Metacognition

Overarching Questions

1. Read the question.
2. Put a ★ if you know it and a ? If you do not.
3. Answer all the ★ questions using just your brain.
4. Use your notes/our webpages/books to look up and complete all the ? questions.
5. Mark/verify your answers to the ★ questions using notes/webpage/books.
6. Make any required improvements to 'perfect' your answers.

Cell Biology: Introduction to Cells

★ / ?	Question:	Answer:
	Outline the cell theory and provide evidence and 2 possible exceptions.	
	Explain the importance of surface area to volume ratio and how this links to cell size.	
	Describe the formation of stem cells, how they are used therapeutically and any ethical implications to their use.	

Cell Biology: Ultrastructure of Cells

★ / ?	Question:	Answer:
	Draw a labelled diagram of a prokaryote and outline the function of all labels.	
	Draw and label a eukaryotic cell and outline the function of all labels.	
	Outline the similarities and differences between animal and plant cells.	

Cell Biology: Membrane Structure

★ / ?	Question:	Answer:
	Draw and label the fluid mosaic model of a cell membranes.	
	Outline the functions of the components of the cell membrane.	
	Outline the limitations of the Davson-Danielli model of a cell membrane	

Cell Biology: Membrane Transport

★ / ?	Question:	Answer:
	Outline passive transport mechanisms.	
	Describe the process of active transport.	
	Explain the process of bulk transport of materials into and out of cells. Include information on vesicular transport.	

Cell Biology: The Origin of Cells

★ / ?	Question:	Answer:
	Outline the Miller-Urey experiment and what it shows.	
	Describe the endosymbiotic theory and the evidence for it.	
	Outline Louis Pasteur's experiments into Biogenesis and what they show.	

Cell Biology: Cell Division

★ / ?	Question:	Answer:
	Provide an overview of the cell cycle including the processes that occur during interphase.	
	Describe what occurs during mitosis.	
	Outline the cell cycle involvement in cancer development and factors which influence it.	

Molecular Biology: Molecules to Metabolism

★ / ?	Question:	Answer:
	Outline the composition and functions of carbohydrates, lipids, nucleic acids and proteins.	
	Describe metabolism including examples of catabolism and anabolism.	
	Outline vitalism and its falsification.	

Molecular Biology: Water

★ / ?	Question:	Answer:
	Draw and label a diagram of water molecules interacting and bonding.	
	Outline the thermal, cohesive and solvent properties of water.	
	Describe how the above properties are useful in organisms.	

Molecular Biology: Carbohydrates and Lipids

★ / ?	Question:	Answer:
	Draw the formation of a disaccharide and outline possible functions.	
	Draw and label the formation of a lipid, outline the possible functions and types of lipids.	
	Outline the structure and function of different sugar based polymers.	

Molecular Biology: Proteins

★ / ?	Question:	Answer:
	Draw and label the production of a dipeptide.	
	State the name and function of different proteins in organisms.	
	Outline the different protein types and provide examples where possible (primary, secondary etc.)	

Molecular Biology: Enzymes

★ / ?	Question:	Answer:
	Annotate a diagram to show the action of an enzyme.	
	Outline how different factors affect enzyme action.	
	Outline how lactose free milk is produced and why it might be needed.	

Molecular Biology: Structure of DNA and RNA

★ / ?	Question:	Answer:
	Draw and label the structure of 4 DNA bases, complementary paired.	
	Describe the structure of DNA including an annotated sketch.	
	Discuss the bonding in both DNA and RNA strands.	

Molecular Biology: DNA Replication, Transcription & Translation

★ / ?	Question:	Answer:
	Outline the process of DNA replication.	
	Describe the stages involved in the transcription of DNA.	
	Explain the process of translation.	

Molecular Biology: Respiration

★ / ?	Question:	Answer:
	Outline the process of glycolysis.	
	Discuss why aerobic produces more ATP that anaerobic respiration.	
	Outline what cell respiration is.	

Molecular Biology: Photosynthesis

★ / ?	Question:	Answer:
	Explain the process of photosynthesis and include information about different wavelengths of light.	
	Describe experiments which can be used to determine the rate of photosynthesis.	
	Outline the factors that affect the rate of photosynthesis and produce sketch graphs for each.	

Genetics: Genes

★ / ?	Question:	Answer:
	Outline the formation of different phenotypes	
	Discuss the human genome project.	
	Outline gene mutations and the formation of sickle cell anemia.	

Genetics: Chromosomes

★ / ?	Question:	Answer:
	Discuss the presence and structure of chromosomes in eukaryotic and prokaryotic cells.	
	Describe what a karyotype is and its potential use, including an example.	
	Describe the methods of sampling used to prepare a karyotope for a fetus and the ethics involved.	

