Paper 1:

B1 Cell Level Systems

B1.1 Cell Structures

B1.1a Describe how light microscopes and staining can be used to view cells

1. What type of microscope is commonly used to view cells in school laboratories?
2. What are the main parts of a light microscope used to observe cells?
3. Why are stains used when viewing cells with a light microscope?
4. Why are thin sections of specimens used when preparing slides for microscopy?
5. How is magnification calculated when using a light microscope?
6. How can a light microscope be used to compare different types of cells?

B1.1b Explain how the main sub-cellular structures of eukaryotic cells (plants and animals) and prokaryotic cells are related to their functions

1. What are the main sub-cellular structures found in eukaryotic and prokaryotic cells?
2. What is the function of the nucleus, genetic material and chromosomes?
3. What are the functions of mitochondria, chloroplasts and ribosomes?
4. What is the function of the cell membrane and why is it selectively permeable?
5. What are plasmids and where are they found?
6. How do the sub-cellular structures of plant, animal and prokaryotic cells differ?

B1.1c Explain how electron microscopy has increased our understanding of sub-cellular structures

1. What is an electron microscope?
2. How does an electron microscope differ from a light microscope?
3. What is meant by the resolution of a microscope?
4. Why does a transmission electron microscope have a higher resolution than a light microscope?

5. How has electron microscopy increased our understanding of sub-cellular structures?
6. Which cell structures can be seen using an electron microscope but not clearly with a light microscope?

B1.2 What happens in cells (and what do cells need)?

B1.2a Describe DNA as a polymer

1. What is DNA?
2. What is meant by the term polymer?
3. Why is DNA described as a polymer?
4. What smaller repeating units make up a DNA polymer?
5. How does the polymer structure of DNA allow it to store genetic information?
6. Why is DNA important in living organisms?

B1.2b Describe DNA as being made up of two strands forming a double helix

1. What is the overall shape of a DNA molecule?
2. How many strands make up a DNA molecule?
3. What is meant by the term double helix?
4. How are the two strands of DNA arranged?
5. Why is DNA described as a double-stranded molecule?
6. How does the double helix structure help distinguish DNA from other biological molecules?

B1.2c Describe that DNA is made from four different nucleotides; each nucleotide consisting of a common sugar and phosphate group with one of four different bases attached to the sugar

1. What is a nucleotide?
2. What are the three parts of a DNA nucleotide?
3. What are the four bases found in DNA?
4. Which bases pair together in a DNA molecule?
5. Why are A-T and G-C known as complementary base pairs?
6. How do complementary base pairs help maintain the structure of DNA?

B1.2d Recall a simple description of protein synthesis

1. What is protein synthesis?
2. What happens to the DNA molecule at the start of protein synthesis?

3. What is the role of mRNA during transcription?
4. Where do transcription and translation occur in a cell?
5. What is the role of tRNA during translation?
6. How is the sequence of amino acids determined during protein synthesis?

B1.2e Explain simply how the structure of DNA affects the proteins made in protein synthesis

1. What is meant by the genetic code?
2. What is a DNA triplet code?
3. How does the sequence of DNA bases determine the sequence of amino acids in a protein?
4. Why does changing the DNA base sequence change the protein produced?
5. How does the structure of DNA influence the structure of proteins?
6. Why is the order of amino acids important in a protein?

B1.2f Describe experiments that can be used to investigate enzymatic reactions

1. What is the purpose of investigating enzyme activity?
2. How can the rate of an enzyme-controlled reaction be measured?
3. Which variables can be changed when investigating enzyme activity?
4. Which variables should be controlled in an enzyme investigation?
5. Why should enzyme investigations be repeated?
6. How can the results of an enzyme investigation be presented and analysed?

B1.2g Explain the mechanism of enzyme action

1. What is an enzyme?
2. What is meant by the active site of an enzyme?
3. How does the lock-and-key hypothesis explain enzyme specificity?
4. What role do enzymes play in metabolism?
5. How does temperature, pH, substrate concentration and enzyme concentration affect the rate of an enzyme-controlled reaction?
6. Why does the rate of an enzyme-controlled reaction eventually stop increasing under some conditions?

B1.3 Respiration

B1.3a Describe cellular respiration as a universal chemical process, continuously occurring that supplies ATP in all living cells

1. What is cellular respiration?
2. Why is cellular respiration described as a universal process?
3. Why does cellular respiration occur continuously in living cells?
4. What is ATP?
5. How does cellular respiration supply ATP to cells?
6. Why is ATP essential for living organisms?

B1.3b Describe cellular respiration as an exothermic reaction

1. What is meant by an exothermic reaction?
2. Why is cellular respiration described as an exothermic reaction?
3. What happens to energy during cellular respiration?
4. How is the energy released during respiration used by cells?
5. How does cellular respiration differ from an endothermic reaction?
6. Why is the release of energy during respiration essential for life?

B1.3c Compare the processes of aerobic respiration and anaerobic respiration

1. What is aerobic respiration?
2. What is anaerobic respiration?
3. What are the differences between aerobic and anaerobic respiration in terms of the conditions required?
4. What are the substrates and products of aerobic and anaerobic respiration in animals and in plants or fungi?
5. How do the ATP yields of aerobic and anaerobic respiration compare?
6. Why is aerobic respiration generally more efficient than anaerobic respiration?

B1.3d Explain the importance of sugars in the synthesis and breakdown of carbohydrates

1. What are carbohydrates?
2. What is meant by the terms monomer and polymer?
3. How are sugars used to synthesise carbohydrates?
4. How are carbohydrates broken down into sugars?
5. Why are sugars important in living organisms?
6. How are monomers and polymers involved in the synthesis and breakdown of carbohydrates?

B1.3e Explain the importance of amino acids in the synthesis and breakdown of proteins

1. What are amino acids?
2. How are amino acids used to synthesise proteins?
3. How are proteins broken down into amino acids?
4. Why are proteins important in living organisms?
5. How are monomers and polymers involved in the synthesis and breakdown of proteins?
6. Why are amino acids essential for growth and repair?

B1.3f Explain the importance of fatty acids and glycerol in the synthesis and breakdown of lipids

1. What are lipids?
2. What are the building blocks of lipids?
3. How are fatty acids and glycerol used to synthesise lipids?
4. How are lipids broken down into fatty acids and glycerol?
5. Why are lipids important in living organisms?
6. Why are fatty acids and glycerol essential for the synthesis and breakdown of lipids?

B1.4 Cell Division

B1.4a Describe the importance of mitosis in growth, repair and asexual reproduction

1. What is mitosis?
2. Why is mitosis important for the growth of multicellular organisms?
3. How does mitosis repair damaged or worn-out tissues?
4. How does mitosis produce genetically identical cells?
5. Why is mitosis important in asexual reproduction?
6. Why is it important that chromosome number is maintained during mitosis?

B1.4b Describe the main stages of the cell cycle, including DNA replication and mitosis

1. What are the main stages of the cell cycle?
2. What happens during DNA replication?
3. What happens during mitosis?
4. What happens during cytokinesis?
5. Why must DNA be replicated before mitosis occurs?

6. What is the outcome of one complete cell cycle?

B1.4c Describe stem cells as unspecialised cells that can divide and differentiate into specialised cells

1. What is a stem cell?
2. What is meant by the term differentiation?
3. Why are stem cells described as unspecialised cells?
4. How can stem cells become specialised cells?
5. Where are stem cells found in animals and plants?
6. Why are stem cells important for growth and repair?

