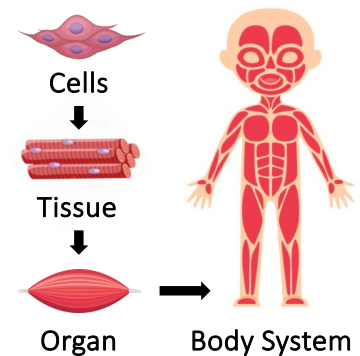


6.1 – SYSTEM INTEGRATION

- C3.1.1** System integration
- C3.1.2** Cells, tissues, organs and body systems as a hierarchy of subsystems that are integrated in a multicellular living organism
- C3.1.3** Integration of organs by hormone and nerve signals and by transport of materials and energy
- C3.1.4** The brain as a central information integration organ
- C3.1.5** The spinal cord as an integrating centre for unconscious processes
- C3.1.6** Input to the spinal cord and cerebral hemispheres through sensory neurons
- C3.1.7** Output from the cerebral hemispheres to muscles through motor neurons
- C3.1.8** Nerves as bundles of nerve fibres of both sensory and motor neurons
- C3.1.9** Pain reflex arcs as an example of involuntary responses with skeletal muscles as the effector
- C3.1.10** Role of the cerebellum in coordinating skeletal muscle contractions and balance
- C3.1.13** Control of the endocrine system by the hypothalamus and pituitary gland

BODY SYSTEMS

Describe the organisation of cellular components in multicellular organisms (cells, tissues, organs, etc.)



Define emergent properties and include a reference to a specific biological example (decision-making)

Outline the role of the different body systems in maintaining internal equilibrium (homeostasis)

Respiratory: _____	Cardiovascular: _____
Nervous: _____	Endocrine: _____
Lymphatic: _____	Excretory: _____
Skeletomuscular: _____	Reproductive: _____

COMMUNICATION

Distinguish between the nervous system and endocrine system as communication networks

NERVOUS SYSTEM	ENDOCRINE SYSTEM

Describe the role of the hypothalamus and pituitary gland in linking the nervous and endocrine systems

ENDOCRINE SYSTEM

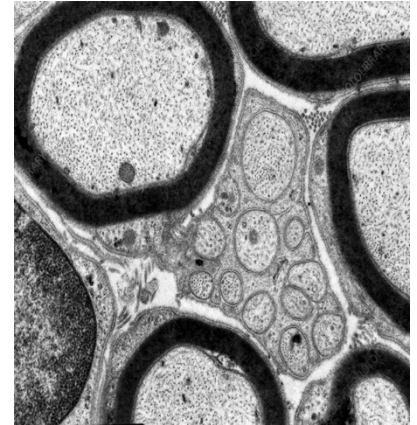
Outline the function of different types of endocrine glands

GLAND	HORMONE	FUNCTION
Pancreas		
Thyroid		
Pineal		
Adrenal		

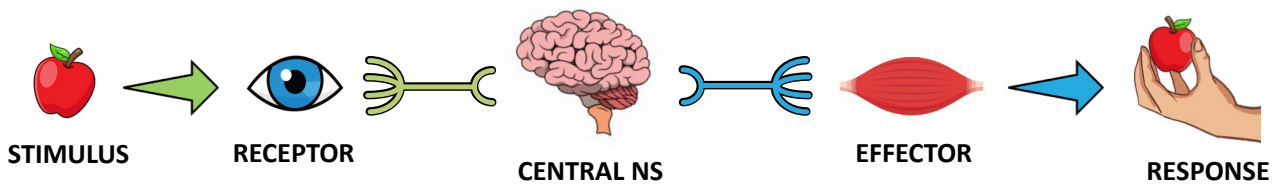
NERVOUS SYSTEM

Outline the main divisions of the nervous system (central versus peripheral)

Outline the organisation of peripheral nerve fibres into nerve bundles



Describe the transfer of information in the nervous system according to the stimulus-response model