Genetics: Meiosis

★ / ?	Question:	Answer:
	Draw a chromosome and outline what homologous chromosomes are.	
	Outline the stages of meiosis.	
	Discuss non-disjunction and provide an example.	

Genetics: Inheritance

★ / ?	Question:	Answer:
	Outline the principals of inheritance using Mendel's experiments.	
	Describe sex-linkage using color blindness and hemophilia as examples.	
	Outline the inheritance of blood type and cystic fibrosis.	

Genetics: Gene Modification and Biotechnology

★ / ?	Question:	Answer:
	Describe how PCR and gel electrophoresis can be used in DNA profiling.	
	Outline how gene transfer can be conducted and its possible uses.	
	Describe the production of animal clones and any ethical considerations.	

Ecology: Species, Communities and Ecosystems

★ / ?	Question:	Answer:
	Define species, habitat, population, community, ecosystem, ecology, autotroph, heterotroph, detritivore and saprotroph	
	Outline nutrient cycling and its importance.	
	Describe how Chi-square can be used to test for association between two species.	

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Ecology: Energy Flow

★ / ?	Question:	Answer:
	Outline the flow of energy through a food chain, using an example chain.	
	Outline the shape of pyramids of energy and how this links to efficiency.	
	Discuss how nutrients are recycled in a food web.	

Ecology: Carbon Cycling

★ / ?	Question:	Answer:
	Draw and label a diagram of the carbon cycle, Add labels to the sources and sinks involved.	
	Explain the relationship between rises in concentrations of atmospheric carbon dioxide, methane and oxides of nitrogen and the enhanced greenhouse effect.	
	Outline the production of peat,	

Ecology: Climate Change

★ / ?	Question:	Answer:
	Outline the greenhouse effect, the gases involved and the potential long term impact.	
	Explain how greenhouse gases impact the Earth including using an annotated diagram.	
	Describe the correlation between atmospheric CO_2 levels and global temperature and possible causes.	

Evolution and Biodiversity: Evidence for Evolution

★ / ?	Question:	Answer:
	Outline evolution and the evidence which suggests that it holds true.	
	Outline how speciation can occur.	
	Describe adaptive radiation and compare examples of homologous structures.	

Evolution and Biodiversity: Natural Selection

★ / ?	Question:	Answer:
	Describe how natural selection can occur and lead to evolution.	
	Use the Daphne Major finches' beaks to discuss the concept of natural selection.	
	Explain how antibiotic resistance occurs.	

Evolution and Biodiversity: Classification of Biodiversity

★ / ?	Question:	Answer:
	Distinguish between the phyla for plants using examples.	
	Distinguish between the phyla for animals using examples.	
	Outline the classification systems, and why some species have been reclassified. Give an example.	

Evolution and Biodiversity: Cladistics

★ / ?	Question:	Answer:
	Draw, label and describe the structure of a cladogram (5 species example) with additional definitions for clade and cladistics.	
	Outline the evidence used in the formation of a cladogram and how the molecular clock is involved.	
	Outline convergent evolution and compare analogous and homologous structures.	

Human Physiology: Digestion and Absorption

★ / ?	Question:	Answer:
	Draw and label a diagram of the digestive system. Outline the role of the organs labelled.	
	Explain the use of enzymes within the digestive system, giving source, substrates, products and optimal conditions for each.	
	Discuss the small intestine. Outline the structure, function and movement across it.	

Human Physiology: The Blood System

★ / ?	Question:	Answer:
	Draw and label the structure of the heart. Describe the passage of blood through it.	
	Draw, label and describe the structure and function of the arteries, veins and capillaries.	
	Outline the cardiac cycle and the control of a heartbeat.	

Human Physiology: Defence Against Infectious Disease

★ / ?	Question:	Answer:
	Outline the process of blood clotting and the cause and consequence of this occurring within coronary arteries.	
	Describe immune responses by phagocytes and lymphocytes.	
	Discuss the effect of HIV on the immune system.	

Human Physiology: Gas Exchange

★ / ?	Question:	Answer:
	Draw and label a diagram of the lungs. Outlining how the structure of the alveoli (and the two cell types) aids its function.	
	Outline the process of ventilation with reference to volume, pressure and muscle contractions.	
	Discuss the consequences of lung cancer and emphysema and their causes.	

Human Physiology: Neurons and Synapses

★ / ?	Question:	Answer:
	Draw and label a motor neurone and outline a nerve impulse passes along it.	
	Outline the transmission of an impulse across a synapse and how ACh is recycled. .	
	Discuss the effect of blocking synaptic transmission in insects.	

