**GCSE Biology Higher Paper 1** [1BI0/1H]

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**Topic 1 – Key Concepts in Biology. Some short answer questions from this topic may be on either Paper 1 or Paper 2**

Content will be assessed from the following topics:

**• Topic 2 Cells and control – cell cycle (2.1–2.6)**

2.1 Describe mitosis as part of the cell cycle, including the stages interphase, prophase, metaphase, anaphase and telophase and cytokinesis (p. 30-31)

2.2 Describe the importance of mitosis in growth, repair and asexual reproduction (p. 30-31)

2.3 Describe the division of a cell by mitosis as the production of two daughter cells, each with identical sets of chromosomes in the nucleus to the parent cell, and that this results in the formation of two genetically identical diploid body cells (p. 30-31)

2.4 Describe cancer as the result of changes in cells that lead to uncontrolled cell division (p. 30-31)

2.5 Describe growth in organisms, including:

a cell division and differentiation in animals (p. 32-33)

b cell division, elongation and differentiation in plants (p. 30-31)

**• Topic 2 Cells and control – brain and eye (2.10B–2.17B)**

2.10B Describe the structures and functions of the brain including the cerebellum, cerebral hemispheres and medulla oblongata (p. 38-39)

2.11B Explain how the difficulties of accessing brain tissue inside the skull can be overcome by using CT scanning and PET scanning to investigate brain function (p. 40-41)

2.12B Explain some of the limitations in treating damage and disease in the brain and other parts of the nervous system, including spinal injuries and brain tumours (p. 40-41)

2.13 Explain the structure and function of sensory receptors, sensory neurones, relay neurones in the CNS, motor neurones and synapses in the transmission of electrical impulses,

including the axon, dendron, myelin sheath and the role of neurotransmitters (p. 42-43)

2.14 Explain the structure and function of a reflex arc including sensory, relay and motor neurones (p. 46-47)

2.15B Explain the structure and function of the eye as a sensory receptor including the role of:

a the cornea and lens (p. 44-45)

b the iris (p. 44-45)

c rod and cone cells in the retina (p. 44-45)

2.16B Describe defects of the eye including cataracts, longsightedness, short-sightedness and colour blindness (p. 44-45)

2.17B Explain how cataracts, long-sightedness and short-sightedness can be corrected (p. 44-45)

**• Topic 3 Genetics – reproduction and DNA (3.1B–3.6)**

3.1B Explain some of the advantages and disadvantages of asexual reproduction, including the lack of need to find a mate, a rapid reproductive cycle, but no variation in the population (p. 50-51)

3.2B Explain some of the advantages and disadvantages of sexual reproduction, including variation in the population, but the requirement to find a mate (p. 50-51)

3.3 Explain the role of meiotic cell division, including the production of four daughter cells, each with half the number of chromosomes, and that this results in the formation of genetically different haploid gametes. The stages of meiosis are not required (p. 52-53)

3.4 Describe DNA as a polymer made up of:

a two strands coiled to form a double helix (p. 54-55)

b strands linked by a series of complementary base pairs joined together by weak hydrogen bonds (p. 54-55)

c nucleotides that consist of a sugar and phosphate group (p. 54-55)with one of the four different bases attached to the sugar

3.5 Describe the genome as the entire DNA of an organism and a gene as a section of a DNA molecule that codes for a specific protein (p. 52-53)

3.6 Explain how DNA can be extracted from fruit (p.56-57)

**• Topic 4 Natural selection and genetic modification – inheritance (4.1B–4.6B)**

4.1B 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 (p. 80-81)

4.2 Explain Darwin’s theory of evolution by natural selection (p.78-79)

4.3 Explain how the emergence of resistant organisms supports

Darwin’s theory of evolution including antibiotic resistance in bacteria (p.78-79)

4.4 Describe the evidence for human evolution, based on fossils,

including:

a Ardi from 4.4 million years ago (p.76-77)

b Lucy from 3.2 million years ago (p.76-77)

c Leakey’s discovery of fossils from 1.6 million years ago (p.76-77)

4.5 Describe the evidence for human evolution based on stone

tools, including:

a the development of stone tools over time (p.76-77)

b how these can be dated from their environment (p.76-77)

4.6B Describe how the anatomy of the pentadactyl limb provides scientists with evidence for evolution (p.76-77)

**• Topic 4 Natural selection and genetic modification – selective breeding and**

**genetic modification (4.8–4.11)**

4.8 Explain selective breeding and its impact on food plants and domesticated animals (p.84-85)

4.9B Describe the process of tissue culture and its advantages in medical research and plant breeding programmes (p.86-87)

4.10 Describe genetic engineering as a process which involves modifying the genome of an organism to introduce desirable characteristics (p.84-85)

4.11 Describe the main stages of genetic engineering including the use of:

a restriction enzymes (p.88-89)

b ligase (p.88-89)

c sticky ends (p.88-89)

d vectors (p.88-89)