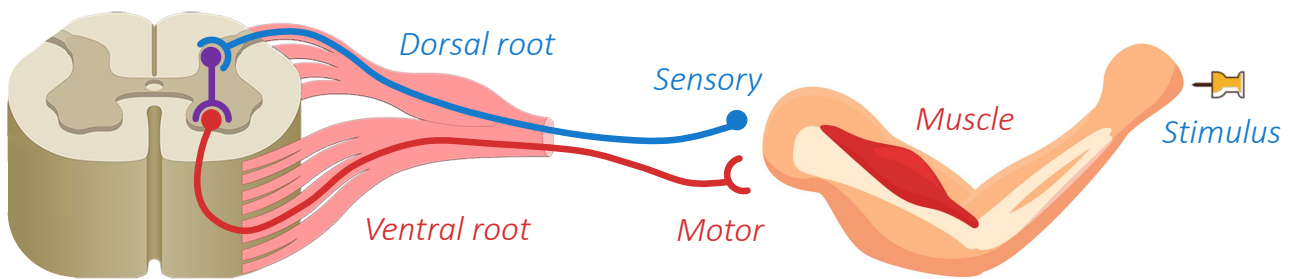
List four specific examples of sensory receptors, including their location within the body

1. _____
2. _____
3. _____
4. _____

Identify two examples of effector organs within the human body

SPINAL CORD

Describe the pain reflex arc, including the role of the spinal cord as an integrating centre



BRAIN

Outline the role of the different sections of the brain

Brainstem (medulla oblongata):

Cerebellum:

Cerebrum:

6.2 – SYSTEM REGULATION

- D3.3.1** Homeostasis as maintenance of the internal environment of an organism
- D3.3.2** Negative feedback loops in homeostasis
- D3.3.3** Regulation of blood glucose as an example of the role of hormones in homeostasis
- D3.3.4** Physiological changes that form the basis of type 1 and type 2 diabetes
- D3.3.5** Thermoregulation as an example of negative feedback control
- D3.3.6** Thermoregulation mechanisms in humans
- C3.1.11** Modulation of sleep patterns by melatonin secretion as a part of circadian rhythms
- C3.1.12** Epinephrine (adrenaline) secretion by adrenal glands to prepare a body for vigorous activity
- C3.1.14** Feedback control of heart rate after sensory input from baroreceptors and chemoreceptors
- C3.1.15** Feedback control of ventilation rate following sensory input from chemoreceptors
- C3.1.16** Control of peristalsis in the digestive system by the central and enteric nervous systems

HOMEOSTASIS

Define homeostasis

Outline the role of negative feedback in homeostatic regulation

CIRCADIAN RHYTHMS

Outline the action of the hormone melatonin in the regulation of circadian rhythms

Suggest a condition that could result if melatonin secretion is not regulated

THERMOREGULATION

Outline the regulation of body temperature by negative feedback

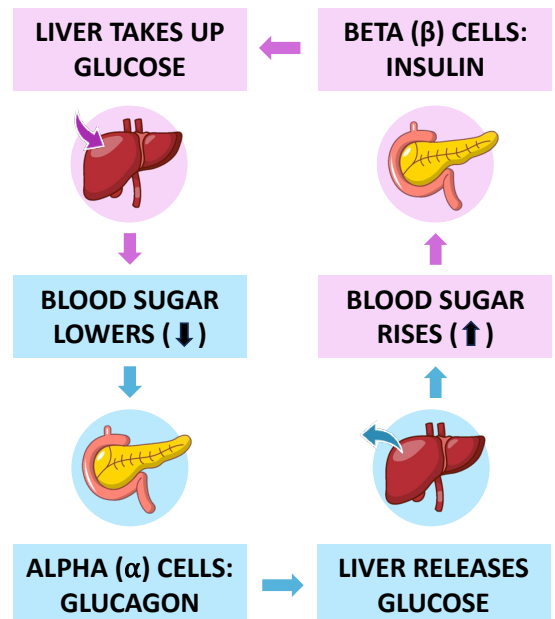
Include: Peripheral thermoreceptors, hypothalamus, pituitary gland, thyroxin

Identify the physiological mechanisms that enable thermoregulation

Heating Mechanisms	Cooling Mechanisms

BLOOD SUGAR REGULATION

Outline the regulation of blood glucose concentration



DIABETES MELLITUS

Distinguish between type I and type II diabetes

	TYPE I	TYPE II
Cause		
Effect		
Onset		
Treatment		

FEEDBACK CONTROL

Describe the feedback control of the following processes (include stimulus, receptors, role of brainstem)

Ventilation Rate:

Heart Rate:

Identify three effects of adrenaline that prepares the body for intense muscular contractions

DIGESTIVE CONTROL

Outline the role of the central nervous system and enteric nervous system in coordinating peristalsis

