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| Topic | Sub topic | 1 | 2 | 3 |
| 1a Cell Biology | Cell structure – prokaryote, eukaryote, nucleus, cytoplasm, cell membrane, mitochondria, ribosomes, cell wall, vacuole, chloroplasts, plasmid |  |  |  |
|  | Microscopy – AIM, light, electron, magnification, resolution, millimetre, micrometre |  |  |  |
|  | Cell differentiation and specialisation – differentiate, sperm, nerve, muscle, root hair, xylem & phloem |  |  |  |
|  | Chromosomes – nucleus, DNA, gene, characteristics |  |  |  |
|  | Mitosis – cell cycle, offspring, grow, replace, copies, daughter cells, clones |  |  |  |
|  | Binary fission – circular DNA, plasmid, poles, mean division time |  |  |  |
|  | Stem cells – undifferentiated, embryos, bone marrow, therapeutic cloning, ethics |  |  |  |
| RP | Using a light microscope (observing onion cells) |  |  |  |
| RP | Culturing microorganisms |  |  |  |
| 1b Transport in cells | Diffusion – concentration gradient, surface area, temperature |  |  |  |
|  | Osmosis – water, partially permeable membrane, diffusion, dilute, concentrated |  |  |  |
|  | Active transport – energy, against, root hairs, gut |  |  |  |
|  | Exchange surfaces – surface area: volume |  |  |  |
|  | Exchanging substances – oxygen, carbon dioxide, urea, alveoli, villi, blood supply, surface area, thin, gills, filaments, lamellae, gas exchange, stomata, water vapour |  |  |  |
| RP | Investigating the effect of sugar solutions on plant cells (osmosis in potato cylinders) |  |  |  |
| 2a Tissues, organs and organ systems | Cell organisation – multicellular, cell, tissue, organ, organ system |  |  |  |
|  | The lungs – thorax, alveoli, intercostal muscles, diaphragm, trachea, bronchi, bronchioles, gas exchange, breathing rate |  |  |  |
|  | Circulatory system –The heart – double circulation, muscle, ventricle, atrium, aorta, vena cava, pulmonary vein, pulmonary artery, valves, coronary arteries, pacemaker |  |  |  |
|  | Circulatory system –The blood vessels – artery, vein, capillary, pressure, lumen, muscle, elastic, valves, permeable |  |  |  |
|  | Circulatory system –The blood – RBCs, WBCs, plasma, platelets, haemoglobin, oxyhaemoglobin, antibodies, antitoxins, phagocytosis, clot |  |  |  |
|  | Plant cell organisation – epidermis, xylem & phloem, palisade mesophyll, spongy mesophyll, meristem, chloroplasts, stomata |  |  |  |
|  | Transpiration and translocation – phloem, pores, sap, direction, living, dead, lignin, water, mineral ions, transpiration stream |  |  |  |
|  | Transpiration and stomata – light intensity, temperature, air flow, humidity, photometer, guard cells, turgid, flaccid |  |  |  |
| 2b Health and disease | Introduction to health and disease – communicable |  |  |  |
|  | Cardiovascular disease - coronary heart disease, stents, statins, artificial hearts, heart valves, artificial blood |  |  |  |
|  | Risk factors for non-communicable diseases – risk factors, correlation, cause, |  |  |  |
|  | Cancer – benign, malignant, risk factors |  |  |  |
| 2c Enzymes and digestion | Enzymes – catalyst, active site, substrate, specific, optimum, denature |  |  |  |
|  | Enzymes and digestion – mechanical, chemical, carbohydrase, protease, lipase, |  |  |  |
|  | Food tests – Benedict’s, iodine, biuret, Sudan III |  |  |  |
| RP | Investigate the effect of pH on the rate of reaction of amylase enzyme |  |  |  |
| RP | Food tests: Test for carbohydrates, lipids, proteins, sugar |  |  |  |
| 3 Infection and response | Communicable disease – pathogen, bacteria, virus, protest, fungi, hyphae, toxins, vector, parasite |  |  |  |
|  | Viral diseases – measles, HIV, TMV, |  |  |  |
|  | Fungal and protist diseases – rose black spot, malaria |  |  |  |
|  | Bacterial diseases and preventing disease – gonorrhoea, Salmonella |  |  |  |
|  | Fighting disease – immune, phagocytosis, antitoxins, antibodies |  |  |  |
|  | Fighting disease – vaccination – antibodies, immune, risk, epidemic |  |  |  |
|  | Fighting disease –drugs – painkillers, antibiotics, resistance, mutate, aspirin, digitalis, penicillin |  |  |  |