**• Topic 5 Health, disease, and the development of medicines – disease (5.2–5.8)**

5.2 Describe the difference between communicable and non-communicable diseases (p.96-97)

5.3 Explain why the presence of one disease can lead to a higher susceptibility to other diseases (p.96-97)

5.4 Describe a pathogen as a disease-causing organism, including viruses, bacteria, fungi and protists (p.102-103)

5.5 Describe some common infections, including:

a cholera (bacteria) causes diarrhoea (p.102-103)

b tuberculosis (bacteria) causes lung damage (p.102-103)

c Chalara ash dieback (fungi) causes leaf loss and bark lesions (p.102-103)

d malaria (protists) causes damage to blood and liver (p.102-103)

e HIV (virus) destroys white blood cells, leading to the onset of AIDS (p.102-103)

f stomach ulcers caused by Helicobacter (bacteria) (p.102-103)

g Ebola (virus) causes haemorrhagic fever (p.102-103)

5.6 Explain how pathogens are spread and how this spread can be reduced or prevented, including:

a cholera (bacteria) – water (p.104-105)

b tuberculosis (bacteria) – airborne (p.104-105)

c Chalara ash dieback (fungi) – airborne (p.104-105)

d malaria (protists) – animal vectors (p.104-105)

e stomach ulcers caused by Helicobacter (bacteria) – oral transmission (p.104-105)

f Ebola (virus) – body fluids (p.104-105)

5.7B Describe the lifecycle of a virus, including lysogenic and lytic pathways (p.106-107)

5.8 Explain how sexually transmitted infections (STIs) are spread and how this spread can be reduced or prevented, including:

a Chlamydia (bacteria) (p.112-113)

b HIV (virus) (p.112-113)

**• Topic 5 Health, disease, and the development of medicines – antibiotics**

**(5.16–5.20)**

5.16 Explain that antibiotics can only be used to treat bacterial infections because they inhibit cell processes in the bacterium but not the host organism (p.116-117)

5.17B Explain the aseptic techniques used in culturing microorganisms in the laboratory, including the use of an autoclave to prepare sterile growth medium and petri dishes, the use of sterile inoculating loops to transfer microorganisms and the need to keep petri dishes and culture vials covered (p.108-109)

5.18B Core Practical: Investigate the effects of antiseptics, antibiotics or plant extracts on microbial cultures (p.110-111)

5.19B Calculate cross-sectional areas of bacterial cultures and clear agar jelly using πr2 (p.107)

5.20 Describe that the process of developing new medicines, including antibiotics, has many stages, including discovery, development, preclinical and clinical testing (p.116-117)

**Core practical activities that will be assessed:**

**• Core Practical 1.6: Investigate biological specimens using microscopes, including magnification calculations and labelled scientific drawings from observations (p.6-7)**

**• Core Practical 1.10: Investigate the effect of pH on enzyme activity (p.20-21)**

**• Core Practical 5.18B: Investigate the effects of antiseptics, antibiotics or plant extracts on microbial cultures (p.118-119)**

**GCSE Biology Higher Paper 2 [1BI0/2H]**

Content will be assessed from the following topics:

**• Topic 6 Plant structures and their functions – transport of substances in plants**

**(6.8–6.12)**

6.8 Explain how the structures of the xylem and phloem are adapted to their function in the plant, including:

a lignified dead cells in xylem transporting water and minerals through the plant (p.132-133)

b living cells in phloem using energy to transport sucrose around the plant (p.132-133)

6.9 Explain how water and mineral ions are transported through the plant by transpiration, including the structure and function of the stomata (p.132-133)

6.10 Describe how sucrose is transported around the plant by translocation (p.132-133)

6.11B Explain how the structure of a leaf is adapted for photosynthesis and gas exchange (p.132-133)

6.12 Explain the effect of environmental factors on the rate of water uptake by a plant, to include light intensity, air movement and temperature (p.132-133)

**• Topic 6 Plant structures and their functions – plant hormones (6.15B–6.16B)**

6.15B Explain how plant hormones control and coordinate plant growth and development, including the role of auxins in phototropisms and gravitropisms (p.136-137)

6.16B Describe the commercial uses of auxins, gibberellins and ethene in plants, including:

a auxins in weedkillers and rooting powders (p.138-139)

b gibberellins in germination, fruit and flower formation and the production of seedless fruit

c ethene in fruit ripening (p.138-139)

**• Topic 7 Animal co-ordination, control, and homeostasis – human hormones**

**(7.1–7.8)**

7.1 Describe where hormones are produced and how they are transported from endocrine glands to their target organs,including the pituitary gland, thyroid gland, pancreas, adrenal glands, ovaries and testes (p.142-143)

7.2 Explain that adrenalin is produced by the adrenal glands to prepare the body for fight or flight, including: (p.144-145)

a increased heart rate

b increased blood pressure

c increased blood flow to the muscles

d raised blood sugar levels by stimulating the liver to change glycogen into glucose

7.3 Explain how thyroxine controls metabolic rate as an example of negative feedback, including: (p.144-145)

a low levels of thyroxine stimulates production of TRH in hypothalamus

b this causes release of TSH from the pituitary gland

c TSH acts on the thyroid to produce thyroxine

d when thyroxine levels are normal thyroxine inhibits the release of TRH and the production of TSH

