

**Personalised Learning Checklist**

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| **Subject/Course:** | **GCSE BIOLOGY (H)** |
| **Student Name:** |  |

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|  |  | Self Assessment |
| Topic | Key knowledge/skills | Red | Amber | Green |
| Cells | Use the terms 'eukaryotic' and 'prokaryotic' to describe types of cells |  |  |  |
| PAPER 1  | Describe the features of bacterial (prokaryotic) cells |  |  |  |
|  | Demonstrate an understanding of the scale and size of cells and be able to make order of magnitude calculations, inc standard form |  |  |  |
|  | Recall the structures found in animal and plant (eukaryotic) cells inc algal cells |  |  |  |
|  | Use estimations and explain when they should be used to judge the relative size or area of sub-cellular structures |  |  |  |
|  | Describe the functions of the structures in animal and plant (eukaryotic) cells |  |  |  |
|  | Describe what a specialised cell is, including examples for plants and animals |  |  |  |
|  | Describe what differentiation is, including differences between animals and plants |  |  |  |
|  | Define the terms magnification and resolution |  |  |  |
|  | Compare electron and light microscopes in terms of their magnification and resolution |  |  |  |
|  | Describe the process of diffusion, including examples |  |  |  |
|  | Explain how diffusion is affected by different factors |  |  |  |
|  | Define and explain "surface area to volume ratio", and how this relates to single-celled and multicellular organisms (inc calculations) |  |  |  |
|  | Explain how the effectiveness of an exchange surface can be increased, inc examples of adaptations for small intestines, lungs, gills roots & leaves |  |  |  |
|  | Describe the process of osmosis (inc calculation of water uptake & percentage gain and loss of mass of plant tissue) |  |  |  |
|  | Describe the process of active transport, including examples - gut and roots |  |  |  |
|  | Explain the differences between diffusion, osmosis and active transport |  |  |  |
| Organisation | Describe the levels of organisation within living organisms  |  |  |  |
| PAPER 1  | Describe the digestive system and how it works as an organ system (from KS3) |  |  |  |
|  | Describe basic features of enzymes (inc rate calculations for chemical reactions) |  |  |  |
|  | Describe the lock and key theory as a model of enzyme action and explain how the shape a of the active sites makes the enzyme specific |  |  |  |
|  | Explain the effect of temperature and pH on enzymes |  |  |  |
|  | Describe the digestive enzymes, including their names, sites of production and actions |  |  |  |
|  | Describe how the products of digestion are used |  |  |  |
|  | Describe the features and functions of bile and state where it is produced and released from |  |  |  |
|  | *Required practical: use qualitative reagents to test for a range of carbohydrates, lipids and proteins* |  |  |  |
|  | *Required practical: investigate the effect of pH on the rate of reaction of amylase enzyme* |  |  |  |
|  | Describe the structure of the human heart and lungs (inc how lungs are adapted for gaseous exchange) |  |  |  |
|  | Explain how the heart moves blood around the body (inc role and position of the aorta, vena cava, pulmonary artery & vein and coronary arteries) |  |  |  |
|  | Explain how the natural resting heart rate is controlled and how irregularities can be corrected |  |  |  |
|  | Describe the structure and function of arteries, veins and capillaries |  |  |  |
|  | Use simple compound measures such as rate and carry out rate calculations for blood flow |  |  |  |
|  | Describe blood and identify its different components, inc identifying blood cells from photographs/diagrams |  |  |  |
|  | Describe the functions of blood components, including adaptations to function |  |  |  |
|  | Describe what happens in coronary heart disease and what statins are used for  |  |  |  |
|  | Describe and evaluate treatments for coronary heart disease and heart failure (inc drugs, mechanical devices or transplant) |  |  |  |
|  | Recall that heart valves can become faulty and describe the consequences of this |  |  |  |
