

OCR Gateway Biology (J247) from 2016 Topic B1: Cell level systems

B1.1

- Describe how light microscopes and staining can be used to view cells
- Name the main sub-cellular structures of eukaryotic cells and prokaryotic cells and explain how they are related to their functions
- Explain how electron microscopy has increased our understanding of sub-cellular structures

B1.2

- Describe DNA as a polymer that is made up of two strands, forming a double helix
- Describe that DNA is made from four different nucleotides
- BIO & HT ONLY: Recall a simple description of protein synthesis
- BIO and HT ONLY: Explain simply how the structure of DNA affects the proteins made in protein synthesis, to include the triplet code
- Describe experiments that can be used to investigate enzymatic reactions
- Explain the mechanism of enzyme action

B1.3

- Describe cellular respiration as a universal chemical process that occurs continuously to supply ATP in all living cells
- Describe cellular respiration as an exothermic reaction
- Describe and compare the processes of aerobic and anaerobic respiration in animals and plants/fungi including ATP yield and location
- Explain the importance of sugars in the synthesis and breakdown of carbohydrates
- Explain the importance of amino acids in the synthesis and breakdown of proteins
- Explain the importance of fatty acids and glycerol in the synthesis and breakdown of lipids

B1.4

- Recall that photosynthetic organisms are the main source of food and therefore biomass for life on Earth
- Describe the process of photosynthesis, to include reactants and products, the word equation and the location of the reaction
- Describe photosynthesis as an endothermic reaction
- Describe experiments to investigate photosynthesis
- Explain the effect of temperature, light intensity and carbon dioxide concentration on the rate of photosynthesis
- HT ONLY: Explain the interaction of the effect of temperature, light intensity and carbon dioxide concentration in limiting the rate of photosynthesis

OCR Gateway Biology (J247) from 2016 Topic B2: Scaling up

B2.1

- Explain how substances are transported into and out of cells through diffusion, osmosis and active transport
- Describe the process of mitosis in growth, including the cell cycle
- Explain the importance of cell differentiation
- Recall that stem cells are present in embryonic and adult animals and meristems in plants
- Describe the functions of stem cells
- Describe the difference between embryonic and adult stem cells in animals

B2.2

- Explain the need for exchange surfaces and a transport system in multicellular organisms in terms of surface area: volume ratio
- Describe the human circulatory system, the relationship with the gaseous exchange system and the arrangement of vessels
- Explain how the structure of the heart and the blood vessels are adapted to their functions
- Explain how red blood cells and plasmas are adapted to their transport functions in the blood
- Explain how hot water and mineral ions are taken up by plants, including relating to the structure of root hair cells to their function
- Describe the process of transpiration and translocation
- Explain how the structures of the xylem and phloem are adapted to their functions in the plant
- Explain the effect of a variety of environmental factors on the rate of water uptake by the plant
- Describe how a simple photometer can be used to investigate factors that affect the rate of water uptake

OCR Gateway Biology (J247) from 2016 Topic B3: Organism level systems

B3.1

- Describe the structure of the nervous system, to include the central nervous system, sensory and motor neurones and sensory receptors
- Explain how the components of the nervous system can produce a co-ordinated response
- Explain how the structure of a reflex arc is related to its function
- BIO ONLY: Describe common defects of the eye and explain how some of these problems may be overcome
- BIO ONLY: Describe the structure and function of the brain, to include the cerebrum, medulla, hypothalamus and pituitary
- BIO AND HT ONLY: Explain some of the difficulties of investigating brain function
- BIO AND HT ONLY: Explain some of the limitations in treating damage and disease in the brain and other parts of the nervous system

B3.2

- Describe the principles of hormonal co-ordination and control by the human endocrine system
- HT ONLY: Explain the roles of thyroxine and adrenalin in the body, including thyroxine as an example of a negative feedback system
- Name and describe the roles of hormones involved in human reproduction, including control of the menstrual cycle
- HT ONLY: Explain the interactions of FSH, LH, oestrogen and progesterone in the control of the menstrual cycle
- Explain the use of hormones in contraception
- Evaluate hormonal and non-hormonal methods of contraception
- HT ONLY: Explain the use of hormones in modern reproductive technologies to treat infertility
- BIO ONLY: Explain how plant hormones are important in the control and co-ordination of plant growth and development
- BIO AND HT ONLY: Describe some of the variety of effect of plant hormones, relating to gibberellins and ethane

- BIO AND HT ONLY: Describe some of the different ways in which people use plant hormones to control plant growth

B3.3

- Explain the importance of maintaining a constant internal environment in response to internal and external change
- BIO ONLY: Describe the function of the skin in the control of body temperature
- Explain how insulin controls blood sugar levels in the body
- HT ONLY: Explain how glucagon interacts with insulin to control blood sugar levels in the body
- Compare Type 1 and Type 2 diabetes and explain how they can be treated
- BIO ONLY: Explain the effect on cells of osmotic changes in body fluids
- BIO ONLY: Describe the function of the kidneys in maintaining the water balance of the body
- Describe the gross structure of the kidney and the structure of the kidney tubule
- BIO AND HT ONLY: Describe the effect of ADH on the permeability of the kidney tubules
- BIO AND HT ONLY: Explain the response of the body to different temperature and osmotic challenges

