

Biology Combined Science

Paper 1

1 hour 15 minutes

70 marks

16.7% of GCSE

<p>B1: Cell Biology</p>	<ul style="list-style-type: none">• Eukaryotes and prokaryotes• Microscopy• RP1: Microscopy• Cell specialisation and differentiation• Chromosomes, mitosis and Cell cycle• Stem cells• Movement across boundaries• RP3: Osmosis
<p>B2: Organisation</p>	<ul style="list-style-type: none">• Principles of organisation• Digestive system• Enzymes• Digestive enzymes and chemicals• Factors affecting enzymes• RP4: Amylase and pH• RP5: Food testing• Plant tissues• Plant organs• The heart and lungs• Blood and blood vessels• CHD and heart trouble• Health issues• The effects of lifestyle• Cancer
<p>B3: Infection and Response</p>	<ul style="list-style-type: none">• Communicable diseases• Immune responses• Bacterial diseases• Viral diseases• Fungal diseases• Protista diseases• Vaccinations• Antibiotics and painkillers• Drug testing
<p>B4: Bioenergetics</p>	<ul style="list-style-type: none">• Photosynthesis• RP6: Rate of photosynthesis• Respiration• The effect of exercise

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Paper 2

1 hour 15 minutes

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<p>B5: Homeostasis and response</p>	<ul style="list-style-type: none">• Homeostasis basics and negative feedback• Human nervous system• Human reflexes• RP7: Reaction time• Human endocrine system• Controlling blood glucose & diabetes• Hormones and the menstrual cycle• Using hormones for contraception and to treat infertility
<p>B6: Inheritance, variation and evolution</p>	<ul style="list-style-type: none">• Classification of living organisms• Reproduction and meiosis• DNA and the genomes• Genetic inheritance• Inherited disorders and sex determination• Predicting inheritance• Selective breeding• Genetic engineering• Evolution (natural selection)• Fossils and extinction
<p>B7: Ecology</p>	<ul style="list-style-type: none">• Communities and competition• Biotic and abiotic factors• RP9: Field investigations• Adaptations in plants & animals• Levels of organisation and feeding relationships• Material cycling• Waste management & land use• Deforestation and peat destruction• Global warming• Biodiversity

Eukaryotes and prokaryotes

- Plant and animal cell (eukaryotes) organelles and function
- Bacterial (prokaryote) cell structure
- Size comparisons of each cell type

Microscopy

- Developments in techniques over time
- Electron microscope improvement in knowledge
- Calculate magnification

RP1: Microscopy - Use a light microscope to observe, draw and label a selection of plant and animal cells. A magnification scale must be included.

- Observe, draw and label microscope diagrams of animal and plant cells
- Calculate magnification

Cell specialisation and differentiation

- Specialised animal cells – sperm, nerve and muscle
- Specialised animal cells – root hair cell, xylem and phloem
- Animal cell differentiation timing and types
- Plant cell differentiation timing and types

Chromosomes, mitosis and Cell cycle

- Chromosomes make up
- Stages of mitosis
- Importance of mitosis

Stem cells

- Definition of a stem cell
- Function of stem cell in embryos, adults and meristem in plants.
- Uses of embryonic stem cells
- Uses of meristem cells
- Treatment using stem cells
- Ethics of stem cell use

Movement across boundaries

- Describe type of particles and their movement in diffusion
- Factors affecting diffusion
- Adaptations to make diffusion efficient
- Describe type of particles and their movement in osmosis
- Describe type of particles and their movement in active transport
- Explain the differences between the three processes

RP3: Osmosis – Investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue.

- Calculations linked to osmosis
- Plot, draw and interpret appropriate graphs

Principles of organisation

- Structure and function of cells, tissues, organs and organ systems.

Digestive system

- Structure and function of the digestive system
- Function of each organ of the digestive system
- Definition of metabolism
- Rate of reaction calculations

Enzymes

- Lock and key theory

Digestive enzymes and chemicals

- Site of production of lipase, protease and amylase.
- Site of use of lipase, protease and amylase.
- Role of lipase, protease and amylase.
- Site of bile production
- Role of bile in digestion
- Role of hydrochloric acid in digestion

Factors affecting enzymes

- Effect of pH on rate of enzyme action
- Effect of temperature on rate of enzyme action
- Effect of concentration of substrate on rate of enzyme action
- Effect of concentration of enzyme on rate of enzyme action

RP4: Amylase and pH - investigate the effect of pH on the rate of reaction of amylase enzyme

- Method of testing for the optimum enzyme pH

RP5: Food testing - Use qualitative reagents to test for a range of carbohydrates, lipids and proteins.