|  | Describe how patients can be treated in the case of heart failure  |  |  |  |
|  | Describe health and the explain causes of ill-health and the relationship between health and disease |  |  |  |
|  | Describe how different types of diseases may interact and translate disease incidence information between graphical and numerical forms |  |  |  |
|  | Describe what risk factors are and give examples discussing human and financial costs of non-communicable diseases at local, national and global levels |  |  |  |
|  | Describe what cancer is and explain the difference between benign and malignant tumours  |  |  |  |
|  | Describe the known risk factors for cancer, including genetic and lifestyle risk factors |  |  |  |

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|  |  | Self Assessment |
| Topic | Key knowledge/skills | Red | Amber | Green |
| Infection and response  | Explain what a pathogen is and how pathogens are spread (inc how viruses, bacteria, protists and fungi are spread in animals and plants) |  |  |  |
| PAPER 1  | Explain how pathogenic bacteria and viruses cause damage in the body |  |  |  |
|  | Explain how the spread of diseases can be reduced or prevented |  |  |  |
|  | Describe measles, HIV and tobacco mosaic virus as examples of viral pathogens  |  |  |  |
|  | Describe salmonella food poisoning and gonorrhoea as examples of bacterial pathogens  |  |  |  |
|  | Describe the signs, transmission and treatment of rose black spot infection in plants as an example of fungal pathogens |  |  |  |
|  | Describe the symptoms, transmission and control of malaria, including knowledge of the mosquito vector as an example of a protists pathogen |  |  |  |
|  | Describe defences that stop pathogens entering the human body (inc skin, nose, trachea & windpipe, stomach) |  |  |  |
|  | Recall the role of the immune system |  |  |  |
|  | Describe how white blood cells destroy pathogens |  |  |  |
|  | Describe how vaccination works, including at the population level |  |  |  |
|  | Explain how antibiotics and painkillers are used to treat diseases, including their limitations |  |  |  |
|  | Describe how sources for drugs have changed over time and give some examples |  |  |  |
|  | Describe how new drugs are tested, including pre-clinical testing and clinical trials (inc double blind trials and placebos) |  |  |  |
|  | ***Bio & HT ONLY: Describe what monoclonal antibodies are and why they are useful*** |  |  |  |
|  | ***Bio & HT ONLY: Describe how monoclonal antibodies are produced*** |  |  |  |
|  | ***Bio & HT ONLY: Explain how monoclonal antibodies are used for diagnosis, research, chemical testing and disease treatments*** |  |  |  |
|  | ***Bio & HT ONLY: Evaluate the advantages and disadvantages of monoclonal antibodies (inc side effects)*** |  |  |  |
|  | ***Bio & HT ONLY: Describe some observable signs of plant disease, and how plant diseases can be identified*** |  |  |  |
|  | *Bio ONLY: Give examples of plant pathogens* |  |  |  |
|  | *Bio ONLY: Give examples of plant ion deficiencies and their effects* |  |  |  |
|  | *Bio ONLY: Describe physical, chemical and mechanical defence responses of plants* |  |  |  |
|  | *Bio ONLY: Describe how bacteria reproduce and the conditions required* |  |  |  |
|  | *Bio ONLY: Describe how to prepare an uncontaminated culture* |  |  |  |
|  | *Bio ONLY: Calculate cross-sectional areas of colonies or clear areas around colonies using πr²* |  |  |  |
|  | *Bio ONLY: Calculate the number of bacteria in a population after a certain time if given the mean division time* |  |  |  |
|  | ***Bio & HT ONLY: Express answers for last two points in standard form***  |  |  |  |
|  | ***Bio ONLY*** *Required practical investigate the effect of antiseptics or antibiotics on bacterial growth using agar plates and measuring zones of inhibition* |  |  |  |
| Bioenergetics  | Describe what happens in photosynthesis, including using a word equation and recognise the chemical formulas for carbon dioxide, water, oxygen & glucose |  |  |  |
| PAPER 1  | Explain why photosynthesis is an endothermic reaction |  |  |  |
