

5th Year Biology Revision Guide – Summer 2010

Topic	Chapter	You need to know....
Unit 1		
The Scientific Method	1	<ul style="list-style-type: none"> ▪ Definition and examples of the areas of study incorporated in biology. ▪ Process of the scientific method. ▪ Principals of Experimentation
The Characteristics of life	2	<ul style="list-style-type: none"> ▪ General outline of the diversity of living organisms. ▪ The common features and behaviours that identify them with the term "living". ▪ Definition of the terms "metabolism" and "continuity of life". ▪ Definition of the term "life". ▪ Definition and identification of the "characteristics of life" through the fundamental principles and interactions of organisation, nutrition, excretion, response, and reproduction.
Food	3	<ul style="list-style-type: none"> ▪ <u>Function of Food</u> Explanation, in simple terms, of the need for food. ▪ <u>Chemical Elements</u> Identification of the elements present in food: six common elements, (C, H, N, O, P, S), five elements present in dissolved salts (Na, Mg, Cl, K, Ca) and three trace elements (Fe, Cu, Zn). ▪ <u>Biomolecular Structures</u> Combination of elements in different ratios to form simple biomolecular units, e.g. carbohydrates $C_x(H_2O)_y$. ▪ <u>Biomolecular Sources and the Components of Food</u> Carbohydrate, fat and oil (lipid), protein and vitamin: their basic element components, biomolecular components and sources. Vitamins: one water-soluble and one fat-soluble vitamin. ▪ <u>Energy Transfer Reactions</u> Definition of "anabolic" and "catabolic" reaction pathways. Photosynthesis as an example of an anabolic reaction sequence. Respiration as an example of a catabolic reaction sequence. ▪ <u>Structural Role of Biomolecules</u> Carbohydrate – e.g. cellulose as a component of cell walls. Protein – e.g. fibrous proteins – as keratin in hair and skin, myosin in muscles. Lipid, e.g. component of cell membranes. ▪ <u>Metabolic Role of Biomolecules</u> Carbohydrates and lipids as primary sources of energy for metabolic activity. Proteins as enzymes. Hormones as regulators of metabolic activity. Vitamins – e.g. C and D for tissue growth, cell production and health maintenance. Disorders associated with deficiency of a water-soluble and a fat-soluble vitamin. ▪ <u>Minerals</u> Requirement and use of any two minerals present in dissolved salts or in trace amounts in: <ul style="list-style-type: none"> • plants • animals ▪ <u>Water</u> Importance of water for organisms.

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Ecology	4	<ul style="list-style-type: none"> ▪ Definition of “ecology”. ▪ Definition and diversity of “ecosystems”. ▪ Explanation of the term “biosphere”. ▪ Definition of “habitat”. ▪ Definition and examples of the following as applied to terrestrial and aquatic environments: <ul style="list-style-type: none"> • abiotic factors • biotic factors • climatic factors. ▪ Definition and examples of edaphic factors as applied to terrestrial environments. ▪ The sun as the primary source of energy for our planet. ▪ Feeding as a pathway of energy flow. ▪ Development of grazing food chain, food web and pyramid of numbers (explanation, construction, and use). ▪ Explanation of the term “niche”. ▪ Nutrient recycling by organisms: definition. ▪ Outline of the Carbon Cycle and the Nitrogen Cycle. (Names of micro-organisms are not required). ▪ “Pollution” – definition, areas of effect, its control. Study the effects of any one pollutant. ▪ Definition of “conservation”. ▪ “Waste management” – problems associated with waste disposal. ▪ Importance of waste minimisation.
Advanced ecology	5	<ul style="list-style-type: none"> ▪ <u>Pyramid of Numbers (Extended Study)</u> Limitation of use. Inference of pyramid shape. ▪ <u>Ecological Relationships</u> Factors that control populations. Definition and one example of the following control factors: <ul style="list-style-type: none"> • competition • predation • parasitism • symbiosis. ▪ <u>Population Dynamics</u> Outline of the contributory factors or variables in predator and prey relationships.
Study of the Ecosystem	6	<ul style="list-style-type: none"> ▪ Mandatory Field Work
Unit 2		
Cell Structure	7	<ul style="list-style-type: none"> ▪ Microscopy <ul style="list-style-type: none"> ✓ An introduction to the microscope. ✓ Specific reference to the light microscope and the transmission electron microscope. ▪ Cell Structure and Function <ul style="list-style-type: none"> ✓ Components of the cell as seen under the light microscope and their functions. ✓ Plant cells: cell wall, cytoplasm, nucleus, vacuole, and chloroplast. ✓ Animal cells: cytoplasm and nucleus. ✓ In both cases indicate the position and function of the cell membrane. ▪ Cell Ultrastructure <ul style="list-style-type: none"> ✓ Identification and function of the cell membrane, mitochondrion, chloroplast, nucleus, nuclear pores, ribosome, and DNA ▪ Prokaryotic and Eukaryotic Cells <ul style="list-style-type: none"> ✓ Existence and definition of "prokaryotic" and "eukaryotic" cells.
Cell Diversity	8	<ul style="list-style-type: none"> ▪ Tissues <ul style="list-style-type: none"> ✓ Definition of a “tissue”. Exemplify by using four tissue types, two each from a plant and an animal.