B1.4d Explain the potential benefits, risks and ethical issues associated with the use of stem cells in medicine

1. How can stem cells be used to treat disease or injury?
2. What are the potential benefits of using stem cells in medicine?
3. What are the potential risks of stem cell treatments?
4. Why can stem cells from embryos cause ethical concerns?
5. How do adult stem cells differ from embryonic stem cells in medical use?
6. Why is the use of stem cells considered both a scientific and an ethical issue?

B1.4 Photosynthesis

B1.4a Describe photosynthetic organisms as the main producers of food and therefore biomass for life on Earth

1. What are photosynthetic organisms?
2. Why are photosynthetic organisms described as producers?
3. How do photosynthetic organisms make food?
4. What is biomass?
5. Why are photosynthetic organisms the main source of biomass on Earth?
6. Why is photosynthesis essential for almost all life on Earth?

B1.4b Describe the process of photosynthesis

1. What is photosynthesis?
2. What are the reactants needed for photosynthesis?
3. What are the products of photosynthesis?
4. Why is photosynthesis described as a two-stage process?
5. Where in a plant cell does photosynthesis take place?
6. What is the word equation for photosynthesis?

B1.4c Describe photosynthesis as an endothermic reaction

1. What is an endothermic reaction?
2. Why is photosynthesis described as an endothermic reaction?
3. What is the source of energy for photosynthesis?
4. What happens to light energy during photosynthesis?
5. How does photosynthesis differ from respiration in terms of energy transfer?
6. Why is the absorption of energy essential for photosynthesis?

B1.4d Describe experiments to investigate photosynthesis

1. What is the purpose of investigating photosynthesis experimentally?
2. How can a plant be tested for starch after photosynthesis?
3. Why is a leaf boiled in water before testing it for starch?
4. Why is a leaf heated in ethanol before adding iodine solution?
5. What colour does iodine solution turn if starch is present?
6. How do starch test experiments show that photosynthesis has occurred?

B1.4e Explain the effect of temperature, light intensity and carbon dioxide concentration on the rate of photosynthesis

1. How does temperature affect the rate of photosynthesis?
2. How does light intensity affect the rate of photosynthesis?
3. How does carbon dioxide concentration affect the rate of photosynthesis?
4. Why does the rate of photosynthesis eventually stop increasing as light intensity increases?
5. Why does the rate of photosynthesis eventually stop increasing as carbon dioxide concentration increases?
6. Why does photosynthesis have an optimum temperature?

B1.4f Explain the interaction of temperature, light intensity and carbon dioxide concentration in limiting the rate of photosynthesis

1. What is meant by a limiting factor?
2. How can light intensity act as a limiting factor in photosynthesis?
3. How can carbon dioxide concentration act as a limiting factor in photosynthesis?
4. How can temperature act as a limiting factor in photosynthesis?
5. How can graphs be used to identify the limiting factor in photosynthesis?
6. Why can changing one limiting factor have no effect if another factor is limiting the rate of photosynthesis?

B2 Scaling Up

B2.1 Supplying the Cell

B2.1a Explain how substances are transported into and out of cells through diffusion, osmosis and active transport

1. What is diffusion?
2. What is osmosis?
3. What is active transport?
4. In which direction do substances move during diffusion, osmosis and active transport in relation to the concentration gradient?
5. Which substances are transported into and out of cells by diffusion, osmosis and active transport?
6. What is meant by water potential, and how does it affect the movement of water by osmosis?

B2.1b Describe the process of mitosis in growth, including the cell cycle

1. What is mitosis?
2. What happens during the cell growth stage of the cell cycle?
3. What happens during DNA replication in the cell cycle?
4. Why does further cell growth occur before mitosis?
5. What happens to chromosomes during mitosis?
6. Why is mitosis important for the growth of multicellular organisms?

B2.1c Explain the importance of cell differentiation

1. What is cell differentiation?
2. Why is cell differentiation important in multicellular organisms?
3. How does cell differentiation allow organisms to become more efficient?
4. What is a specialised cell?
5. What are examples of specialised cells in animals and plants?
6. Why are specialised cells needed in multicellular organisms?

B2.1d Recall that stem cells are present in embryonic and adult animals, and meristems in plants

1. What are stem cells?
2. Where are stem cells found in embryonic animals?

3. Where are stem cells found in adult animals?
4. What are meristems?
5. Where are meristems found in plants?
6. How do stem cells in animals differ from meristems in plants?

B2.1e Describe the functions of stem cells in embryonic and adult animals, and meristems in plants

1. What is the function of embryonic stem cells?
2. What is the function of adult stem cells?
3. What is the function of meristems in plants?
4. How do stem cells produce different cell types?
5. Why are stem cells important for development, growth and repair?
6. Why are meristems important for plant growth?

B2.1f Describe the difference between embryonic and adult stem cells in animals

1. What are embryonic stem cells?
2. What are adult stem cells?
3. How does the range of cell types produced by embryonic stem cells differ from that of adult stem cells?
4. Why are embryonic stem cells considered less specialised than adult stem cells?
5. Why are adult stem cells usually limited to producing certain cell types?
6. How do the abilities of embryonic stem cells and adult stem cells differ?

B2.2 The Challenges of Size

B2.2a Explain the need for exchange surfaces and a transport system in multicellular organisms in terms of surface area : volume ratio

1. The amount of surface area compared with the volume of an organism.
2. Surface area : volume ratio decreases as size increases.
3. Because diffusion alone is too slow to meet the needs of all cells.
4. To transport substances efficiently to and from cells throughout the organism.
5. Diffusion distances become larger as organisms increase in size.
6. A smaller surface area : volume ratio and larger diffusion distances mean specialised exchange surfaces and transport systems are required.

B2.2b Describe some of the substances transported into and out of a range of organisms in terms of the requirements of those organisms

1. For aerobic respiration.
2. As a waste product of respiration.
3. For metabolic reactions and to maintain water balance.
4. To provide energy and raw materials for growth and respiration.
5. For healthy growth and the synthesis of important molecules.
6. Urea is removed because it is a waste product produced from the breakdown of excess amino acids.

B2.2c Describe the human circulatory system

1. To transport substances such as oxygen, nutrients, carbon dioxide and urea around the body.
2. Blood transports oxygen from the lungs and carbon dioxide back to the lungs.
3. To keep oxygenated and deoxygenated blood separate and maintain high blood pressure to the body.
4. The pulmonary circulation and the systemic circulation.
5. The heart pumps blood through arteries, capillaries and veins.
6. Its arrangement allows rapid transport of substances to and from all body cells.

B2.2d Explain how the structure of the heart and the blood vessels are adapted to their functions

1. Cardiac muscle contains many mitochondria and contracts continuously without tiring.
2. Valves prevent backflow of blood; atria receive blood; ventricles pump blood; the vena cava and pulmonary vein enter the heart; the aorta and pulmonary artery leave the heart.
3. Thick muscular walls and elastic tissue withstand high pressure.
4. Thin walls, a large lumen and valves help return blood at low pressure.
5. Thin walls, a narrow lumen and a large surface area allow efficient diffusion.
6. Their specialised structures enable efficient circulation of blood throughout the body.