|  | Developing drugs – testing, efficacy, toxicity, clinical trial, optimum, placebo, blind, double blind |  |  |  |
|  | Monoclonal antibodies – B lymphocytes, antigens, hybridoma, specific |  |  |  |
|  | Monoclonal antibody uses – pregnancy test, beads, antibodies, control window, anti-cancer drugs |  |  |  |
|  | Plant diseases and defences – deficiency, infestation, physical, chemical & mechanical defences |  |  |  |
| 4 Bioenergetics | Photosynthesis – glucose, chloroplasts, chlorophyll, |  |  |  |
|  | How plants use glucose - cellulose, lipids, starch, respiration |  |  |  |
|  | Rate of photosynthesis – limiting factors |  |  |  |
|  | Photosynthesis inverse square law (higher) – light intensity, inversely proportional |  |  |  |
|  | Artificially controlling plant growth (higher) – greenhouse, costs |  |  |  |
|  | Aerobic respiration – exothermic, glucose, mitochondria, energy |  |  |  |
|  | Anaerobic respiration – lactic acid, energy, oxygen debt, yeast, ethanol, fermentation, beer, bread |  |  |  |
|  | Exercise – energy, breathing rate, respiration, fatigue, recovery period |  |  |  |
|  | Metabolism – enzymes, endothermic, exothermic, reactions |  |  |  |
| RP | Investigate the effect of light intensity on the rate of photosynthesis using pondweed |  |  |  |
| 5 a Homeostasis and response | Homeostasis – control systems, coordination systems, effectors, stimuli, negative feedback, optimum |  |  |  |
|  | The nervous system – stimuli, neurones, receptors, effectors, CNS, sensory, motor, relay |  |  |  |
|  | Synapses and reflexes – synapse, neurone, diffuse, impulse, neurotransmitter, reflex arc, unconscious |  |  |  |
|  | The brain – cerebral cortex, medulla, cerebellum, patient studies, MRI scans, electrical stimulation |  |  |  |
|  | The eye – sclera, cornea, pupil, iris, retina, lens, ciliary muscles, suspensory ligaments, optic nerve, iris reflex, accommodation |  |  |  |
|  | Correcting vision defects – hyperopia, myopia, convex lens, concave lens, contacts, laser eye surgery, replacement lens surgery |  |  |  |
|  | Controlling body temperature – thermoregulatory centre, receptors, negative feedback, core, effectors, hairs, sweat, vasodilation, vasoconstriction, shiver |  |  |  |
| RP | The effect of a factor (caffeine) on reaction times |  |  |  |
| 5 b The endocrine system | Hormones – blood, target organ, glands, pituitary, pancreas, thyroid, adrenal glands, ovaries, testes |  |  |  |
|  | Controlling blood glucose – sugar, pancreas, insulin, glycogen, glucagon, diabetes types 1 & 2, treatments, tests |  |  |  |
|  | Controlling water content – kidneys, urine, filtration, selective reabsorption, ions, urea, ADH, pituitary |  |  |  |
|  | Kidney failure – dialysis, kidney transplant, rejections, antibodies, antigens, immunosuppressant drugs |  |  |  |
| 5 c Animal & plant hormones | Puberty and the menstrual cycle – testosterone, oestrogen, egg, uterus, menstruation, lining, ovulation, FSH, LH, progesterone |  |  |  |
|  | Contraceptives – fertility, oestrogen, progesterone, combined pill, patch, implant, condom, diaphragm, IUD, sterilisation, abstinence |  |  |  |
|  | Increasing fertility (Higher) – IVF, egg maturation, fertilisation |  |  |  |
|  | Thyroxine And Adrenaline (Higher) – thyroid gland,, TSH, negative feedback, pituitary, adrenal glands, fight or flight |  |  |  |
|  | Plant hormones – auxin, phototropism, gravitropism, shoots, roots, elongation |  |  |  |
|  | Uses of plant hormones – killing weeds, rooting powder, tissue culture, gibberellins, ethene |  |  |  |
| RP | Investigating plant growth responses |  |  |  |
| 6 a DNA and reproduction | DNA – nucleus, chromosome, gene, double helix, protein, amino acid, genome |  |  |  |
|  | DNA structure – nucleotide, A T G C, base complimentary, non-coding |  |  |  |
|  | Protein synthesis – ribosomes, DNA, mRNA, amino acids, carrier molecules, protein chains, folding |  |  |  |
|  | Mutations – random, inherited, base sequence, amino acids, proteins, insertion, deletion, substitution |  |  |  |