OCR Gateway Biology (J247) from 2016 Topic B4: Community Level Systems

B4.1

- Recall that many different substances cycle through the abiotic and biotic components of an ecosystem, with examples
- Explain the role of microorganisms in the cycling of substances through an ecosystem
- Explain the importance of the carbon cycle and the water cycle to living organisms
- BIO ONLY: Explain the effect of factors such as temperature, water content and oxygen availability of rate of decomposition
- Describe different levels of organisation in an ecosystem from individual organisms to the whole ecosystem
- Explain how abiotic and biotic factors can affect communities
- Describe the importance of interdependence and competition in a community
- BIO ONLY: Describe the differences between the trophic levels of organisms within an ecosystem
- BIO ONLY: Describe pyramids of biomass and explain, with examples, how biomass is lost between the different trophic levels
- BIO ONLY: Calculate the efficiency of biomass transfers between trophic levels and explain how this affects the number of trophic levels in a food chain

OCR Gateway Biology (J247) from 2016 Topic B5: Genes, inheritance and selection

- Explain the following terms: gamete, chromosome, gene, genome, allele/variant, dominant, recessive, homozygous, heterozygous, genotype and phenotype
- Describe the genome as the entire genetic material of an organism
- Describe that the genome, and its interaction with the environment, influence the development of the phenotype of an organism
- 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
- BIO AND HT ONLY: Describe how genetic variants may influence phenotype, to include how in coding DNA the activity of a protein can be altered and how in non-coding DNA gene expression can be altered
- BIO ONLY: Explain some of the advantages and disadvantages of asexual and sexual reproduction in a range of organisms
- Explain the terms haploid and diploid
- Explain the role of meiotic cell division in halving the chromosome number to form gametes
- Explain single gene inheritance
- Predict the results of single gene crosses
- Describe sex determination in humans using a genetic cross
- Recall that most phenotypic features are the result of multiple genes rather than single gene inheritance

- BIO ONLY: Describe the development of our understanding of genetics, to include knowledge of Mendel

B5.2

- State that there is usually extensive genetic variation within a population of a species
- Describe the impact of developments in biology on classification systems
- Explain how evolution occurs through the natural selection of variants that have given rise to different phenotypes
- Describe evolution as a change in the inherited characteristics of a population over time, through a process of natural selection
- Describe the evidence for evolution, to include fossils and antibiotic resistance in bacteria
- BIO ONLY: Describe the work of Darwin and Wallace in the development of the theory of evolution by natural selection
- BIO ONLY: Explain the impact of the theory of evolution on modern biology and society

OCR Gateway Biology (J247) from 2016 Topic B6: Global challenges

B6.1

- 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
- Describe positive and negative human interactions within ecosystems
- Explain the impact of human interactions within ecosystems on biodiversity
- Explain some of the benefits and challenges of maintaining local and global biodiversity
- BIO AND HT ONLY: Evaluate the evidence for the impact of environment changes on the distribution of organisms, with reference to water and atmospheric gases

B6.2

- BIO ONLY: Explain the term 'food security' and some of the biological factors that affect it
- BIO ONLY: Describe and explain some possible agricultural solutions to the demands of the growing human population
- Explain the impact of the selective breeding of food plants and domesticated animals
- Describe genetic engineering as a process which involves modifying the genome of an organism to introduce desirable characteristics
- HT ONLY: Describe the main steps in the process of genetic engineering
- BIO ONLY: Explain some of the possible benefits and risks of using gene technology in modern agriculture
- Describe and explain some possible biotechnological and agricultural solutions to the demands of the growing human population

B6.3

- Describe the relationship between health and disease
- Describe different types of diseases, to include communicable and non-communicable diseases
- Describe the interactions between different types of disease
- Explain how communicable diseases are spread in animals and plants
- Explain how the spread of communicable diseases may be reduced or prevented in animals and plants
- Describe a minimum of one common human infection, one plant disease and sexually transmitted infections in humans
- BIO ONLY: Describe physical and chemical plant defences
- BIO AND HT ONLY: Describe different ways plant diseases can be detected and identified, in the lab and in the field
- Explain how white blood cells and platelets are adapted to their defence functions in the blood
- Describe the non-specific defences systems of the human body against pathogens
- Explain the role of the immune system of the human body in defence against disease
- BIO AND HT ONLY: Describe what monoclonal antibodies are and how they are produced
- BIO AND HT ONLY: Describe some of the ways in which monoclonal antibodies can be used

- Explain the use of vaccines and medicines in the prevention and treatment of the disease
- BIO ONLY: Explain the aseptic techniques used in culturing organisms
- Describe the process of discovery and development of potential new medicines
- Recall that many non-communicable human diseases are caused by the interaction of a number of factors
- Evaluate some different treatments for cardiovascular disease
- Analyse the effect of lifestyle factors on the incidence of non-communicable diseases at local, national and global levels
- Describe cancer as the results of changes in cells that lead to uncontrolled growth and division
- Discuss potential benefits and risks associated with the use of stem cells in medicine
- Explain some of the possible benefits and risks of using gene technology in medicine
- Discuss the potential importance for medicine of our increasing understanding of the human genome

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