7.4 Describe the stages of the menstrual cycle, including the roles of the hormones oestrogen and progesterone, in the control of the menstrual cycle (p.146-147)

7.5 Explain the interactions of oestrogen, progesterone, FSH and LH in the control of the menstrual cycle, including the repair and maintenance of the uterus wall, ovulation and menstruation (p.148-149)

7.6 Explain how hormonal contraception influences the menstrual cycle and prevents pregnancy (p.148-149)

7.7 Evaluate hormonal and barrier methods of contraception (p.146-147)

7.8 Explain the use of hormones in Assisted Reproductive Technology (ART) including IVF and clomifene therapy (p.148-149)

**• Topic 7 Animal co-ordination, control, and homeostasis – thermoregulation and**

**diabetes (7.11B–7.16)**

7.11B Explain how thermoregulation takes place, with reference to the function of the skin, including: (p.154-155)

a the role of the dermis

b the role of the epidermis

c the role of the hypothalamus

7.12B Explain how thermoregulation takes place, with reference to: (p.154-155)

a shivering b vasoconstriction c vasodilation

7.13 Explain how the hormone insulin controls blood glucose concentration (p.150-151)

7.14 Explain how blood glucose concentration is regulated by glucagon (p.150-151)

7.15 Explain the cause of type 1 diabetes and how it is controlled (p.150-151)

7.16 Explain the cause of type 2 diabetes and how it is controlled (p.152-153)

**• Topic 8 Exchange and transport in animals – gas exchange (8.2–8.5B)**

8.2 Explain the need for exchange surfaces and a transport system in multicellular organisms including the calculation of surface area : volume ratio (p.162-163)

8.3 Explain how alveoli are adapted for gas exchange by diffusion between air in the lungs and blood in capillaries (p.162-163)

8.4B Describe the factors affecting the rate of diffusion, including surface area, concentration gradient and diffusion distance (P. 164-165)

8.5B Calculate the rate of diffusion using Fick’s law (P. 164-165)

**• Topic 8 Exchange and transport in animals – respiration (8.9–8.12)**

8.9 Describe cellular respiration as an exothermic reaction which occurs continuously in living cells to release energy for metabolic processes, including aerobic and anaerobic respiration (P.170-171)

8.10 Compare the process of aerobic respiration with the process of anaerobic respiration (P.170-171)

8.11 Core Practical: Investigate the rate of respiration in living organisms (P. 172-173)

8.12 Calculate heart rate, stroke volume and cardiac output, using the equation cardiac output = stroke volume × heart rate (P.168-169)

**• Topic 9 Ecosystems and material cycles – energy transfers (9.7B–9.9)**

9.7B Explain how some energy is transferred to less useful forms at each trophic level and that this affects the number of organisms at each trophic level, limits the length of a food chain and determines the shape of a pyramid of biomass in an ecosystem (P. 178-179)

9.8B Calculate the efficiency of energy transfers between trophic levels and percentage calculations of biomass (P.178-179)

9.9 Explain the positive and negative human interactions within ecosystems and their impacts on biodiversity, including: (p.190-191)

a fish farming

b introduction of non-indigenous species

c eutrophication

**• Topic 9 Ecosystems and material cycles – conservation and material cycles**

**(9.10–9.15)**

9.10 Explain the benefits of maintaining local and global biodiversity, including the conservation of animal species and the impact of reforestation (P.192-193)

9.11B Describe the biological factors affecting levels of food security,

including: (P.194-195)

a increasing human population

b increasing animal farming and the increased meat and fish consumption

c the impact of new pests and pathogens

d environmental change caused by human activity

e sustainability issues, e.g. use of land for biofuel production and the cost of agricultural inputs

9.12 Describe how different materials cycle through the abiotic and biotic components of an ecosystem (P.196-197)

9.13 Explain the importance of the carbon cycle, including the processes involved and the role of microorganisms as decomposers (P.198-199)

9.14 Explain the importance of the water cycle, including the processes involved and the production of potable water in areas of drought including desalination (P.196-197)

9.15 Explain how nitrates are made available for plant uptake,including the use of fertilisers, crop rotation and the role of bacteria in the nitrogen cycle (P.200-201)

**• Topic 9 Ecosystems and material cycles – decomposition (9.16B–9.19B)**

9.16B Evaluate the use of indicator species as evidence to assess the level of pollution, including: (P.186-187)

a polluted water – bloodworm, sludgeworm

b clean water – freshwater shrimps, stonefly

c air quality – different species of lichen, blackspot fungus on roses

9.17B Explain the effects of temperature, water content and oxygen availability on the rate of decomposition in food preservation (P.202-203)

9.18B Explain the effects of temperature, water content and oxygen availability on the rate of decomposition in composting (p. 202-203)

9.19B Calculate rate changes in the decay of biological material (p.202-203)

**Core practical activities that will be assessed:**

**• Core Practical 8.11: Investigate the rate of respiration in living organisms (p.172)**

**• Core Practical 9.5: Investigate the relationship between organisms and their environment using fieldwork techniques, including quadrats and belt transects (p.182-183)**