

BIOLOGY SYLLABUS – GRADE 12

2017-2018

UNIT 1: BIOMOLECULES, REPRODUCTION AND DEVELOPMENT

TERM 1

MODULE 1: CELL AND MOLECULAR BIOLOGY

Aspects of Biochemistry

- Structure and properties of water
- Relationship between the structure and function of the following carbohydrates: glucose, sucrose, starch, glycogen and cellulose
- Structure and function of the following lipids: triglycerides, phospholipids
- Protein structure and function: amino acids, bond formation, protein structure (primary, secondary, tertiary and quaternary), haemoglobin and collagen as examples

Cell Structure

- Function of membrane systems and organelles found in animal and plant cells
 - Rough and smooth endoplasmic reticulum
 - Golgi body
 - Mitochondria
 - Ribosomes
 - Lysosomes
 - Chloroplasts
 - Cell membrane
 - Nuclear envelope
 - Centrioles
 - Nucleus
 - Nucleolus
- Comparison of typical plant and animal cell
- Structure of prokaryotic cell
- Comparison of prokaryotic cells with eukaryotic cells
- Concepts of tissue and organ using the dicotyledonous root as an example

Membrane Structure and Function

- Fluid mosaic model of membrane structure
- Membrane processes: diffusion, facilitated diffusion, osmosis, active transport, endocytosis and exocytosis

Enzymes

- Definitions of metabolism, catabolism, anabolism
- Properties of enzymes
- Mode of action of enzymes – induced fit hypothesis
- Effects of temperature, pH, enzyme concentration and substrate concentration on enzyme activity
- Effects of competitive and noncompetitive inhibitors on enzyme activity

MODULE 2: GENETICS, VARIATION AND NATURAL SELECTION

Structure and Roles of Nucleic Acids

- Structure of RNA and DNA
- DNA replication
- Protein synthesis – transcription and translation
- Roles of RNA and DNA in protein synthesis
- Relationship between DNA structure, protein structure and the phenotype of an organism
- Relationship between DNA, chromatin and chromosomes

Mitotic and Meiotic Cell Division

- Phases of mitosis – interphase, prophase, metaphase, anaphase, telophase, cytokinesis
- DNA replication in relation to genetic stability
- Role and importance of mitosis in growth, repair and asexual reproduction
- Define – homologous pairs of chromosomes, haploid, diploid
- Phases of meiosis – interphase, prophase I, metaphase I, anaphase I, telophase I, prophase II, metaphase II, anaphase II, telophase II, cytokinesis
- Meiosis contributing to genetic variation

TERM 2

MODULE 2: GENETICS, VARIATION AND NATURAL SELECTION

Patterns of Inheritance

- Define – gene, allele, dominant, recessive, codominant, homozygous, heterozygous
- Use genetic diagrams to solve – monohybrid crosses, dihybrid crosses
- Use Chi-square test to check results of genetic crosses
- Determine if observed results match expected ratios using Chi-Square test

Aspect of Genetic Engineering

- Define – genetic engineering, recombinant DNA
- Use of restriction enzymes in genetic engineering
- Steps involved in recombinant DNA technology
- Possible benefits and hazards of gene therapy
- Implications of the use of GMOs on humans and the environment

Variation and Natural Selection

- Variation in sexually produced organisms
- Define – gene and chromosome mutation
- Mutation bringing about genetic variation – Sickle-cell anaemia, Down's Syndrome
- Importance of heritable variation to selection
- Environmental factors as forces of natural selection – resistance to antibiotics, peppered moth
- Natural selection as an agent of change or constancy – direction, disruptive and stabilising selection
- Natural selection bringing about evolution – Darwin's theory, observation and conclusions
- Biological species concept – definition and limitation
- Speciation – isolating mechanisms, allopatric and sympatric speciation

MODULE 3: REPRODUCTIVE BIOLOGY

Asexual Reproduction and Vegetative Propagation

- Explain asexual reproduction – discussing binary fission, budding, spore formation, fragmentation, vegetative propagation, tissue culture
- Advantages and disadvantages of asexual reproduction
- Principles and importance of vegetative propagation – using cuttings and tissue culture as examples

Sexual Reproduction in the Flowering Plant

- Structure of anther and formation of pollen
- Structure of ovule and formation of embryo sac
- Promotion of cross-fertilisation
- Genetic consequences of sexual reproduction
- Pollination to fertilization – significance of double fertilization
- Development of seed and fruit

Sexual Reproduction in Humans

- Structure and function of the male and female reproductive systems
- Gametogenesis – oogenesis, spermatogenesis
- Structure and function of sperm and ovum
- Hormones regulation gametogenesis
- Menstrual cycle
- Fertilization and implantation
- Contraceptive methods – development based on human reproductive anatomy and physiology
- Structure and function of placenta
- Function of amnion
- Possible effects of maternal behaviour on foetal development – nutrition, drug and alcohol abuse, cigarettes