|  | Recall the limiting factors of photosynthesis |  |  |  |
|  | Explain how limiting factors affect the rate of photosynthesis, including graphical interpretation (limited to one factor) |  |  |  |
|  | **HT ONLY: Explain how the limiting factors of photosynthesis interact, inc graphical interpretation (two/three factors)** |  |  |  |
|  | **HT ONLY: Explain how limiting factors are important to the economics of greenhouses, including data interpretation** |  |  |  |
|  | **HT ONLY: Explain and use inverse proportion in the context of photosynthesis** |  |  |  |
|  | *Required practical : investigate the effect of light intensity on the rate of photosynthesis using an aquatic organism such as pondweed* |  |  |  |
|  | Describe how the glucose produced in photosynthesis is used by plants |  |  |  |
|  | Describe what happens in respiration including using a word equation and recognise the chemical formulas for carbon dioxide, water, oxygen & glucose |  |  |  |
|  | Describe aerobic and anaerobic respiration with regard to the need for oxygen, the differing products and the relative amounts of energy transferred |  |  |  |
|  | Recognise the equations for aerobic respiration, anaerobic respiration in muscles and anaerobic respiration in plants and yeast cells. |  |  |  |
|  | Recall what type of respiration fermentation is and its economic importance.  |  |  |  |
|  | Describe what happens to heart rate, breathing rate and breath volume during exercise and why these changes occur |  |  |  |
|  | Explain what happens when muscles do not have enough oxygen and define the term oxygen debt |  |  |  |
|  | **HT ONLY: Explain what happens to accumulated lactic acid in the body** |  |  |  |
|  | Explain the importance of sugars, amino acids, fatty acids and glycerol in the synthesis and breakdown of carbohydrates, proteins and lipids |  |  |  |
|  | Explain what metabolism is, including examples  |  |  |  |
| Cells topic practicals  |  |  |  |  |
| Microscope required practical  | *Required practical: use a light microscope to observe, draw and label a selection of plant and animal cells* |  |  |  |
|  | Carry out calculations involving magnification using the formula: magnification = size of image/ size of real object -inc standard form |  |  |  |
| Osmosis required practical  | *Required practical : investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue* |  |  |  |
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| PAPER 1 |  | Self Assessment |  |  |
| Topic | Key knowledge/skills | Red | Amber | Green |
| **Ecology** | Explain the terms 'interdependence' and 'stable community' |  |  |  |
| PAPER 2  | Name some abiotic and biotic factors that affect communities |  |  |  |
|  | Explain how a change in an abiotic or biotic factor might affect a community  |  |  |  |
|  | Describe structural, behavioural and functional adaptations of organisms |  |  |  |
|  | Describe what an extremophile is |  |  |  |
|  | Represent the feeding relationships within a community using a food chain and describe these relationships |  |  |  |
|  | Explain how and why ecologists use quadrats and transects |  |  |  |
|  | Describe and interpret predator-prey cycles |  |  |  |
|  | *Required practical: measure the population size of a common species in a habitat. Use sampling to investigate the effect of one factor on distribution* |  |  |  |
|  | Describe the processes involved in the carbon cycle |  |  |  |
|  | Describe the processes involved in the water cycle |  |  |  |
|  | *Bio ONLY: Explain how temperature, water and availability of oxygen affect the rate of decay of biological material* |  |  |  |
|  | *Bio ONLY: Explain how the conditions for decay are optimised by farmers and gardeners, and the reasons for this* |  |  |  |
|  | *Bio ONLY: Describe how methane gas can be produced from decaying materials for use as a fuel* |  |  |  |
|  | *Bio ONLY: Required practical: investigate the effect of temperature on the rate of decay of fresh milk by measuring pH change* |  |  |  |
|  | *Bio ONLY: Explain how environmental changes can affect the distribution of species in an ecosystem (temperature, water and atmospheric gases)* |  |  |  |
