BIOLOGY 'A' SCHEME OF WORK – Topic 1

Week number	Content of lessons	Spec ref	Teaching suggestions
1	Understand the importance of water as a solvent in transport, including its dipole nature. Know the difference between monosaccharides, disaccharides and polysaccharides, including glycogen and starch (amylose and amylopectin). Be able to relate the structures of monosaccharides, disaccharides and polysaccharides to their roles in providing and storing energy.	1.2 1.12i 1.12ii	Use of model beads to construct water and carbohydrate molecules Use of paper shapes to construct carbohydrate molecules
2	Know how monosaccharides join to form disaccharides (sucrose, lactose and maltose) and polysaccharides (glycogen and amylose) through condensation reactions forming glycosidic bonds, and how these can be split through hydrolysis reactions. Know how a triglyceride is synthesised by the formation of ester bonds during condensation reactions between glycerol and three fatty acids. Know the differences between saturated and unsaturated lipids.	1.13 1.14i 1.14ii	Use of immobilised lactase to show hydrolysis of the disaccharide lactose into the monosaccharides glucose and galactose Use of model beads to construct lipids Use of paper shapes to construct lipids
3	Understand why many animals have a heart and circulation (mass transport to overcome limitations of diffusion in meeting the requirements of organisms). Know the cardiac cycle (atrial systole, ventricular systole and cardiac diastole) and relate the structure and operation of the mammalian heart, including the major blood vessels, to its function.	1.1 1.4i	Dissect sheep heart Use of animations Use of heart model Use of model body showing major blood vessels

	Know how the relationship between heart structure and function can be investigated practically.	1.4ii	
4	Understand how the structures of blood vessels (capillaries, arteries and veins) relate to their functions. CORE PRACTICAL 1: Investigate the effect of caffeine on heart rate in daphnia. Discuss the potential ethical issues regarding the use of invertebrates in research. Understand the blood-clotting process (thromboplastin release, conversion of prothrombin to thrombin and fibrinogen to fibrin) and its role in cardiovascular disease (CVD).	1.3 1.17 1.6	Look at prepared slides showing an artery and a vein. Demonstrate elastic recoil by suspending a ring of artery and vein from a hook on a clamp stand and record the length with a 10g mass attached to the free end. CORE PRACTICAL 1 Hold a debate on ethics Look at prepared microscope slides showing blood cells, including platelets
5	Understand the course of events that leads to atherosclerosis (endothelial dysfunction, inflammatory response, plaque formation, raised blood pressure). Know how factors such as genetic, diet, age, gender, high blood pressure, smoking and inactivity increase the risk of cardiovascular disease (CVD). Know the benefits and risks of treatments for cardiovascular disease (CVD) (antihypertensives, statins, anticoagulants and platelet inhibitors).	1.5 1.7 1.18	Use ECG traces to calculate heart rate. Use of research linking factors to CVD and its treatments.
6	Be able to analyse and interpret data on the possible significance for health of blood cholesterol levels and levels of high-density lipoproteins (HDLs) and low-density lipoproteins (LDLs).	1.15i	Analysis of data from research on blood cholesterol and CVD.

	Know the evidence for a causal relationship between blood cholesterol levels (total cholesterol and LDL cholesterol) and cardiovascular disease (CVD).	1.15ii	Plotting correlations between cholesterol levels and CVD. Calculating coefficients.
	Understand how people use scientific knowledge about the effects of diet including obesity indicators body mass index and waist-to-hip ratio, exercise and smoking to reduce their risk of coronary heart disease.	1.16	Plan a health campaign using information on lifestyle factors and coronary heart disease.
7	CORE PRACTICAL 2: Investigate the vitamin C content of food and drink.		CORE PRACTICAL 2
	Be able to analyse data on energy budgets and diet.	1.11i	Look at evidence, including causality vs correlations, of research into weight gain and loss and health risks.
	Understand the consequences of energy imbalance, including weight loss, weight gain, and development of obesity.	1.11ii	
	Be able to analyse and interpret quantitative data on illness and mortality rates to determine health risks (including distinguishing between correlation and causation and recognising conflicting evidence).	1.8	Debate and devise a plan to improve the health of the nation.
8	Be able to evaluate the design of studies used to determine health risk factors including sample selection and sample size used to collect data that is both valid and reliable.	1.9	Look at some original research using different designs and debate their validity.
	Understand why people's perceptions of risks are often different from the actual risks including underestimating and overestimating the risks due to diet and other lifestyle factors in the development of heart disease.	1.10	Class discussion of risk perception and possible factors.