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		<ul style="list-style-type: none"> ▪ Organs <ul style="list-style-type: none"> ✓ Definition of an “organ”. Exemplify by using two kinds of organs, one each from a plant and an animal. ▪ Organ Systems <ul style="list-style-type: none"> ✓ Definition of an “organ system”. ✓ Exemplify by using any two animals organ systems.
Diffusion and Osmosis	13	<ul style="list-style-type: none"> ▪ Selective permeability of membranes surrounding the cells and within the cells. ▪ Definition of the terms "diffusion" and "osmosis". Examples of each.
Enzymes	9	<ul style="list-style-type: none"> ▪ Definition of “enzymes”–reference to their protein nature, folded shape, and roles in plants and animals. Special reference to their role in metabolism. ▪ Effect of pH and temperature range on enzyme activity. ▪ Bioprocessing with immobilised enzymes –procedure, advantages and use in bioreactors.
Enzymes and energy carriers	10	<ul style="list-style-type: none"> ▪ The Active Site Theory to explain enzyme function and "specificity". ▪ Explanation of the term "optimum activity" under specific conditions as applied to pH range. Heat denaturation of protein. ▪ Nature and role of ATP, production of ATP from ADP + P + Energy. ▪ Role of NADP⁺ in trapping and transferring electrons and hydrogen ions in cell activities.
Unit 3		
Structure of the flowering plant	24	<ul style="list-style-type: none"> ▪ Organisational Complexity of the Flowering Plant <ul style="list-style-type: none"> ✓ Organisational complexity of the flowering plant as exemplified by the root, stem, leaf, flower, seed, and transport/vascular structures. ✓ Function of the root and shoot system. ✓ Explanation of the term "meristem" – location in the root and shoot. ✓ Location of three tissue types – dermal, ground and vascular in transverse and in longitudinal sections of the root and stem. ✓ Xylem and phloem as examples of vascular tissues – their function and structure. ✓ Identification of dicotyledons and monocotyledons under the headings: woody/herbaceous, arrangement of floral parts, arrangement of vascular bundles, cotyledon or seed leaf number.
Transport, food storage and gas exchange in flowering plants	25	<ul style="list-style-type: none"> ▪ Nutrition in the Flowering Plant <ul style="list-style-type: none"> ✓ Autotrophic nature of plants. ✓ Description of the uptake and process of transport of the following through the plant: <ul style="list-style-type: none"> ○ water: to include reference to root hairs, root cortex, xylem, osmosis, diffusion, root pressure, transpiration, and stomata ○ minerals: to include solubility in water, transport from the roots to all parts of the plant by the same route as water ○ carbon dioxide: directly from respiring cells or through stomata ○ photosynthetic products: production of ✓ carbohydrate and transport through phloem sieve tube cells. ▪ Modified Plant Food Storage Organs <ul style="list-style-type: none"> ✓ One example of a root, stem and leaf modification as a food storage organ. ▪ Cohesion – Tension Model of Xylem Transport <ul style="list-style-type: none"> ✓ <i>As related to attractive forces of water molecules, cohesive property, role of transpiration. Refer to the work of Dixon and Joly.</i> ▪ The Structure of an Exchange System in Flowering Plants <ul style="list-style-type: none"> ✓ Examination of the structure of the leaf in relation to gaseous exchange. Reference to the presence of lenticels in stem structures.