|  | Describe what biodiversity is, why it is important, and how human activities affect it |  |  |  |
|  | Describe the impact of human population growth and increased living standards on resource use and waste production  |  |  |  |
|  | Explain how pollution can occur, and the impacts of pollution |  |  |  |
|  | Describe how humans reduce the amount of land available for other animals and plants |  |  |  |
|  | Explain the consequences of peat bog destruction |  |  |  |
|  | Describe what deforestation is and why it has occurred in tropical areas |  |  |  |
|  | Explain the consequences of deforestation |  |  |  |
|  | Describe how the composition of the atmosphere is changing, and the impact of this on global warming |  |  |  |
|  | Describe some biological consequences of global warming |  |  |  |
|  | Describe both positive and negative human interactions in an ecosystem and explain their impact on biodiversity |  |  |  |
|  | Describe programmes that aim to reduce the negative effects of humans on ecosystems and biodiversity |  |  |  |
|  | *Bio ONLY: Describe the different trophic levels and use numbers and names to represent them* |  |  |  |
|  | *Bio ONLY: Describe what decomposers are and what they do* |  |  |  |
|  | *Bio ONLY: Construct pyramids of biomass accurately from data and explain what they represent* |  |  |  |
|  | *Bio ONLY: State how much energy producers absorb from the Sun and how much biomass is transferred* |  |  |  |
|  | *Bio ONLY: Explain how biomass is lost between trophic levels, including the consequences of this and calculate efficiency between trophic levels* |  |  |  |
|  | *Bio ONLY: Explain the term 'food security' and describe biological factors that threaten it* |  |  |  |
|  | *Bio ONLY: Explain how the efficiency of food production can be improved* |  |  |  |
|  | *Bio ONLY: Explain the term 'factory farming', including examples, and ethical objections* |  |  |  |
|  | *Bio ONLY: Explain the importance of maintaining fish stocks at a level where breeding continues* |  |  |  |
|  | *Bio ONLY: Explain some methods that can help to conserve fish stocks* |  |  |  |
|  | *Bio ONLY: Describe how modern biotechnology is used in food production, including the fungus Fusarium as an example* |  |  |  |
|  | *Bio ONLY: Describe the uses of genetically modified organisms in insulin and food production* |  |  |  |
| **Homeostasis and response**  | Describe what homeostasis is and why it is important stating specific examples from the human body |  |  |  |
| PAPER 2  | Describe the common features of all control systems |  |  |  |
|  | State the function of the nervous system and name its important components |  |  |  |
|  | Describe how information passes through the nervous system |  |  |  |
|  | Describe what happens in a reflex action and why reflex actions are important |  |  |  |
|  | Explain how features of the nervous system are adapted to their function, including a reflex arc (inc all types of neurone and the synapse) |  |  |  |
|  | *Required practical 7: plan and carry out an investigation into the effect of a factor on human reaction time* |  |  |  |

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|  | *Bio ONLY: State the function of the brain and how it is structured, including identifying he cerebral cortex, cerebellum and medulla on a diagram of the brain* |  |  |  |
|  | *Bio ONLY: Describe the functions of different regions of the brain* |  |  |  |
|  | ***Bio & HT ONLY: Explain how neuroscientists have been able to map regions of the brain to particular functions*** |  |  |  |
|  | *Bio ONLY: State the function of the eye and how it is structured, including names of specific parts* |  |  |  |
|  | *Bio ONLY: Describe the functions of different parts of the eye, including relating structure to function* |  |  |  |
|  | *Bio ONLY: Describe what accommodation is, and how it is carried out* |  |  |  |
|  | *Bio ONLY: Explain what myopia and hyperopia are and how they are treated, including interpreting ray diagrams* |  |  |  |
|  | *Bio ONLY: Describe how body temperature is monitored and controlled*  |  |  |  |
