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| **Topic** | **Biology Student Checklist** | **R** | **A** | **G** |
| **Topic 1: Cell biology** | Use the terms 'eukaryotic' and 'prokaryotic' to describe types of cells |  |  |  |
| Describe the features of bacterial (prokaryotic) cells |  |  |  |
| State the structures found in animal and plant (eukaryotic) cells |  |  |  |
| Describe the functions of the structures in animal and plant (eukaryotic) cells |  |  |  |
| Describe what differentiation is, including differences between animals and plants |  |  |  |
| Describe what a specialised cell is, including examples |  |  |  |
| Define the terms magnification and resolution |  |  |  |
| Compare electron and light microscopes in terms of their magnification and resolution |  |  |  |
| Describe how genetic information is stored in the nucleus of a cell |  |  |  |
| Describe the processes that happen during the cell cycle, including an understanding of mitosis |  |  |  |
| Describe stem cells, including sources of stem cells in plants and animals and their role in an organism |  |  |  |
| Describe the use of stem cells in the production of plant clones and therapeutic cloning |  |  |  |
| Discuss the potential risks, benefits and issues associated with using stem cells in medical research and treatments |  |  |  |
| Describe the process of diffusion, including examples |  |  |  |
| Explain how diffusion is affected by different factors |  |  |  |
| Explain the term "surface area to volume ratio", and how this relates to single-celled and multicellular organisms |  |  |  |
| Explain how the effectiveness of an exchange surface can be increased, including examples of exchange surface adaptations |  |  |  |
| Describe the process of osmosis |  |  |  |
| Describe the process of active transport, including examples |  |  |  |
| Explain the differences between diffusion, osmosis and active transport |  |  |  |
| **Topic 2: Organisation** | Describe the levels of organisation within living organisms |  |  |  |
| Describe basic features of enzymes |  |  |  |
| Describe the lock and key theory as a model of enzyme action |  |  |  |
| 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 |  |  |  |
| Describe the structure of the human heart and lungs |  |  |  |
| Explain how the heart moves blood around the body |  |  |  |
| 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 |  |  |  |
| Describe blood and identify its different components, including identifying blood cells from photographs and diagrams |  |  |  |
| Describe the functions of blood components, including adaptations to function |  |  |  |
| Describe what happens in coronary heart disease |  |  |  |
| Describe treatments for coronary heart disease and heart failure |  |  |  |
| Recall that heart valves can become faulty and describe the consequences of this |  |  |  |
| Describe health and the causes of ill-health |  |  |  |
| Describe how different types of diseases may interact |  |  |  |
| Describe what risk factors are and give examples |  |  |  |
| Describe benign and malignant tumours |  |  |  |
| Describe the known risk factors for cancer, including genetic and lifestyle risk factors |  |  |  |
| Name some plant tissues and describe their functions |  |  |  |
| Explain how the structure of plant tissues are related to their function within the leaf, which is a plant organ |  |  |  |
| That the roots, stem and leaves 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 what transpiration is |  |  |  |
| Explain how the rate of transpiration can be affected by different factors |  |  |  |
| Describe the role of stomata and guard cells in the control of gas exchange and water loss |  |  |  |
| **Topic 3: Infection and response** | Describe what a pathogen is and how pathogens are spread |  |  |  |
| 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 (to include pathology, treatment and disease control) |  |  |  |
| Describe salmonella food poisoning and gonorrhoea as examples of bacterial pathogens (to include pathology, treatment and disease control) |  |  |  |
| Describe the signs, transmission and treatment of rose black spot infection in plants |  |  |  |
| Describe the symptoms, transmission and control of malaria, including knowledge of the mosquito vector |  |  |  |
| Describe defences that stop pathogens entering the human body |  |  |  |
| State the role of the immune system |  |  |  |
| Describe how white blood cells attack 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 |  |  |  |
| **Topic 4: Bioenergetics** | Describe what happens in photosynthesis, including using a word equation |  |  |  |