6.3 – SYSTEM COMMUNICATION (AHL)

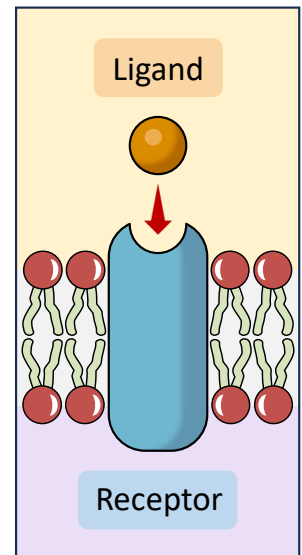
- C2.1.1** Receptors as proteins with binding sites for specific signalling chemicals
- C2.1.2** Cell signalling by bacteria in quorum sensing
- C2.1.3** Hormones, neurotransmitters, cytokines and calcium ions as examples of functional categories of signalling chemicals in animals
- C2.1.4** Chemical diversity of hormones and neurotransmitters
- C2.1.5** Localised and distant effects of signalling molecules
- C2.1.6** Differences between transmembrane receptors in a cell membrane and intracellular receptors in the cytoplasm or nucleus
- C2.1.7** Initiation of signal transduction pathways by receptors
- C2.1.8** Transmembrane receptors for neurotransmitters and changes to membrane potential
- C2.1.9** Transmembrane receptors that activate G proteins
- C2.1.10** Mechanism of action of epinephrine (adrenaline) receptors
- C2.1.11** Transmembrane receptors with tyrosine kinase activity
- C2.1.12** Intracellular receptors that affect gene expression
- C2.1.13** Effects of the hormones oestradiol and progesterone on target cells
- C2.1.14** Regulation of cell signalling pathways by positive and negative feedback

LIGANDS

Outline the relationship between a receptor and a specific ligand

Identify four types of signalling molecules and provide an example of their use

1. _____
2. _____
3. _____
4. _____



Demonstrate the chemical diversity of signalling molecules with specific examples

Hormones	Neurotransmitters

SIGNALLING PATHWAYS

Differentiate between autocrine, paracrine and endocrine signalling (with a specific example)

Autocrine: _____

Paracrine: _____

Endocrine: _____

Compare the mechanism of action for intracellular receptors and transmembrane receptors

Hydrophobic Ligand:

Hydrophilic Ligand:

INTRACELLULAR RECEPTORS

Describe the effects of oestradiol and progesterone on target cells

Oestradiol:

Progesterone:

TRANSMEMBRANE RECEPTORS

Describe the mechanism of action for different types of transmembrane receptors (with examples)

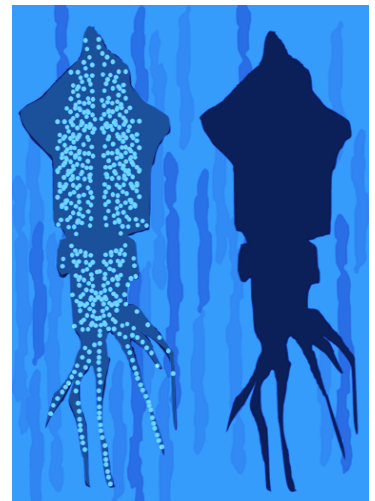
Ligand-Gated Ion Channel:

G-Protein Coupled Receptor:

Receptor Tyrosine Kinase:

QUORUM SENSING

*Describe how quorum sensing by *Vibrio fischeri* may result in bioluminescence within the bobtail squid*



6.4 – VIRUSES (AHL)

- A2.3.1 Structural features common to viruses
- A2.3.2 Diversity of structure in viruses
- A2.3.3 Lytic cycle of a virus
- A2.3.4 Lysogenic cycle of a virus
- A2.3.5 Evidence for several origins of viruses from other organisms
- A2.3.6 Rapid evolution in viruses

VIRUS STRUCTURE

Identify the structural features common to all viruses (mnemonic: PIGS)

- P: _____
- I: _____
- G: _____
- S: _____

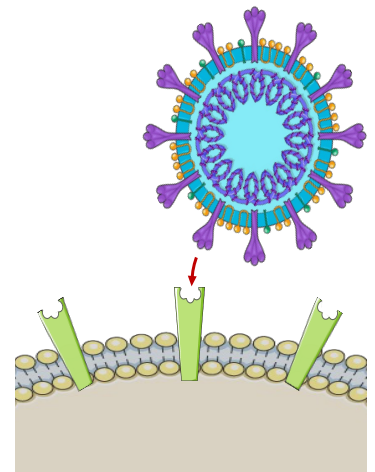


Outline the diversity of structures in viruses

- Capsid: _____
- Attachment proteins: _____
- Genetics: _____
- Envelope: _____
- Size: _____