- Method, reagent used and positive/negative results when testing for lipids
- Method, reagent used and positive/negative results when testing for proteins
- Method, reagent used and positive/negative results when testing for reducing sugars
- Method, reagent used and positive/negative results when testing for starch

Plant tissues

- Explain the link between the structure and function of epidermal tissues, palisade mesophyll, spongy mesophyll, meristem tissues, xylem and phloem

Plant organs

- Structure of a leaf
- Function of each layer of a leaf's structure
- Structure and adaptations of root hair cells.
- Structure and adaptations of xylem
- Structure and adaptations of phloem
- Transpiration
- Effect of temperature, humidity, air movement and light intensity on the rate of transpiration

The heart and lungs

- Structure and function of the heart
- Structure and function of the lungs

Blood and blood vessels

- Structure of blood
- Function of each blood component
- Adaptation of blood cells for their function
- Types of blood vessels
- Link structure to function
- Calculation of blood flow

CHD and heart trouble

- Evaluate advantages and disadvantages of treating cardiovascular disease – (CHD, leaky valves and heart failure)
- Describe how CHD occurs.

Health issues

- Definition of non-communicable disease
- Definition of health
- Definition of disease
- Interaction of diseases
- Interpretation of disease data/graphs
- Sampling techniques related to health surveying

The effects of lifestyle

- Discuss global, national or local human and financial cost of non-communicable disease
- Risk factors linked to certain diseases
- Interpretation of disease data/graphs
- Sampling techniques related to health surveying

Cancer

- Describe how cancer develops
- Benign vs malignant tumours
- Risk factors linked to different cancers

Communicable diseases

- Definition of communicable disease
- Definition of pathogen
- Methods of spreading
- Prevention of spread of disease
- How bacteria cause people to feel unwell
- How viruses cause people to feel unwell

Immune responses

- Non-specific human defence systems
- The defence role of phagocytosis
- The defence role of antibody production
- The defence role of antitoxin production

Bacterial diseases

- Knowledge of symptoms and spreading method of Salmonella
- Knowledge of symptoms, spreading method and treatment of Gonorrhoea

Viral diseases

- Knowledge of symptoms, spreading method and long term problems of measles
- Knowledge symptoms, spreading method and long term problems of HIV
- Knowledge of symptoms and long term problems of TMV

Fungal diseases

- Knowledge of symptoms, spreading method and treatment of rose black spot

Protista diseases

- Knowledge of symptoms and spreading method of malaria
- Prevention of malaria

Vaccinations

- Explain how vaccinations prevent illness
- Explain how herd immunisation help reduce the spread of pathogens

Antibiotics and painkillers

- The use of medicine in treating disease.
- The link between use of antibiotics and death rates from bacterial diseases.

Drug testing

- Stages of testing new drugs/medicines
- Purpose of each stage of drug testing
- Traditional drug extracts

Photosynthesis

- Word and symbol equations
- Type of chemical reaction
- Effect of light intensity on the rate of photosynthesis
- Effect of carbon dioxide concentration on the rate of photosynthesis
- Effect of the amount of chlorophyll on the rate of photosynthesis
- Limiting factors linked to greenhouses
- Use of glucose in plants

RP6: Rate of photosynthesis - investigate the effect of light intensity on the rate of photosynthesis using an aquatic organism such as pondweed

- Calculate rates of photosynthesis
- Plot graphs on rate of photosynthesis
- Interpret graphs on limiting factors

Respiration

- Type of reaction
- Importance of respiration
- Comparison between aerobic and anaerobic respiration
- Word and chemical equation for aerobic respiration
- Word equation for anaerobic respiration
- Word equation for anaerobic respiration in plant and yeast cells
- Use of anaerobic respiration

The effect of exercise

- Response of the heart and lungs during exercise
- The importance of these responses
- Definition of metabolism
- Synthesis that occurs during metabolism

Homeostasis basics and negative feedback

- Examples of conditions that need to be controlled in the body
- How the body responds to control body temperature
- The roles of thyroxin and adrenaline

Human nervous system

- Key-terms: stimulus, receptor, coordinator, effector, response
- Structure of the nervous system
- Purpose of the nervous system
- Pathway of a voluntary nervous response
- Purpose of a voluntary nervous response

Human reflexes

- Key terms: stimulus, receptor, coordinator, effector, response
- Structure of the reflex arc
- Pathway of a reflex response
- Purpose of reflex actions

RP7: Reaction time - Plan and carry out an investigation into the effect of a factor on human reaction time.