B2.2e Explain how red blood cells and plasma are adapted to their transport functions in the blood

1. They contain haemoglobin, have a biconcave shape and lack a nucleus, increasing space for haemoglobin.
2. Haemoglobin binds reversibly with oxygen to transport it.
3. Carbon dioxide, urea, glucose, amino acids, hormones and dissolved ions.
4. It transports dissolved substances throughout the body.
5. Red blood cells transport oxygen, whereas plasma transports dissolved substances.
6. Red blood cells carry oxygen while plasma transports many other substances around the body.

B2.2f Explain how water and mineral ions are taken up by plants, relating the structure of the root hair cells to their function

1. Water enters by osmosis and mineral ions are absorbed mainly by active transport.
2. They have a large surface area and thin cell walls for efficient osmosis.
3. They contain many mitochondria to supply energy for active transport.
4. To increase the rate of absorption.
5. Because mineral ions are often absorbed against the concentration gradient.
6. Their adaptations maximise the uptake of water and mineral ions from the soil.

B2.2g Describe the processes of transpiration and translocation

1. The loss of water vapour from leaves through the stomata.
2. The movement of dissolved sugars and other organic substances through the phloem.
3. They allow gas exchange and regulate water loss.
4. Dissolved sugars, mainly sucrose, and other organic substances.
5. Transpiration moves water in the xylem; translocation moves sugars in the phloem.
6. They transport water, minerals and food to where they are needed in the plant.

B2.2h Explain how the structure of the xylem and phloem are adapted to their functions in the plant

1. To transport water and mineral ions from the roots to the rest of the plant.
2. To transport dissolved sugars and other organic substances.
3. Xylem vessels are dead, hollow, strengthened with lignin and have no end walls.
4. Phloem consists of living cells with sieve plates and companion cells.
5. Xylem transports water and minerals; phloem transports dissolved sugars and other organic substances.

6. Their specialised structures allow efficient transport of different substances throughout the plant.

B2.2i Explain the effect of a variety of environmental factors on the rate of water uptake by a plant

1. Increasing light intensity increases water uptake.
2. Greater air movement increases water uptake.
3. Increasing temperature increases water uptake up to a point.
4. Light opens stomata, increasing transpiration.
5. Moving air removes water vapour around the leaf, maintaining a diffusion gradient.
6. Environmental factors affect transpiration, which changes the rate of water uptake.

B2.2j Describe how a simple potometer can be used to investigate factors that affect the rate of water uptake

1. A piece of apparatus used to estimate the rate of water uptake by a plant.
2. By measuring the movement of an air bubble in a capillary tube over time.
3. Change the light intensity while keeping other variables constant and measure bubble movement.
4. Change temperature or air movement while keeping other variables constant and measure bubble movement.
5. Rate = distance moved (or volume of water taken up) ÷ time.
6. It measures water uptake, which is used as an estimate of transpiration because not all water taken up is lost by transpiration.

B2.2 The Challenges of Size

B2.2a Explain the need for exchange surfaces and a transport system in multicellular organisms in terms of surface area : volume ratio

1. What is meant by the surface area : volume ratio of an organism?
2. How does increasing size affect an organism's surface area : volume ratio?
3. Why do multicellular organisms require specialised exchange surfaces?
4. Why do multicellular organisms require transport systems?
5. How do diffusion distances change as organisms become larger?

6. How does surface area : volume ratio explain the need for exchange surfaces and transport systems in multicellular organisms?

B2.2b Describe some of the substances transported into and out of a range of organisms in terms of the requirements of those organisms

1. Why is oxygen transported into organisms?
2. Why is carbon dioxide transported out of organisms?
3. Why is water transported into and out of organisms?
4. Why are dissolved food molecules transported around organisms?
5. Why are mineral ions transported into organisms?
6. Why is urea transported out of the body?

B2.2c Describe the human circulatory system

1. What is the function of the human circulatory system?
2. How is the human circulatory system linked to the gaseous exchange system?
3. Why do mammals have a double circulatory system?
4. What are the two circuits of the human circulatory system?
5. How are blood vessels arranged in the human circulatory system?
6. How does the arrangement of the circulatory system help to transport substances around the body?

B2.2d Explain how the structure of the heart and the blood vessels are adapted to their functions

1. How is cardiac muscle adapted to enable the heart to pump blood continuously?
2. What are the names and functions of the valves, chambers and blood vessels entering and leaving the heart?
3. How is the structure of an artery adapted to its function?
4. How is the structure of a vein adapted to its function?
5. How is the structure of a capillary adapted to its function?
6. How do the structures of the heart and blood vessels enable the circulatory system to function effectively?

B2.2e Explain how red blood cells and plasma are adapted to their transport functions in the blood

1. How are red blood cells adapted to transport oxygen?
2. Why do red blood cells contain haemoglobin?
3. What substances are transported by plasma?

4. Why is plasma important for transporting dissolved substances around the body?
5. How do the adaptations of red blood cells differ from those of plasma?
6. How do red blood cells and plasma work together to transport substances in the blood?

B2.2f Explain how water and mineral ions are taken up by plants, relating the structure of the root hair cells to their function

1. How are water and mineral ions taken up by plants?
2. How are root hair cells adapted to absorb water efficiently?
3. How are root hair cells adapted to absorb mineral ions efficiently?
4. Why do root hair cells have a large surface area?
5. Why is active transport needed for the uptake of some mineral ions?
6. How does the structure of a root hair cell relate to its function in water and mineral ion uptake?

B2.2g Describe the processes of transpiration and translocation

1. What is transpiration?
2. What is translocation?
3. What is the function of the stomata in transpiration?
4. What substances are transported by translocation?
5. How do transpiration and translocation differ?
6. How do transpiration and translocation help plants survive?

B2.2h Explain how the structure of the xylem and phloem are adapted to their functions in the plant

1. What is the function of xylem tissue?
2. What is the function of phloem tissue?
3. How is xylem adapted to transport water and mineral ions?
4. How is phloem adapted to transport dissolved sugars and other organic substances?
5. How do the structures of xylem and phloem differ?
6. How do the adaptations of xylem and phloem enable them to carry out their functions?

B2.2i Explain the effect of a variety of environmental factors on the rate of water uptake by a plant

1. How does light intensity affect the rate of water uptake by a plant?

2. How does air movement affect the rate of water uptake by a plant?
3. How does temperature affect the rate of water uptake by a plant?
4. Why does increasing light intensity increase water uptake?
5. Why does increasing air movement affect the rate of water uptake?
6. Why do changes in environmental factors affect the rate of water uptake by a plant?

B2.2j Describe how a simple potometer can be used to investigate factors that affect the rate of water uptake

1. What is a potometer?
2. How does a simple potometer measure the rate of water uptake?
3. How can a potometer be used to investigate the effect of light intensity on water uptake?
4. How can a potometer be used to investigate the effect of temperature or air movement on water uptake?
5. How is the rate of water uptake calculated using measurements from a potometer?
6. Why is a potometer used to estimate the rate of transpiration rather than measure transpiration directly?

B3 Organism Level Systems

B3.1 Coordination and Control – The Nervous System

B3.1a Describe the structure of the nervous system

1. What is the Central Nervous System (CNS)?
2. What are the functions of sensory neurones, relay neurones and motor neurones?
3. What are sensory receptors and what is their function?
4. What is a synapse and what is its role in the nervous system?
5. What are effectors and how do they respond to nerve impulses?
6. How are the Central Nervous System, neurones, receptors, synapses and effectors organised to form the nervous system?

B3.1b Explain how the components of the nervous system can produce a coordinated response

1. Why does the nervous system connect to all parts of the body?
2. How do sensory receptors detect changes in the internal or external environment?