|  | ***Bio & HT ONLY: Explain how the body's responses act to raise or lower temperature in a given context*** |  |  |  |
|  | Describe how water, ions and urea are lost from the body |  |  |  |
|  | Describe the consequences of losing or gaining too much water for body cells  |  |  |  |
|  | **HT ONLY: Recall that protein digestion leads to excess amino acids inside the body and describe what happens to these** |  |  |  |
|  | Describe how the kidneys produce urine |  |  |  |
|  | **HT ONLY: Describe the effect of ADH on the permeability of the kidney tubules and explain how the water level in the body is controlled by ADH** |  |  |  |
|  | Describe the endocrine system, including the location of the pituitary, pancreas, thyroid, adrenal gland, ovary and testis and the role of hormones |  |  |  |
|  | State that blood glucose concentration is monitored and controlled by the pancreas |  |  |  |
|  | Describe the body's response when blood glucose concentration is too high |  |  |  |
|  | Explain what type 1 and type 2 diabetes are and how they are treated |  |  |  |
|  | **HT ONLY: Describe the body's response when blood glucose concentration is too low** |  |  |  |
|  | **HT ONLY: Explain how glucagon interacts with insulin to control blood glucose levels in the body** |  |  |  |
|  | Describe how kidney failure can be treated by organ transplant or dialysis and recall the basic principles of dialysis |  |  |  |
|  | Describe what happens at puberty in males and females, inc knowledge of reproductive hormones |  |  |  |
|  | Describe the roles of the hormones involved in the menstrual cycle (FSH, LH and oestrogen) |  |  |  |
|  | **HT ONLY: Explain how the different hormones interact to control the menstrual cycle and ovulation** |  |  |  |
|  | Describe how fertility can be controlled by hormonal and non-hormonal methods of contraception (giving specific examples from the spec) |  |  |  |
|  | **HT ONLY: Explain how hormones are used to treat infertility, inc the steps in IVF** |  |  |  |
|  | **HT ONLY: Evaluate the risks and benefits of fertility treatments** |  |  |  |
|  | **HT ONLY: Describe the functions of adrenaline and thyroxine in the body, and recall where they are produced** |  |  |  |
|  | **HT ONLY: Explain the roles of thyroxine and adrenaline in the body as negative feedback systems** |  |  |  |
|  | *Bio ONLY: Describe hormone-linked plant responses, to include phototropism and gravitropism and the role of auxin*  |  |  |  |
|  | ***Bio & HT ONLY: Describe the functions of gibberellins and ethene in plants*** |  |  |  |
|  | *Required practical: investigate the effect of light or gravity on the growth of newly germinated seedling* |  |  |  |
|  | **HT ONLY: Explain the use of plant growth hormones are used in agriculture and horticulture (auxins, ethene and gibberellins)** |  |  |  |

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|  |  | Self Assessment |
| Topic | Key knowledge/skills | Red | Amber | Green |
| Inheritance, variation, and evolution  | Describe how genetic information is stored in the nucleus of a cell (inc genes & chromosomes) (examined in paper 1)  |  |  |  |
| PAPER 2  | Describe the processes that happen during the cell cycle, including mitosis (inc recognise and describe where mitosis occurs) (examined in paper 1) |  |  |  |
|  | Describe stem cells, including sources of stem cells in plants and animals and their roles (examined in paper 1) |  |  |  |
|  | Describe the use of stem cells in the production of plant clones and therapeutic cloning (examined in paper 1) |  |  |  |
|  | Discuss the potential risks, benefits and issues with using stem cells in medical research/treatments (inc diabetes and paralysis) (examined in paper 1) |  |  |  |
|  | Describe features of sexual and asexual reproduction |  |  |  |
|  | Describe what happens during meiosis and compare to mitosis |  |  |  |
|  | Describe what happens at fertilisation |  |  |  |
|  | *Bio ONLY: Explain advantages of sexual and asexual reproduction* |  |  |  |
|  | *Bio ONLY: Describe examples of organisms that reproduce both sexually and asexually (malarial parasites, fungi, strawberry plants and daffodils)* |  |  |  |