|  | Reproduction – gametes, fertilisations, sexual, variation, asexual, clones, mitosis, 23, 46, fertilisation |  |  |  |
|  | Meiosis – gamete, 23, equator, spindles, embryo |  |  |  |
|  | More on reproduction – variation, survival advantage, selective breeding, energy, identical, malaria, fungi, strawberries |  |  |  |
| 6 b Genetics | X and Y chromosomes – sex, X, XY, fertilisation, genetic diagram |  |  |  |
|  | Alleles and genetic diagrams – gene, allele, homozygous, heterozygous, dominant, recessive, genotype, phenotype, genetic cross, Punnett square |  |  |  |
|  | Inherited disorders – cystic fibrosis, polydactyly, carriers, dominant, recessive, embryonic screening, chorionic villus sampling, pre-implantation genetic diagnosis |  |  |  |
|  | The work of Mendel – pea plants, inherited, dominant, recessive |  |  |  |
| 6C | Variation – genetic, environmental, genes, sex cells, phenotype |  |  |  |
|  | Evolution & extinction – Darwin, variation, success, reproductive age, natural selection, speciation, extinction |  |  |  |
|  | Ideas about evolution – controversy, Lamarck, hypothesis |  |  |  |
|  | Selective breeding – artificial, characteristics, breed, generations, offspring, inbreeding, gene pool |  |  |  |
|  | Genetic engineering – vector, plasmid, insulin, enzymes |  |  |  |
|  | Cloning – tissue culture, cuttings, embryo transplants, adult cell cloning, womb, surrogate, gene pool, ethics |  |  |  |
|  | Fossils – minerals, decay, cast, impression, preservation, fossil record, geological activity |  |  |  |
|  | Speciation – species, breed, isolation, alleles, adaptation, inherited |  |  |  |
|  | Antibiotic – resistant bacteria – mutation, competition, MRSA, prescribe, agriculture |  |  |  |
|  | Classification – Linnaeus, 3 domains, Woese, binomial nomenclature, evolutionary tree, common ancestor |  |  |  |
| 7 a Organisms and their environment | Competition – habitat, population, community, ecosystem, resources, interdependence, stable community |  |  |  |
|  | Abiotic and biotic factors – non-living, living, predators, pathogens, food, moisture, light, oxygen |  |  |  |
|  | Adaptations – structural, behavioural, functional, extremophiles |  |  |  |
|  | Food chains – producer, biomass, predator, prey, primary, secondary & tertiary consumers, cyclic fluctuation |  |  |  |
|  | Environmental change – water, temperature, atmospheric gas, seasonal, geographic, human influence |  |  |  |
|  | Material cycling – evaporation, precipitation, transpiration, carbon, food chain, photosynthesis, burning, decay, respiration, detritus feeders |  |  |  |
|  | Decay – Decomposition, detritus, microbe, temperature, oxygen, water, compost, biogas, methane, fermenter, batch, continuous |  |  |  |
| RP | Using quadrats & transects |  |  |  |
| RP | Decay |  |  |  |
| 7 b Biodiversity & waste | Biodiversity & waste – population, demand, standard of living, waste, water, sewage, land, pollution |  |  |  |
|  | Global warming – insulate, carbon dioxide, methane, greenhouse effect, climate change, sea levels, organism distribution, migration |  |  |  |
|  | Deforestation and land use – quarrying, building, farming, waste, biodiversity, carbon dioxide, peat bogs, compost, decompose. |  |  |  |
|  | Maintaining ecosystems & biodiversity – protection programmes |  |  |  |
| 7 C Biomass, food and biotechnology | Trophic levels – producer, food chain, primary consumer, herbivore, carnivore, omnivore, secondary consumers, tertiary consumers, apex predator, decomposers |  |  |  |
|  | Pyramids of biomass – biomass, pyramid, food chain |  |  |  |
|  | Biomass transfer – 1%, 10%, food chain, waste, respiration, uneaten material, biomass, biomass efficiency calculation |  |  |  |
|  | Food security and farming – population, price, conflict, diets, pathogens, sustainable, overfishing, fishing quotas, net size, factory farm, fish farm |  |  |  |
|  | Biotechnology – mycoprotein, *Fusarium*, insulin, plasmid, restriction enzyme, ligase, sticky ends, recombinant DNA, GM crop |  |  |  |