3. How are nerve impulses transmitted through the nervous system to produce a response?
4. What is the role of the Central Nervous System in coordinating responses?
5. Why are different sensory receptors needed in the nervous system?
6. How do the components of the nervous system work together to produce a coordinated response?

B3.1c Explain how the structure of a reflex arc is related to its function

1. What is a reflex action?
2. What are the stages of a reflex arc?
3. What is the role of a sensory neurone in a reflex arc?
4. What is the role of a relay neurone in a reflex arc?
5. What is the role of a motor neurone and an effector in a reflex arc?
6. How does the structure of a reflex arc enable a rapid automatic response?

You're right—I was looking at an incomplete page before. B3.1 continues to B3.1h.

B3.1d Explain how the main structures of the eye are related to their functions

1. What is the function of the cornea in the human eye?
2. How does the iris control the amount of light entering the eye?
3. What is the function of the pupil?
4. How do the lens, ciliary body and suspensory ligaments work together to focus light onto the retina?
5. What are the functions of the retina and the optic nerve?
6. How are the main structures of the eye adapted to enable vision?

B3.1e Describe common defects of the eye and explain how some of these problems may be overcome

1. What is colour blindness?
2. What causes short-sightedness (myopia)?
3. What causes long-sightedness (hyperopia)?
4. How can short-sightedness be corrected?
5. How can long-sightedness be corrected?
6. How do corrective lenses overcome defects of the eye?

B3.1f Describe the structure and function of the brain

1. What is the function of the cerebrum?
2. What is the function of the cerebellum?

3. What is the function of the medulla?
4. What are the roles of the hypothalamus and the pituitary gland?
5. How do different regions of the brain work together to control the body?
6. How is the structure of the brain related to its functions?

B3.1g Explain some of the difficulties of investigating brain function

1. Why is it difficult to investigate the function of different parts of the brain?
2. Why can case studies be useful when investigating brain function?
3. What are the limitations of using case studies to investigate brain function?
4. What ethical issues must be considered when researching the human brain?
5. Why can ethical considerations limit brain research?
6. How do practical and ethical difficulties affect investigations into brain function?

B3.1h Explain some of the limitations in treating damage and disease in the brain and other parts of the nervous system

1. Why is damage to nervous tissue often difficult to repair?
2. Why can damage to surrounding nervous tissue limit treatment?
3. Why is it difficult for surgeons to access some parts of the nervous system?
4. Why can diseases of the brain and nervous system be difficult to treat?
5. What are the main limitations of current treatments for damage to the brain and nervous system?
6. How do the properties of nervous tissue make treatment of brain and nervous system disorders challenging?

B3.2 Coordination and Control – The Endocrine System

B3.2a Describe the principles of hormonal coordination and control by the human endocrine system

1. What is hormonal coordination?
2. What is the endocrine system?
3. What is the function of hormones in the human body?
4. How are hormones transported around the body?
5. What are endocrine glands and what do they do?
6. How do hormones act on target organs and cells with specific receptors?

B3.2b Explain the roles of thyroxine and adrenaline in the body

1. What is the function of thyroxine in the body?
2. How is thyroxine an example of a negative feedback system?
3. What is the function of adrenaline in the body?
4. How does adrenaline prepare the body for a fight-or-flight response?
5. Why is negative feedback important in controlling thyroxine levels?
6. How do the roles of thyroxine and adrenaline differ?

B3.2c Describe the role of hormones in human reproduction including the control of the menstrual cycle

1. What is the role of oestrogen in the menstrual cycle?
2. What is the role of progesterone in the menstrual cycle?
3. What is the role of FSH in human reproduction?
4. What is the role of testosterone in human reproduction?
5. How do hormones control the menstrual cycle?
6. Why are hormones essential for human reproduction?

B3.2d Explain the interactions of FSH, LH, oestrogen and progesterone in the control of the menstrual cycle

1. How does FSH influence the menstrual cycle?
2. What is the role of LH in the menstrual cycle?
3. How does oestrogen affect the release of FSH and LH?
4. What is the role of progesterone after ovulation?
5. How do FSH, LH, oestrogen and progesterone interact to control the menstrual cycle?
6. Why are changes in hormone levels necessary throughout the menstrual cycle?

B3.2e Explain the use of hormones in contraception and evaluate hormonal and non-hormonal methods of contraception

1. How are hormones used in contraception?
2. How do hormonal methods of contraception prevent pregnancy?
3. What are examples of non-hormonal methods of contraception?
4. What are the advantages and disadvantages of hormonal contraception?
5. What are the advantages and disadvantages of non-hormonal contraception?
6. How does the effectiveness of hormonal contraception compare with non-hormonal contraception?

B3.2f Explain the use of hormones in modern reproductive technologies to treat infertility

1. How are hormones used to treat infertility?
2. What is the role of fertility drugs in reproductive technology?
3. How can hormones stimulate ovulation?
4. Why may hormonal treatment be used before assisted reproduction?
5. How do modern reproductive technologies help people with infertility?
6. What are the advantages and limitations of using hormones to treat infertility?

B3.2g Explain how plant hormones are important in the control and coordination of plant growth and development, with reference to the role of auxins in phototropisms and gravitropisms

1. What is the function of auxins in plants?
2. How do auxins cause phototropism?
3. How do auxins cause gravitropism?
4. Why does an unequal distribution of auxin cause plant shoots to bend?
5. How do auxins coordinate plant growth and development?
6. How are auxins involved in both phototropism and gravitropism?

B3.2h Describe some of the variety of effects of plant hormones, relating to auxins, gibberellins and ethene

1. How do auxins affect plant growth?
2. What is the role of gibberellins in seed germination?
3. How do gibberellins affect plant growth?
4. What is the role of ethene in fruit ripening?
5. How does ethene affect flower opening and the shedding of leaves?
6. How do the effects of auxins, gibberellins and ethene differ?

B3.2i Describe some of the different ways in which people use plant hormones to control plant growth

1. How are selective herbicides used to control plant growth?
2. How are plant hormones used to produce root cuttings?
3. How are plant hormones used to produce seedless (parthenocarpic) fruit?
4. How can plant hormones be used to alter seed dormancy?
5. Why are plant hormones useful in agriculture and horticulture?
6. How are different plant hormones used to control plant growth?

B3.3 Maintaining Internal Environments

B3.3a Explain the importance of maintaining a constant internal environment in response to internal and external change

1. What is meant by maintaining a constant internal environment?
2. Why is homeostasis important for living organisms?
3. Why must metabolic reactions occur at appropriate rates?
4. How can internal changes affect the body's internal environment?
5. How can external changes affect the body's internal environment?
6. Why is maintaining a constant internal environment essential for survival?

B3.3b Describe the function of the skin in the control of body temperature

1. How does the skin detect changes in external temperature?
2. How does sweating help to control body temperature?
3. How does shivering help to maintain body temperature?
4. What is vasodilation and how does it help cool the body?
5. What is vasoconstriction and how does it help conserve body heat?
6. How does the skin help maintain a constant body temperature?

B3.3c Explain how insulin controls blood sugar levels in the body

1. What is the function of insulin?
2. When is insulin released into the bloodstream?
3. How does insulin lower blood glucose concentration?
4. What effect does insulin have on liver and muscle cells?
5. Why is insulin important for homeostasis?
6. How does insulin help maintain a constant blood sugar level?