VIRAL REPLICATION

Differentiate between the lytic cycle and the lysogenic cycle



VIRAL ORIGINS

Suggest one piece of evidence that would support each of the theories regarding viral origins

<i>Virus-first theory</i>	
<i>Escape theory</i>	
<i>Regressive theory</i>	

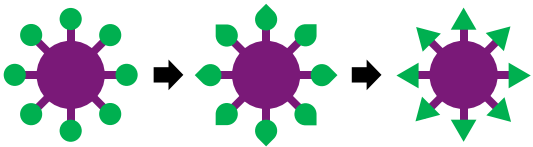
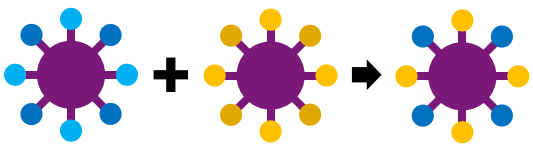
Explain why different viruses would share common structural features if they had evolved independently

VIRAL EVOLUTION

State three factors that enable viruses to evolve very rapidly

1. _____
2. _____
3. _____

Contrast antigenic drift and antigenic shift as mechanisms for viral evolution

ANTIGENIC DRIFT	ANTIGENIC SHIFT
	

6.5 – CANCER (AHL)

D2.1.12 Cell proliferation for growth, cell replacement and tissue repair

D2.1.13 Phases of the cell cycle

D2.1.14 Cell growth during interphase

D2.1.15 Control of the cell cycle using cyclins

D2.1.16 Consequences of mutations in genes that control the cell cycle

D2.1.17 Differences between tumours in rates of cell division and growth and in the capacity for metastasis and invasion of neighbouring tissue

CELL PROLIFERATION

Provide a specific example of the use of cell proliferation for growth and repair

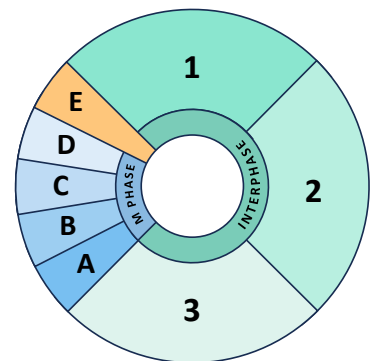
Growth:

Repair:

CELL CYCLE

Identify the stages of the cell cycle

- | | |
|----------|----------|
| 1. _____ | 2. _____ |
| 3. _____ | A. _____ |
| B. _____ | C. _____ |
| D. _____ | E. _____ |



Outline the key events that occur during interphase of the cell cycle

CELL CYCLE PROGRESSION

Describe the role of cyclins during the cell cycle

Outline the role of proto-oncogenes and tumour suppressor genes in the control of the cell cycle

PROTO-ONCOGENES	TUMOUR SUPPRESSOR GENES

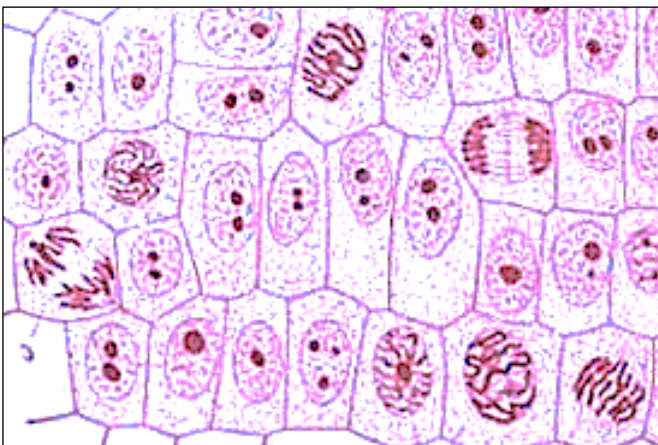
CANCER

Define cancer

Differentiate between benign and malignant tumours

MITOTIC INDEX

Calculate the mitotic index based on the image shown below



Mitotic Index Formula:

Cells in interphase vs mitosis:

Mitotic Index:
