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| **AQA Biology (8461) from 2016 Topic B4.1 Cell biology** |
| **Topic**  | **Student Checklist** | **R** | **A** | **G** |
| **4.1.1 Cell structure** | Use the terms 'eukaryotic' and 'prokaryotic' to describe types of cells |  |  |  |
| 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 |  |  |  |
| *Required practical 1: use a light microscope to observe, draw and label a selection of plant and animal cells* |  |  |  |
| 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 |   |   |   |
| Carry out calculations involving magnification using the formula: magnification = size of image/ size of real object -inc standard form |   |   |   |
| *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***  |   |   |   |
| *Required practical 2: investigate the effect of antiseptics or antibiotics on bacterial growth using agar plates and measuring zones of inhibition* |   |   |   |
| **4.1.2 Cell division** | Describe how genetic information is stored in the nucleus of a cell (inc genes & chromosomes) |   |   |   |
| Describe the processes that happen during the cell cycle, including mitosis (inc recognise and describe where mitosis occurs) |   |   |   |
| Describe stem cells, including sources of stem cells in plants and animals and their roles |   |   |   |
| Describe the use of stem cells in the production of plant clones and therapeutic cloning |   |   |   |
| Discuss the potential risks, benefits and issues with using stem cells in medical research/treatments (inc diabetes and paralysis) |   |   |   |
| **4.1.3 Transport in cells** | 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) |   |   |   |
| *Required practical 3: investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue* |   |   |   |
| Describe the process of active transport, including examples - gut and roots |   |   |   |
| Explain the differences between diffusion, osmosis and active transport |   |   |   |

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| **AQA Biology (8461) from 2016 Topic B4.2 Organisation** |
| **Topic**  | **Student Checklist** | **R** | **A** | **G** |
| **4.2.1 Principles of organisation & 4.2.2 Animal tissues, organs and organ systems** | Describe the levels of organisation within living organisms  |  |  |  |
| 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 4: use qualitative reagents to test for a range of carbohydrates, lipids and proteins* |  |  |  |
| *Required practical 5: 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 |  |  |  |
| **4.2.3 Plant tissues, organs and system** | Describe plant tissues (epidermal, palisade mesophyll, spongy mesophyll, xylem, phloem and meristem) and describe their functions |  |  |  |
| Explain how the structure of plant tissues are related to their function within the leaf (plant organ) inc stomata and guard cells |  |  |  |
| Recall the plant parts that form a plant organ system that transports substances around the plant |  |  |  |
| Explain how root hair cells, xylem and phloem are adapted to their functions |  |  |  |
| Describe the process of transpiration and translocation including the role of the different plant tissues |  |  |  |
| Explain how the rate of transpiration can be affected by different factors (inc naming the factors) |  |  |  |
| Describe the role of stomata and guard cells in the control of gas exchange and water loss |  |  |  |

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| **AQA Biology (8461) from 2016 Topic B4.3 Infection and response** |
| **Topic**  | **Student Checklist** | **R** | **A** | **G** |
| **4.3.1 Communicable diseases** | Explain what a pathogen is and how pathogens are spread (inc how viruses, bacteria, protists and fungi are spread in animals and plants) |  |  |  |
| 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) |  |  |  |
| **4.3.2 Monoclonal antibodies** | ***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*** |  |  |  |
| **4.3.3 Plant disease** | *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* |  |  |  |

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| **AQA Biology (8461) from 2016 Topic B4.4 Bioenergetics** |
| **Topic**  | **Student Checklist** | **R** | **A** | **G** |
| **4.4.1 Photosynthesis** | Describe what happens in photosynthesis, including using a word equation and recognise the chemical formulas for carbon dioxide, water, oxygen & glucose |  |  |  |
| 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 6: 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 |  |  |  |
| **4.4.2 Respiration** | 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  |  |  |  |