B3.3d Explain how glucagon interacts with insulin to control blood sugar levels in the body

1. What is the function of glucagon?
2. When is glucagon released?
3. How does glucagon increase blood glucose concentration?
4. How do insulin and glucagon work together?
5. Why are both insulin and glucagon needed to regulate blood sugar?
6. How do insulin and glucagon maintain blood glucose by negative feedback?

B3.3e Compare type 1 and type 2 diabetes and explain how they can be treated

1. What is type 1 diabetes?
2. What is type 2 diabetes?
3. How is type 1 diabetes treated?
4. How can type 2 diabetes be managed or treated?
5. What are the main differences between type 1 and type 2 diabetes?
6. Why do the treatments for type 1 and type 2 diabetes differ?

B3.3f Explain the effect on cells of osmotic changes in body fluids

1. What happens to cells when body fluids have a higher water potential than the cells?
2. What happens to cells when body fluids have a lower water potential than the cells?
3. What happens to cells when body fluids have the same water potential as the cells?
4. What is meant by lysis?
5. Why can cells shrink when water leaves by osmosis?
6. How do osmotic changes in body fluids affect animal cells?

B3.3g Describe the function of the kidneys in maintaining the water balance of the body

1. What is the function of the kidneys in maintaining water balance?
2. How do the kidneys vary the amount of water excreted?
3. How do the kidneys change the concentration of urine?
4. Why is regulating water balance important?
5. How do the kidneys respond when the body is dehydrated?
6. How do the kidneys help maintain homeostasis?

B3.3h Describe the gross structure of the kidney and the structure of the kidney tubule

1. What are the main structures of the kidney?
2. What is the function of the cortex and medulla?
3. What is the role of the kidney tubule?
4. How is the kidney tubule adapted for reabsorption?
5. What is filtered from the blood into the kidney tubule?
6. How do the structures of the kidney enable it to maintain water balance?

B3.3i Describe the effect of ADH on the permeability of the kidney tubules

1. What is ADH?
2. How does ADH affect the permeability of the kidney tubules?
3. How does ADH affect the amount of water reabsorbed into the blood?
4. How does ADH affect the concentration of urine?
5. How is ADH controlled by negative feedback?
6. How does ADH help maintain water balance in the body?

B3.3j Explain the response of the body to different temperature and osmotic challenges

1. How does the body respond to high rates of sweating and dehydration?
2. How does the body respond to drinking excessive amounts of water?
3. How does the body respond to a high salt intake?
4. How does the sensation of thirst help maintain water balance?
5. How do the kidneys respond to different osmotic challenges?
6. How do negative feedback mechanisms maintain water balance and body temperature during different environmental challenges?

Paper 2:

B4 Community Level Systems

B4.1 Ecosystems

B4.1a Recall that many different materials cycle through the abiotic and biotic components of an ecosystem

1. What does it mean when a material cycles through an ecosystem?
2. What are the abiotic components of an ecosystem?
3. What are the biotic components of an ecosystem?
4. How do materials move between the abiotic and biotic components of an ecosystem?
5. Which materials are named in the OCR specification as examples of materials that cycle through ecosystems?
6. Why must materials such as carbon and nitrogen be continuously recycled in ecosystems?

B4.1b Explain the role of microorganisms in the cycling of materials through an ecosystem

1. What role do microorganisms play in the cycling of materials through an ecosystem?
2. What is decomposition?
3. How do microorganisms act as decomposers?
4. Why are decomposers essential for recycling materials in ecosystems?
5. How does decomposition return materials from dead organisms and waste to the environment?
6. How does the action of microorganisms help maintain the cycling of materials through an ecosystem?

B4.1c Explain the importance of the carbon cycle and the water cycle to living organisms

1. Why is the carbon cycle important to living organisms?
2. Why is the water cycle important to living organisms?
3. How do the carbon and water cycles help to maintain habitats?
4. How do the carbon and water cycles ensure the availability of fresh water?
5. How do the carbon and water cycles contribute to the flow of nutrients?
6. Describe the main stages of both the carbon cycle and the water cycle.

B4.1d Explain the effect of factors such as temperature, water content and oxygen availability on rate of decomposition

1. How does temperature affect the rate of decomposition?
2. How does water content affect the rate of decomposition?
3. How does oxygen availability affect the rate of decomposition?
4. What is the difference between aerobic and anaerobic decomposition?
5. Why do microorganisms decompose materials more quickly under favourable conditions?
6. Explain how temperature, water content and oxygen availability together affect the rate of decomposition.

B4.1e Describe different levels of organisation in an ecosystem

1. What is an individual organism?
2. What is a population?
3. What is a community?
4. What is an ecosystem?
5. Arrange the following in order of increasing level of organisation: community, ecosystem, individual organism and population.

6. What is the difference between a population, a community and an ecosystem?

B4.1f Explain how abiotic and biotic factors can affect communities

1. What are abiotic factors in an ecosystem?
2. How can temperature, light intensity, moisture level and soil pH affect a community?
3. What are biotic factors in an ecosystem?
4. How can predators affect the size of a community?
5. How can food availability affect a community?
6. Explain how abiotic and biotic factors together determine the size and distribution of communities.

B4.1g Describe the importance of interdependence and competition in a community

1. What is meant by interdependence in a community?
2. What is predation?
3. What is mutualism?
4. What is parasitism?
5. Why is interdependence important for the survival of organisms in a community?
6. Why does competition occur between organisms living in the same community?

B4.1h Describe the differences between the trophic levels of organisms within an ecosystem

1. What is a trophic level?
2. What is a producer?
3. What is a consumer?
4. How do producers and consumers occupy different trophic levels?
5. How is energy transferred from one trophic level to the next?
6. Explain how trophic levels describe feeding relationships within an ecosystem.

B4.1i Describe pyramids of biomass and explain, with examples, how biomass is lost between the different trophic levels

1. What is a pyramid of biomass?
2. Why is there less biomass at each successive trophic level?

3. How is biomass lost by egestion?
4. How is biomass lost by excretion?
5. How is biomass lost through respiration?
6. Explain, using egestion, excretion and respiration, why pyramids of biomass become narrower at higher trophic levels.

B4.1j Calculate the efficiency of biomass transfers between trophic levels and explain how this affects the number of trophic levels in a food chain

1. What is meant by the efficiency of biomass transfer between trophic levels?
2. State the equation used to calculate the percentage efficiency of biomass transfer.
3. A producer level contains 5000 g of biomass and the primary consumers contain 500 g. Calculate the percentage efficiency of biomass transfer.
4. A food chain has 1200 g of biomass at one trophic level and 180 g at the next. Calculate the efficiency of biomass transfer.
5. Why is biomass transfer between trophic levels never 100% efficient?
6. Explain how the efficiency of biomass transfer limits the number of trophic levels in a food chain.

B5 Genes, Inheritance and Selection

B5.1 Inheritance

B5.1a Explain the following terms: gamete, chromosome, gene, allele/variant, dominant, recessive, homozygous, heterozygous, genotype and phenotype

1. What is a gamete?
2. What is the difference between a chromosome, a gene and an allele (variant)?
3. What is meant by the terms dominant and recessive?
4. What is the difference between homozygous and heterozygous?
5. What is the difference between an organism's genotype and its phenotype?
6. An organism has the genotype Bb, where B is dominant for brown eyes and b is recessive for blue eyes. What is the organism's phenotype?