- Know how to use the ruler drop test to test the nervous response of a person
- Link data collected to expected results
- Make conclusion from the data collected

Human endocrine system

- Principles of hormonal coordination and control
- Position of structures of the endocrine systems (pituitary glands, pancreas, thyroid, adrenal gland, ovary, testes)
- Role of each of these structures

Controlling blood glucose & diabetes

- Body responses to unbalanced blood glucose
- Role of insulin in controlling blood glucose
- Comparing the causes, symptom & treatment for Type 1 and Type 2 diabetes

Hormones and the menstrual cycle

- The role of hormones in controlling the menstrual cycle
- The role of hormones in puberty
- The roles of LH, FSH & Progesterone

Using hormones for contraception and to treat infertility

- Methods of contraception
- Using hormones (FSH & LH) in IVF
- The advantages & disadvantages of using hormones for treating infertility

Classification of living organisms

- Linnaeus classification
- Developments in classification
- Evidence to support classification systems
- 'Three-domain system'

Reproduction and meiosis

- Differences between sexual and asexual reproduction
- Stages of meiosis

DNA and the genomes

- Structure of DNA
- Key-term: DNA, genome, gene, chromosome
- The importance of understanding the human genome

Genetic inheritance

- Key-terms: gamete, chromosomes, gene, allele, dominant, recessive, homozygous, heterozygous, genotype, phenotype.
- Monogenetic traits vs polygenetic traits

Inherited disorders and sex determination

- Knowledge of polydactyly & cystic fibrosis
- Ethics of embryo screening for inherited disorders
- Sex determination chromosome pairs

Predicting inheritance

- Characteristics shown by heterozygous, homozygous dominant and homozygous recessive genotypes
- Predicting inheritance using punnet squares
- Interpreting family tree diagrams

Selective breeding

- Impact of selective breeding
- Process of selective breeding
- Advantages and disadvantages of selective breeding

Genetic engineering

- Process of genetic engineering
- Advantages and disadvantages of genetic engineering
- Ethics of genetic engineering

Evolution (natural selection)

- Theory of natural selection
- Linking natural selection to resistant bacteria
- MRSA

Fossils and extinction

- How fossils are formed
- Factors that cause animals to become extinct
- How fossil evidence gives proof to evolutionary theories

Communities and competition

- Key-terms: ecosystem, habitat, interdependence, interdependent, species, community, competition.
- Levels of organisation in an ecosystem
- What animals and plants compete over
- Interdependence in an ecosystem

Biotic and abiotic factors

- Biotic factors that can affect a community and/or organism distribution
- Abiotic factors that can affect a community and/or organism distribution
- Interpret graphical or numerical data

RP9: Field investigations - measure the population size of a common species in a habitat. Use sampling techniques to investigate the effect of a factor on the distribution of this species.

- Method of line transect sampling
- When to use a line transect technique
- Method of random sampling
- When to use a random sampling technique

Adaptations in plants & animals

- Examples of how plants and animals adapt to live in extreme conditions (e.g. dry/ hot/ cold/ wet)
- Example of how plants and animals adapt to protect themselves against predators

Levels of organisation and feeding relationships

- Key-terms: producer herbivore, omnivore, carnivore, predator, prey, consumer
- Interpret food chains and food webs
- Interpret graphical or numerical data on relationships

Material cycling

- Processes in the decay cycle
- Processes in the water cycle
- Processes in the carbon cycle

Waste management & land use

- Pollution of water, air and land from increase in waste creation
- How humans are using land for themselves
- The impact of using this land on ecosystems

Deforestation and peat destruction

- Why deforestation and peat destruction occurs
- The impact of deforestation and peat destruction

Global warming

- Biological impact of global warming

Biodiversity

- Methods of maintaining biodiversity
- Importance of maintaining biodiversity