|  | Describe the structure of DNA and its role in storing genetic information inside the cell |  |  |  |
|  | Explain the term 'genome' and the importance of the human genome (specific examples from spec only) |  |  |  |
|  | *Bio ONLY: Describe the structure of DNA, including knowledge of nucleotide units* |  |  |  |
|  | ***Bio & HT ONLY: Explain complementary base pairing in DNA*** |  |  |  |
|  | ***Bio & HT ONLY: Explain the relationship between DNA bases (ATCG), amino acids and proteins*** |  |  |  |
|  | ***Bio & HT ONLY: Describe how proteins are synthesised on ribosomes, including protein folding and its importance for protein function*** |  |  |  |
|  | ***Bio & HT ONLY: Explain what mutations are, and the possible effects of mutations*** |  |  |  |
|  | ***Bio & HT ONLY: Explain what non-coding parts of DNA are, and why they are important*** |  |  |  |
|  | Describe how characteristics are controlled by one or more genes, including examples |  |  |  |
|  | Explain important genetic terms: gamete, chromosome, gene, allele, genotype, phenotype, dominant, recessive, homozygous and heterozygous |  |  |  |
|  | Explain and use Punnet square diagrams, genetic crosses and family trees |  |  |  |
|  | **HT ONLY: Construct Punnet square diagrams to predict the outcomes of a monohybrid cross** |  |  |  |
|  | Describe cystic fibrosis and polydactyly as examples of inherited disorders |  |  |  |
|  | Evaluate social, economic and ethical issues concerning embryo screening when given appropriate information |  |  |  |
|  | Describe how the chromosomes are arranged in human body cells, including the function of the sex chromosomes |  |  |  |
|  | Explain how sex is determined and carry out a genetic cross to show sex inheritance |  |  |  |
|  | Describe what variation is and how it can be caused within a population |  |  |  |
|  | Describe mutations and explain their influence on phenotype and changes in a species |  |  |  |
|  | Explain the theory of evolution by natural selection |  |  |  |
|  | Describe how new species can be formed |  |  |  |
|  | Describe what selective breeding is  |  |  |  |
|  | Explain the process of selective breeding, including examples of desired characteristics and risks associated with selective breeding |  |  |  |
|  | Describe what genetic engineering is, including examples, and how it is carried out |  |  |  |
|  | Explain some benefits, risks and concerns related to genetic engineering |  |  |  |
|  | **HT ONLY: Explain the process of genetic engineering, to include knowledge of enzymes and vectors** |  |  |  |
|  | *Bio ONLY: Describe different cloning techniques, to include: tissue culture, cuttings, embryo transplants and adult cell cloning* |  |  |  |
|  | *Bio ONLY: Describe the ideas proposed by Darwin in his theory of natural selection and explain why this theory was only gradually accepted* |  |  |  |
|  | *Bio ONLY: Describe other inheritance-based theories that existed (apart from the theory of natural selection), and the problems with these theories* |  |  |  |
|  | *Bio ONLY: Describe the work of Alfred Russel Wallace* |  |  |  |
|  | *Bio ONLY: Explain how new species can be formed* |  |  |  |
|  | *Bio ONLY: Describe how our understanding of genetics has developed over time, to include knowledge of Mendel* |  |  |  |
|  | Describe some sources of evidence for evolution |  |  |  |
|  | Describe what fossils are, how they are formed and what we can learn from them |  |  |  |
|  | Explain why there are few traces of the early life forms, and the consequences of this in terms of our understanding of how life began |  |  |  |
|  | Describe some of the causes of extinction |  |  |  |
|  | Describe how antibiotic-resistant strains of bacteria can arise and spread (inc MRSA) |  |  |  |
|  | Describe how the emergence of antibiotic-resistant bacteria can be reduced and controlled, to include the limitations of antibiotic development |  |  |  |
|  | Describe how organisms are named and classified in the Linnaean system |  |  |  |
|  | Explain how scientific advances have led to the proposal of new models of classification, inc three-domain system |  |  |  |
|  | Describe and interpret evolutionary trees |  |  |  |