B5.1b Describe the genome as the entire genetic material of an organism

1. What is a genome?

2. What does the genome contain?
3. How is the genome different from a chromosome?
4. How is the genome different from a gene?
5. Does every cell in an organism usually contain the same genome?
6. Why is the genome important for an organism?

B5.1c Describe that the genome, and its interaction with the environment, influence the development of the phenotype of an organism

1. How does the genome influence an organism's phenotype?
2. How can the environment influence an organism's phenotype?
3. What is meant by discontinuous variation?
4. What is meant by continuous variation?
5. Give one example of discontinuous variation and one example of continuous variation.
6. Explain how both genes and the environment together determine an organism's phenotype.

B5.1d Recall that all variants arise from mutations, and that most have no effect on the phenotype, some influence phenotype and a very few determine phenotype

1. What is a mutation?
2. Where do all genetic variants come from?
3. What effect do most mutations have on phenotype?
4. What effect do some mutations have on phenotype?
5. What effect do very few mutations have on phenotype?
6. Explain why different mutations can have different effects on an organism's phenotype.

B5.1e Describe how genetic variants may influence phenotype

1. How can a mutation in coding DNA alter an organism's phenotype?
2. How can changing the structure of a protein affect its function?
3. How can a mutation affecting the active site of an enzyme influence phenotype?
4. How can a mutation in non-coding DNA affect phenotype?
5. How can changes in non-coding DNA alter whether a gene is expressed?
6. Explain the difference between mutations in coding DNA and non-coding DNA.

B5.1f Explain some of the advantages and disadvantages of asexual and sexual reproduction in a range of organisms

1. State one advantage and one disadvantage of asexual reproduction.
2. State one advantage and one disadvantage of sexual reproduction.
3. How does the number of offspring produced differ between asexual and sexual reproduction?
4. Which type of reproduction usually allows organisms to reproduce more quickly?
5. Why is genetic variation an advantage in changing environments?
6. Explain why environmental pressures can make sexual reproduction advantageous despite producing fewer offspring more slowly.

B5.1g Explain the terms haploid and diploid

1. What is meant by the term haploid?
2. What is meant by the term diploid?
3. Which human cells are haploid?
4. Which human cells are diploid?
5. How do the chromosome numbers of haploid and diploid cells differ?
6. Why must gametes be haploid?

B5.1h Explain the role of meiotic cell division in halving the chromosome number to form gametes

1. What is meiosis?
2. Why does meiosis halve the chromosome number?
3. What cells are produced by meiosis?
4. Why is halving the chromosome number necessary before fertilisation?
5. How does fertilisation restore the diploid chromosome number?
6. Why is meiosis a source of genetic variation?

B5.1i Explain single gene inheritance in the context of homozygous and heterozygous crosses involving dominant and recessive genes

1. What is meant by single gene inheritance?
2. How does a homozygous dominant genotype differ from a homozygous recessive genotype?
3. How does a heterozygous genotype affect phenotype when one allele is dominant?
4. Explain why dominant alleles mask recessive alleles in heterozygous individuals.
5. A homozygous dominant (TT) plant is crossed with a homozygous recessive (tt) plant. What are the genotypes and phenotypes of the offspring?
6. Explain how homozygous and heterozygous crosses demonstrate dominant and recessive inheritance.

B5.1j Predict the results of single gene crosses

1. What is a Punnett square?
2. How is a Punnett square used to predict offspring genotypes?
3. Complete a Punnett square for the cross Bb × Bb.
4. A Bb × Bb cross produces four possible offspring. Calculate the probability of an offspring having the recessive phenotype.
5. A TT × Tt cross is carried out. Calculate the probability of producing a homozygous dominant offspring.
6. Why are Punnett squares useful for predicting inheritance but not the exact outcomes of individual families?

B5.1k Describe sex determination in humans using a genetic cross

1. Which chromosomes determine sex in humans?
2. What sex chromosomes does a female have?
3. What sex chromosomes does a male have?
4. Why can sperm determine the sex of a baby but eggs cannot?
5. Complete a Punnett square for an XX × XY cross and state the probability of a male child.
6. Explain why the chance of a baby being male or female is approximately 50%.

B5.1l Recall that most phenotypic features are the result of multiple genes rather than single gene inheritance

1. What is meant by multiple gene inheritance?
2. Why are most phenotypic characteristics controlled by more than one gene?
3. Give an example of a characteristic controlled by multiple genes.
4. How does multiple gene inheritance differ from single gene inheritance?
5. Why does multiple gene inheritance often produce continuous variation?
6. Why are relatively few characteristics controlled by a single gene?

B5.1m Describe the development of our understanding of genetics

1. Who was Gregor Mendel?
2. What investigations did Mendel carry out?
3. What did Mendel discover about inheritance?
4. Why were Mendel's ideas not accepted immediately?
5. How did later scientific discoveries support Mendel's work?
6. Explain why Mendel is considered the founder of modern genetics.

B5.2 Natural Selection and Evolution

B5.2a State that there is usually extensive genetic variation within a population of a species

1. What is genetic variation?
2. Why is there usually extensive genetic variation within a population?
3. Why is genetic variation important for the survival of a species?
4. Does every individual in a population have the same alleles? Explain your answer.
5. How does genetic variation make individuals within a population different from one another?
6. Why is genetic variation essential for evolution by natural selection?

B5.2b Describe the impact of developments in biology on classification systems

1. What is the difference between an artificial classification system and a natural classification system?
2. What is molecular phylogenetics?
3. How is DNA sequencing used to classify organisms?
4. Why have developments in biology changed classification systems?
5. Why can DNA evidence provide a more accurate classification than appearance alone?
6. Explain how molecular phylogenetics has improved scientists' understanding of relationships between organisms.

B5.2c Explain how evolution occurs through the natural selection of variants that have given rise to phenotypes best suited to their environment

1. What is meant by natural selection?
2. What role do mutations play in evolution?
3. Why are some phenotypes better suited to an environment than others?
4. How are advantageous alleles passed on through natural selection?
5. Explain how natural selection causes advantageous variants to become more common in a population over time.
6. Describe the sequence of events from mutation to natural selection and evolution.

B5.2d Describe evolution as a change in the inherited characteristics of a population over time, through a process of natural selection, which may result in the formation of new species

1. What is evolution?
2. Why does evolution occur in populations rather than individuals?
3. How does natural selection cause inherited characteristics to change over time?
4. How can evolution eventually lead to the formation of a new species?
5. Why does speciation usually occur over many generations?
6. Explain how natural selection can result in speciation.

B5.2e Describe the evidence for evolution

1. How do fossils provide evidence for evolution?
2. How does antibiotic resistance in bacteria provide evidence for evolution?
3. Why do resistant bacteria become more common after antibiotics are used?
4. What does the fossil record show about organisms over time?
5. Explain how antibiotic resistance develops through natural selection.
6. Explain why fossils and antibiotic-resistant bacteria both support the theory of evolution.

B5.2f Describe the work of Darwin and Wallace in the development of the theory of evolution by natural selection and explain the impact of these ideas on modern biology

1. Who were Charles Darwin and Alfred Russel Wallace?
2. What theory did Darwin and Wallace develop?
3. Why were Darwin's ideas not immediately accepted?
4. How has the theory of evolution by natural selection influenced modern biology?
5. What is a seed bank, and why is it important for conserving biodiversity?
6. Explain the importance of the work of Darwin and Wallace to our understanding of evolution today.