| **HT ONLY: Describe photosynthesis using a chemical equation** |  |  |  |
| State 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, including graphical interpretation involving two or 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** |  |  |  |
| Describe how the glucose produced in photosynthesis is used by plants |  |  |  |
| Describe basic features of respiration |  |  |  |
| Describe aerobic and anaerobic respiration using word equations |  |  |  |
| **HT ONLY: Describe aerobic and anaerobic respiration (in plants and yeast cells only) using chemical equations** |  |  |  |
| Compare aerobic and anaerobic respiration |  |  |  |
| 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 |  |  |  |
| **HT ONLY: Explain what happens to lactic acid** |  |  |  |
| Explain what metabolism is, including examples |  |  |  |
| **Topic 5: Homeostasis and response** | Describe what homeostasis is and why it is important, and give examples of conditions controlled by homeostasis |  |  |  |
| 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 |  |  |  |
| Describe the endocrine system, including the location of parts and the role of hormones |  |  |  |
| State that blood glucose concentration is monitored and controlled by the pancreas, and describe the body's response when blood glucose 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 water, ions and urea are lost from the body, and 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: Explain how the water level in the body is controlled by ADH** |  |  |  |
| Describe how kidney failure can be treated |  |  |  |
| Describe what happens at puberty in males and females, including knowledge of male and female reproductive hormones |  |  |  |
| name and describe the roles of the hormones involved in the menstrual cycle |  |  |  |
| **HT ONLY: Explain how different hormones interact to control the menstrual cycle and ovulation** |  |  |  |
| Describe how fertility can be controlled by hormonal and non-hormonal methods of contraception |  |  |  |
| **HT ONLY: Explain how hormones are used to treat infertility, including the steps involved in In Vitro Fertilisation (IVF) treatment** |  |  |  |
| **HT ONLY: Evaluate the risks and benefits of fertility treatments** |  |  |  |
| **HT ONLY: Describe the functions of adrenaline and thyroxine in the body, and Recallwhere they are produced** |  |  |  |
| **HT ONLY: Explain the roles of thyroxine and adrenaline in the body as negative feedback systems** |  |  |  |
| **Topic 6: Inheritance, variation and evolution** | Describe features of sexual and asexual reproduction |  |  |  |
| Describe what happens during meiosis |  |  |  |
| Describe what happens at fertilisation |  |  |  |
| 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 |  |  |  |
| Describe how characteristics are controlled by one or more genes, including examples |  |  |  |
| Explain important genetic terms: allele, genotype, phenotype, dominant, recessive, homozygous and heterozygous |  |  |  |
| Understand and use Punnet square diagrams, genetic crosses and family trees |  |  |  |
| **HT ONLY: Construct a Punnet square diagram to predict the outcome 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 as 23 pairs in 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 |  |  |  |
| 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** |  |  |  |
| 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 |  |  |  |
| 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, including knowledge of the three-domain system |  |  |  |
| Describe and interpret evolutionary trees |  |  |  |
| **Topic 7: Ecology** | State what an ecosystem is |  |  |  |
| Describe which resources animals and plants compete for, and why they do this |  |  |  |
| Explain the terms 'interdependence' and 'stable community' |  |  |  |
| name some abiotic and biotic factors that affect communities |  |  |  |
| Explain how a change in an abiotic or biotic factor might affect a community given appropriate data or context |  |  |  |
| Describe structural, behavioural and functional adaptations of organisms |  |  |  |
| Describe what an extremophile is |  |  |  |
| Represent the feeding relationships within a community using a food chain, including the use of scientific terms to describe these relationships |  |  |  |
| Explain how and why ecologists use quadrats and transects |  |  |  |
| Understand and interpret predator-prey cycles |  |  |  |
| Describe the processes involved in the carbon cycle |  |  |  |
| Describe the processes involved in the water cycle |  |  |  |
| 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 programmes that aim to reduce the negative effects on ecosystems and biodiversity |  |  |  |