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		<ul style="list-style-type: none"> ▪ Plant Excretion ✓ The role of leaves as excretory organs of plants.
Blood	26	<ul style="list-style-type: none"> ▪ Composition of blood, role of red blood cells, white blood cells, platelets, and plasma. ▪ <i>More detailed treatment of red blood cells</i> – e.g. absence of nucleus, absence of mitochondria. White blood cells – classification as lymphocytes and monocytes ▪ (Classification of white blood cells not required). ▪ Blood grouping – names of the common blood groups A, B, AB, O and the Rhesus factors. ▪
The heart and blood vessels and links with other systems	27	<ul style="list-style-type: none"> ✓ The circulatory system: description of the structures and organisation of tissues in the closed circulatory system in humans, strong muscular heart and vessels (arteries, veins, capillaries, venules, arterioles). ✓ Role of muscle tissues and valves. ✓ Two-circuit circulatory system. ✓ Drawing of the structure of the heart, the main pathways of blood circulation, including the hepatic portal system. ✓ Cardiac supply through the cardiac artery and vein. ✓ Simple understanding of: <ul style="list-style-type: none"> • heartbeat and its control • pulse • blood pressure. ✓ <i>An awareness of specialised heart muscle tissue and the existence and location of pacemaker nodes (SA and AV).</i> ✓ <i>The heart cycle, systole and diastole periods.</i>
The Lymphatic system	28	<ul style="list-style-type: none"> ▪ The lymphatic system: <ul style="list-style-type: none"> ✓ structure: lymph nodes, lymph vessels ✓ any three functions.
Human Nutrition	29	<ul style="list-style-type: none"> ▪ Nutrition in the Human ✓ Heterotrophic organisms – “omnivore” (human), “herbivore” and “carnivore” – definition of terms. ✓ Explanation of the term “digestion”. ✓ Outline the need for digestion and a digestive system. ✓ Explanation of the terms “ingestion”, “digestion”, “absorption” and “egestion” as related to the sequence in the human digestive tract. ▪ Human Digestive System ✓ Macrostructure and basic function of the alimentary canal and associated glands in the digestion and transport of nutrients. ✓ Explanation of the mechanical breakdown and transport of food, to include the role of teeth, peristalsis, and the stomach. ✓ Explanation of the chemical breakdown of food, to include: <ul style="list-style-type: none"> ○ bile salts ○ the role, production site, pH at a ✓ named location of action and products of an amylase, a protease and a lipase enzyme. ✓ Two functions of symbiotic bacteria in the <ul style="list-style-type: none"> ▪ digestive tract. ✓ Benefits of fibre. ✓ Basic structure of the small intestine and large intestine in relation to their functions ▪ Blood Transport of Nutrients ✓ Description of the composition of blood fluid as a transport system of nutrients, the absorption of nutrients from the villi, transport through the hepatic portal vein to the liver. ✓ The function of the liver (without biochemical pathways). ✓ The transport of nutrients to all nutrient requiring cells of the body, and the transport of waste products to the kidney.

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		<ul style="list-style-type: none"> ▪ Balanced Human Diet ✓ Explain the concept of a balanced diet, variety, and moderation. Relate its importance to age, sex and activity (detailed breakdown not required), and to variety from a selection of food groups – milk and milk products; meat, fish and poultry; breads and cereals; fruit and vegetables; others, e.g. fats, oils, alcohol.
Homeostasis	30	<ul style="list-style-type: none"> ✓ Definition of “homeostasis”. ✓ The necessity for homeostasis in living organisms.
Human Breathing	31	<ul style="list-style-type: none"> ✓ Macrostructure and basic function of the breathing tract in humans. ✓ Essential features of the alveoli and capillaries as surfaces over which gas exchange takes place. ✓ Description of the mechanism of the breathing system in the exchange of gases in humans. ✓ <i>Carbon dioxide level as a controlling factor in the human breathing (respiratory) system.</i>
Excretion	32	<ul style="list-style-type: none"> ✓ Role of the excretory system in homeostasis. ✓ Function, location and excretory products of the lungs, skin, and urinary system. ✓ Macrostructure and basis function of the urinary excretory system in humans (kidney, ureters, urinary bladder, and urethra). ✓ Role of the kidney in regulating body fluids. ✓ Identification of the site of filtration. Reabsorption ✓ in the cortex, in the medulla and renal pelvis. ✓ Description of the pathway of urine from the kidney to the urethra. ✓ <i>The nephron structure and its associated blood supply.</i> ✓ <i>Formation of urine: Bowman’s capsule, passage of glomerular filtrate through the proximal convoluted tubule, where reabsorption of required body substances takes place – glucose, amino acids, some salts and water reabsorbed into the blood by osmosis, diffusion, and active transport.</i> ✓ <i>More water reabsorbed in the Loop of Henle and the distal convoluted tube.</i> ✓ <i>Urine passes into the pelvis of the kidney and to the bladder for storage.</i> ✓ <i>Reabsorption of water in the collecting duct is under hormonal influence (ADH). Its action depends on the water content of the blood.</i>

The Exam

Length: 2 hours

Total Marks: 340 Marks

Layout:

Section A - Answer 5 questions. Each question carries 20 marks giving a total of 100 marks for this section. You must write your answers into the space provided on the question sheet. Questions can come from Unit 1, 2 and 3 (suggested time 30 minutes)

Section: B - The 2 questions from this section are based on the mandatory experiments you did in class. Each question carries 30 marks giving a total of 60 marks for this section. (suggested time 30 minutes)

Section: C - These are the long questions there will be one on each Unit. (i.e. 3 questions). Each Question carries 60 Marks (suggested time 60 minutes)