B6 Global Challenges

B6.1 Monitoring and Maintaining the Environment

B6.1a Explain how to carry out a field investigation into the distribution and abundance of organisms in a habitat and how to determine their numbers in a given area

1. What is the difference between the distribution and abundance of organisms in a habitat?

2. How are random sampling and transect sampling used to investigate the distribution of organisms?
3. What are quadrats, pooters, nets and identification keys, and how are they used during ecological fieldwork?
4. How does the capture–recapture method estimate the size of a population?
5. A 1 m² quadrat contains 12 daisies. If the field has an area of 250 m², estimate the total number of daisies using scaling up.
6. Explain how field investigations can be used to determine the numbers and distribution of organisms in a habitat.

B6.1b Describe both positive and negative human interactions within ecosystems and explain their impact on biodiversity

1. What is meant by biodiversity?
2. Give two examples of positive human interactions with ecosystems.
3. Give two examples of negative human interactions with ecosystems.
4. How can the conservation of individual species and habitats help maintain biodiversity?
5. How do land use and hunting threaten biodiversity?
6. Explain how both positive and negative human activities affect biodiversity.

B6.1c Explain some of the benefits and challenges of maintaining local and global biodiversity

1. Why is maintaining biodiversity important?
2. What are the challenges of gaining international agreements for conservation schemes?
3. Why must conservation schemes be monitored?
4. What is ecotourism?
5. How can ecotourism help conserve biodiversity?
6. Explain why maintaining biodiversity involves both benefits and challenges.

B6.1d Evaluate the evidence for the impact of environmental changes on the distribution of organisms, with reference to water and atmospheric gases

1. How can changes in water availability affect the distribution of organisms?
2. How can changes in atmospheric gases affect the distribution of organisms?
3. What evidence might scientists collect to investigate changes in the distribution of organisms?

4. Why is it important to evaluate the quality of evidence before drawing conclusions about environmental change?
5. A survey shows that a plant species has disappeared from areas that have become much drier over the last 20 years. What conclusion can be drawn, and what additional evidence would strengthen it?
6. Evaluate the evidence that changes in water availability and atmospheric gases can affect where organisms are found.

B6.2 Feeding the Human Race

B6.2a Describe some of the biological factors affecting levels of food security

1. What is meant by food security?
2. How does an increasing human population affect food security?
3. How can changing diets in wealthier populations affect global food security?
4. How do new pests and pathogens reduce food security?
5. How can environmental change affect food production?
6. Explain how sustainability and the cost of agricultural inputs can affect food security.

B6.2b Describe and explain some possible agricultural solutions to the demands of the growing human population

1. What is hydroponics, and how can it increase food production?
2. What is biological control?
3. How can gene technology increase food production?
4. How do fertilisers improve crop yields?
5. How do pesticides help increase food production?
6. Explain how hydroponics, biological control, gene technology, fertilisers and pesticides can help meet the demands of a growing human population.

B6.2c Explain the impact of the selective breeding of food plants and domesticated animals

1. What is selective breeding?
2. How is selective breeding carried out?
3. What are the benefits of selectively breeding food plants?
4. What are the benefits of selectively breeding domesticated animals?
5. What are some disadvantages or risks of selective breeding?
6. Explain the overall impact of selective breeding on agriculture.

B6.2d Describe genetic engineering as a process which involves modifying the genome of an organism to introduce desirable characteristics

1. What is genetic engineering?
2. What is meant by modifying an organism's genome?
3. What is a desirable characteristic?
4. How does genetic engineering differ from selective breeding?
5. Give one example of a desirable characteristic that can be introduced by genetic engineering.
6. Explain how genetic engineering can produce organisms with desirable characteristics.

B6.2e Describe the main steps in the process of genetic engineering

1. What is the role of a restriction enzyme in genetic engineering?
2. What are sticky ends?
3. What is the role of DNA ligase?
4. Why are plasmids used as vectors in genetic engineering?
5. Why are host bacteria and antibiotic resistance markers used during genetic engineering?
6. Describe the main steps involved in genetic engineering, including restriction enzymes, sticky ends, ligase, plasmids, host bacteria and antibiotic resistance markers.

B6.2f Explain some of the possible benefits and risks of using gene technology in modern agriculture

1. Give two possible benefits of using gene technology in agriculture.
2. Give two possible risks of using gene technology in agriculture.
3. What practical considerations should be considered before using gene technology?
4. What ethical considerations are associated with gene technology?
5. Why do scientists and governments evaluate both the benefits and risks before approving genetically modified organisms?
6. Explain why the use of gene technology in modern agriculture remains controversial.

B6.2g Describe and explain some possible biotechnological solutions to the demands of the growing human population

1. What is meant by biotechnology?
2. What is genetic modification (GM)?
3. How can genetically modified crops help increase food production?

4. How can genetically modified livestock help meet the demands of a growing population?
5. Give one example of how genetic modification has been used in agriculture.
6. Explain how biotechnology, including genetic modification, can help address the demands of a growing human population.

B6.3 Monitoring and Maintaining Health

B6.3a Describe the relationship between health and disease

1. What is meant by health?
2. What is meant by disease?
3. How can disease affect a person's physical health?
4. Can a person have poor health without having an infectious disease? Explain your answer.
5. How can having a disease reduce overall health?
6. Explain the relationship between health and disease.

B6.3b Describe different types of diseases

1. What is a communicable disease?
2. What is a non-communicable disease?
3. Give one example of a communicable disease.
4. Give one example of a non-communicable disease.
5. What is the main difference between communicable and non-communicable diseases?
6. Explain why communicable diseases can spread between organisms but non-communicable diseases cannot.

B6.3c Describe the interactions between different types of disease

1. How can HIV increase the risk of tuberculosis?
2. How can infection with HPV increase the risk of cervical cancer?
3. Why can one disease increase the likelihood of developing another disease?
4. Which diseases are used by OCR as examples of disease interactions?
5. Explain why people with weakened immune systems are more likely to develop additional diseases.
6. Explain how communicable diseases can influence the development of non-communicable diseases.

B6.3d Explain how communicable diseases (caused by viruses, bacteria, protists and fungi) are spread in animals and plants

1. Which four groups of pathogens cause communicable diseases?
2. How are communicable diseases spread between animals?
3. How are communicable diseases spread between plants?
4. Why does increasing the number of pathogens increase the chance of disease spread?
5. A disease infects 45 people in a village of 900 people. Calculate the percentage of the population infected.
6. Explain how viruses, bacteria, protists and fungi spread communicable diseases in animals and plants.

B6.3e Explain how the spread of communicable diseases may be reduced or prevented in animals and plants

1. How can detecting antigens help reduce the spread of disease?
2. How can DNA testing be used to identify disease?
3. How can visual identification help detect disease?
4. Why is early detection important in controlling communicable diseases?
5. Explain how identifying infected organisms helps reduce disease spread.
6. Describe how antigen testing, DNA testing and visual identification are used to reduce or prevent the spread of communicable diseases.

B6.3f Describe a minimum of one common human infection, one plant disease and sexually transmitted infections in humans including HIV/AIDS

1. Name one viral, one bacterial and one fungal human infection.
2. What causes HIV/AIDS?
3. Which viral plant disease is specified by OCR?
4. Which fungal plant disease is specified by OCR?
5. Which bacterial plant disease is specified by OCR?
6. State the pathogen responsible for tobacco mosaic virus (TMV), barley powdery mildew (Erysiphe graminis) and crown gall disease (Agrobacterium tumefaciens).