BIOLOGY 'A' SCHEME OF WORK – Topic 4

Week number	Content of lessons	Spec ref	Teaching suggestions
1	Know the ultrastructure of plant cells (cell walls, chloroplasts, amyloplasts, vacuole, tonoplast, plasmodesmata, pits and middle lamella) and be able to compare it with animal cells.	4.7	Use of prepared slides of plant tissues and electron microscope (EM) images of plant tissue to show different plant organelles.
	Be able to recognise the organelles in 4.7 from electron microscope (EM) images.	4.8	
	Understand the structure and function of the polysaccharides starch and cellulose, including the role of hydrogen bonds between β-glucose molecules in the formation of cellulose microfibrils.	4.9	Diagrams of structure of cellulose vs starch to illustrate structure related to function
2	Understand how the arrangement of cellulose microfibrils and secondary thickening in plant cell walls contributes to the physical properties of xylem vessels and sclerenchyma fibres in plant fibres that can be exploited by humans.	4.10	Use of prepared slides of plant tissue to show xylem and phloem etc. Examination of different aged sections through plant stems.
	Know the similarities and differences between the structures, position in the stem and function of sclerenchyma fibres (support), xylem vessels (support and transport of water and mineral ions) and phloem (translocation of organic solutes).	4.11	Illustrate dendrochronology using different aged stems of trees etc.
	CORE PRACTICAL 6: Identify sclerenchyma fibres, phloem sieve tubes and xylem vessels and their location within stems through a light microscope		CORE PRACTICAL 6
	CORE PRACTICAL 8: Determine the tensile strength of plant fibres practically.		CORE PRACTICAL 8

3	Understand how the uses of plant fibres and starch may contribute to sustainability, including plant-based products to replace oil-based plastics. Understand the importance of water and inorganic ions (nitrate, calcium ions and magnesium ions) to plants. CORE PRACTICAL 7: Understand how to investigate plant mineral deficiencies practically.	4.15 4.12	Research and presentations by students on the use of plant-based products. CORE PRACTICAL 7
4	Understand the development of drug testing from historic to contemporary protocols, including William Withering's digitalis soup, double blind trials, placebo, three-phased testing. Understand the conditions required for bacterial growth. CORE PRACTICAL 9: Investigate the antimicrobial properties of plants, including aseptic techniques for the safe handling of bacteria.	4.13 4.14	Use of historical description of drug testing including William Withering's work. CORE PRACTICAL 9
5	Know that over time the variety of life has become extensive but is now being threatened by human activity. iUnderstand the terms biodiversity and endemism. iKnow how biodiversity can be measured within a habitat using species richness and within a species using genetic diversity by calculating the heterozygosity index (H). How biodiversity can be compared in different habitats using Simpson's diversity index (D).	4.1 4.2i 4.2ii 4.2iii	Historical study of life on earth Use of data to calculate the heterozygosity index and Simpson's index

6	Understand the concept of niche and be able to discuss examples of adaptation of organisms to their environment (behavioural, physiological and anatomical).	4.3	Use of examples of niche e.g. bird feeding behaviours and beak types.
	Understand how natural selection can lead to adaptation and evolution.	4.4	
	Understand how the Hardy-Weinberg equation can be used to see whether a change in allele frequency is occurring in a population over time.	4.5i	Calculations using data and the Hardy-Weinberg equation
	iUnderstand that reproductive isolation can lead to accumulation of different genetic information in populations potentially leading to the formation of new species.	4.5ii	Case studies of isolation and speciation
7	Understand that classification is a means of organising the variety of life based on relationships between organisms using differences and similarities in phenotypes and in genotypes, and is built around the species concept.	4.6i	Use of examples of classification on the basis of genotype and phenotype.
	Understand the process and importance of critical evaluation of new data by the scientific community, which leads to new taxonomic groupings, including the three domains of life based on molecular phylogeny, which are Bacteria, Archaea, Eukaryota	4.6ii	Debate/discussion about the three domain approach to classification
	Be able to evaluate the methods used by zoos and seed banks in the conservation of endangered species and their genetic diversity, including scientific research, captive breeding programmes, reintroduction programmes and education.	4.16	Visit to a zoo or seed bank to explore breeding programmes.