Human Physiology: Hormones, Homeostasis and Reproduction

★ / ?	Question:	Answer:
	Define homeostasis and the control of blood glucose concentration.	
	Explain the control of body temperature.	
	Outline the role of hormones in the menstrual cycle and annotate a graph to show this.	

Nucleic Acids: DNA Structure and Replication

★ / ?	Question:	Answer:
	Outline the experiment by Hershey and Chase	
	Explain the process of DNA replication.	
	Outline the functions of non-coding DNA.	

Nucleic Acids: Transcription and Gene Expression

★ / ?	Question:	Answer:
	Outline the process of transcription.	
	Describe the post transcriptional modifications and the reasons for them.	
	Discuss the controls of gene expression.	

Nucleic Acids: Translation

★ / ?	Question:	Answer:
	Sketch and label diagrams of a ribosome and a tRNA molecule.	
	Describe the process of translation.	
	Outline the different protein structures which can be produced.	

Metabolic Reactions: Metabolism

★ / ?	Question:	Answer:
	Sketch and label a sequence to describe the induced-fit model.	
	Outline competitive and non-competitive inhibition using an example for each.	
	Describe end-product inhibition using an example.	

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Metabolic Reactions: Respiration

★ / ?	Question:	Answer:
	Describe the process of respiration which includes glycolysis and the link reaction.	
	Outline the Kreb's cycle and be specific about where oxidation, reduction. And decarboxylation occur.	
	Describe what happnes during the electron transport chain and chemiosmosis.	

Metabolic Reactions: Photosynthesis

★ / ?	Question:	Answer:
	Outline the light dependent reactions of photosynthesis.	
	Describe the light-independent reactions and photophosphorylation.	
	Draw and label a chloroplast, describing the function of the parts labelled.	

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Plant Biology: Transport in the Xylem

★ / ?	Question:	Answer:
	Describe the process of transpiration and how an experiment can be set up to measure it.	
	Draw and label a diagram of the xylem with descriptions.	
	Describe the process of absorption of water in the roots.	

Plant Biology: Transport in the Phloem

★ / ?	Question:	Answer:
	Outline the movement of sugars from source to sink.	
	Draw and label a diagram of the phloem relating the structure to its function.	
	Outline the factors which affect transpiration rate	

Plant Biology: Growth in Plants

★ / ?	Question:	Answer:
	Outline how auxins regulate plant growth and the tropisms that can occur.	
	Describe the process of micropropagation.	
	Outline the function of meristems and the occurrence of apical growth.	

Plant Biology: Reproduction in Plants

★ / ?	Question:	Answer:
	Draw and label the structure of a flower and describe the function of the labelled parts.	
	Outline the different ways in which a plant can reproduce.	
	Draw and label the structure of a seed and outline the factors which affect its germination.	

Genetics and Evolution: Meiosis

★ / ?	Question:	Answer:
	Describe the stages of meiosis.	
	Outline the crossing over of chromosomes and the impact this has.	
	Discuss Mendel's Law of independent assortment.	

Genetics and Evolution: Inheritance

★ / ?	Question:	Answer:
	Explain an example of a cross between two linked genes.	
	Discuss Morgan's discovery of non-mendelian ratios in Drosophila.	
	Outline polygenetic inheritance and provide an example.	

Genetics and Evolution: Gene Pool and Speciation

★ / ?	Question:	Answer:
	Outline the different types of selection.	
	Describe the different types of reproductive barriers.	
	Discuss speciation.	

Animal Physiology: Antibody Production and Vaccination

★ / ?	Question:	Answer:
	Outline the principle of challenge and response, clonal selection and memory cells as the basis of immunity.	
	Describe the production of monoclonal antibodies and their use in diagnosis and in treatment.	
	Explain the principle of vaccination.	

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Animal Physiology: Movement

★ / ?	Question:	Answer:
	Draw, label and outline the functions of the different parts of the elbow joint.	
	Draw and label a sketch of a sarcomere.	
	Explain the contraction of skeletal muscle and how this would differ when viewed under an electron microscope. .	

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Animal Physiology: Kidney and Osmoregulation

★ / ?	Question:	Answer:
	Draw and label a diagram of the kidney	
	Outline ultrafiltration and selective reabsorption	
	Discuss the occurrence of osmoregulation and the consequences of over, and dehydration.	

Animal Physiology: Sexual Reproduction

★ / ?	Question:	Answer:
	Draw and label a sperm and an egg and outline the process of fertilization including the prevention of polyspermy.	
	Outline both processes of gametogenesis.	
	Discuss the role of the placenta.	