B6.3g Describe physical plant defence responses to disease

1. What is the function of the leaf cuticle?
2. How does the cell wall help defend plants against disease?
3. Why is the leaf cuticle considered a physical defence?
4. Why is the cell wall considered a physical defence?
5. Explain how physical barriers reduce infection in plants.

6. Describe the physical defence responses of plants against disease.

B6.3h Describe chemical plant defence responses

1. What are antimicrobial substances?
2. How do antimicrobial substances protect plants?
3. Why are antimicrobial substances considered chemical defences?
4. Give the function of antimicrobial substances in plants.
5. Explain how antimicrobial substances help prevent disease.
6. Describe the chemical defence responses of plants against disease.

B6.3i Describe different ways plant diseases can be detected and identified, in the lab and in the field

1. How can DNA from a pathogen be used to identify plant disease?
2. How can antigens be used to detect plant disease?
3. How can observation be used to diagnose plant disease in the field?
4. How is microscopy used to identify plant disease?
5. What is the difference between laboratory and field diagnosis of plant diseases?
6. Describe how plant diseases can be detected and identified in both the laboratory and the field.

B6.3j Explain how white blood cells and platelets are adapted to their defence functions in the blood

1. What is the role of white blood cells?
2. What are the three main defence functions of white blood cells?
3. What is the role of platelets?
4. How does blood clotting help defend the body against disease?
5. Explain how white blood cells are adapted to protect the body from pathogens.
6. Explain how white blood cells and platelets work together to defend the body.

B6.3k Describe the non-specific defence systems of the human body against pathogens

1. What is meant by a non-specific defence system?
2. Give four examples of non-specific defences in the human body.
3. How does the skin help prevent infection?
4. How does stomach acid protect the body from pathogens?
5. Explain how mucus and cilia help defend the respiratory system.

6. Describe the non-specific defence systems of the human body against pathogens.

B6.3l Explain the role of the immune system of the human body in defence against disease

1. What is the role of the immune system?
2. How do white blood cells recognise pathogens?
3. What are antibodies?
4. What are antitoxins?
5. How do memory cells provide immunity?
6. Explain how the immune system protects the body from disease.

B6.3m Describe how monoclonal antibodies are produced

1. What is a monoclonal antibody?
2. Which cells are fused to produce monoclonal antibodies?
3. What is a hybridoma?
4. Why are hybridoma cells useful?
5. How are large quantities of monoclonal antibodies produced?
6. Describe the process used to produce monoclonal antibodies.

B6.3n Describe some of the ways in which monoclonal antibodies can be used

1. How are monoclonal antibodies used in pregnancy testing?
2. How can monoclonal antibodies be used to detect prostate cancer?
3. How can monoclonal antibodies be used to target cancer cells?
4. Why are monoclonal antibodies useful in disease detection?
5. Explain why monoclonal antibodies can target specific antigens.
6. Describe the uses of monoclonal antibodies in pregnancy testing, disease detection and treating disease.

B6.3o Explain the use of vaccines and medicines in the prevention and treatment of disease

1. How do vaccines help prevent disease?
2. What is the difference between antibiotics, antivirals and antiseptics?
3. Why do antibiotics not work against viruses?
4. How do vaccines produce immunity?
5. Explain how medicines can help treat disease.
6. Compare the roles of vaccines, antibiotics, antivirals and antiseptics in preventing and treating disease.

B6.3p Explain the aseptic techniques used in culturing organisms

1. Why is alcohol used during aseptic technique?
2. Why are inoculating loops flamed before use?
3. Why are glassware and growth media autoclaved?
4. Why is culturing often carried out near a Bunsen burner?
5. A Petri dish has a clear circular area with a radius of 12 mm. Calculate the area of the clear zone. Give your answer in mm^2. (Use πr^2.)
6. Describe the aseptic techniques used when culturing microorganisms.

B6.3q Describe the processes of discovery and development of potential new medicines

1. What is preclinical testing?
2. What is clinical testing?
3. Why are new medicines first tested in the laboratory?
4. Why are clinical trials carried out in humans?
5. Why must new medicines be tested for safety, effectiveness and dosage?
6. Describe the stages involved in developing a new medicine.

B6.3r Recall that many non-communicable human diseases are caused by the interaction of a number of factors

1. Why do many non-communicable diseases have more than one cause?
2. Give four non-communicable diseases listed in the specification.
3. How can lifestyle contribute to cardiovascular disease?
4. How can nutrition influence the risk of type 2 diabetes?
5. Why can both genetic and environmental factors contribute to disease?
6. Explain why many non-communicable diseases result from the interaction of several factors.

B6.3s Evaluate some different treatments for cardiovascular disease

1. Give one lifestyle treatment for cardiovascular disease.
2. Give one medical treatment for cardiovascular disease.
3. Give one surgical treatment for cardiovascular disease.
4. Why might lifestyle changes be recommended before surgery?
5. A study shows that after treatment A, 72 out of 90 patients improved. Calculate the percentage of patients who improved.
6. Evaluate the advantages and disadvantages of lifestyle, medical and surgical treatments for cardiovascular disease.

You're right—I stopped too early. Here are the remaining learning outcomes.

B6.3t Analyse the effect of lifestyle factors on the incidence of non-communicable diseases at local, national and global levels

1. Which lifestyle factors does the specification identify as affecting the incidence of non-communicable diseases?
2. How can a lack of exercise increase the risk of non-communicable diseases?
3. How can poor diet contribute to non-communicable diseases?
4. How do alcohol consumption and smoking affect the incidence of non-communicable diseases?
5. A town has 2,500 adults. 375 have a smoking-related disease. Calculate the percentage of adults affected.
6. Analyse how exercise, diet, alcohol and smoking influence the incidence of non-communicable diseases at local, national and global levels.

B6.3u Describe cancer as the result of changes in cells that lead to uncontrolled growth and division

1. What is cancer?
2. What changes occur in cells that can lead to cancer?
3. Why is uncontrolled cell division harmful?
4. How do tumours form?
5. What is the difference between normal cell division and uncontrolled cell division?
6. Describe how cancer develops as a result of changes in cells leading to uncontrolled growth and division.

B6.3v Discuss potential benefits and risks associated with the use of stem cells in medicine

1. What are stem cells?
2. How can stem cells be used in tissue transplantation?
3. Why can transplanted tissues be rejected by the immune system?
4. Give two potential benefits of using stem cells in medicine.
5. Give two potential risks or ethical concerns associated with using stem cells.
6. Discuss the benefits and risks of using stem cells in medicine, including tissue transplantation and rejection.

B6.3w Explain some of the possible benefits and risks of using gene technology in medicine

1. Give two possible benefits of using gene technology in medicine.
2. Give two possible risks of using gene technology in medicine.

3. What practical considerations should be considered before using gene technology in medicine?
4. What ethical considerations are associated with using gene technology in medicine?
5. Why must gene technology be carefully tested before it is widely used?
6. Explain why the use of gene technology in medicine has both potential benefits and potential risks.

B6.3x Discuss the potential importance for medicine of our increasing understanding of the human genome

1. How can understanding the human genome help predict the likelihood of developing certain diseases?
2. What is meant by drugs that are targeted to genomes?
3. How could knowledge of the human genome improve the treatment of disease?
4. Why might genome-based medicine be more effective than a single treatment for everyone?
5. Give one potential benefit and one limitation of using genome information in medicine.
6. Discuss the importance of increasing knowledge of the human genome for predicting disease risk and developing targeted drug treatments.