

BGCSE COMBINED SCIENCE

FORMAT OF EXAMINATION

PAPER 1: 50 MULTIPLE CHOICE QUESTIONS (*1 hour 15 mins*)

PAPER 2: STRUCTURED AND SHORT ANSWER QUESTIONS (*1 hour 30 mins*)

PAPER 3: EXTENDED PAPER (*1 hour 30 mins*)

SECTION A: STRUCTURED QUESTIONS

SECTION B: FREE RESPONSE QUESTIONS (3 questions to answer 2)

PAPER 4: COURSEWORK

BIOLOGY

1. Characteristics of living organisms
2. The five kingdoms of classification
3. Cell structure and organization
 - (a) Levels of organization
 - (b) Structure of plant and animal cells
 - (c) Function of the parts of plant and animal cells
 - (d) Differences in structure between plant and animal cells
 - (e) Types of cells and their functions
 - (f) Types of tissues and their functions
 - (g) Organs and organ systems
4. Diffusion and osmosis
 - (a) Definition of diffusion and its importance
 - (b) Definition of osmosis and its importance
5. Enzymes
 - (a) Definition and types of enzymes
 - (b) The effect of temperature and pH on enzyme activity
 - (c) The use of enzymes in detergents
6. Plant Nutrition
 - (a) Definition and word equation for photosynthesis
 - (b) Description of photosynthesis
 - (c) Factors affecting the rate of photosynthesis
7. Transpiration and Translocation
 - (a) Definition of transpiration
 - (b) Relation of water vapour loss to cell surfaces, air spaces and stomata
 - (c) How wilting occurs
 - (d) Definition and description of translocation
8. Diet
 - (a) Definition of diet and balanced diet
 - (b) Relating a balanced diet to age, sex and activity
 - (c) The effects of malnutrition
9. The Human Alimentary Canal and Digestion
 - (a) Structure of the human alimentary canal
 - (b) The four types of teeth and their functions
 - (c) The causes of dental decay and the proper care of the teeth
 - (d) Peristalsis and its importance
 - (e) Enzymes and chemical digestion

10. Absorption and Assimilation
 - (a) Region where absorption takes place
 - (b) The villi and its role in absorption
 - (c) The role of the liver in assimilation

11. Transport in Animals
 - (a) Structure and function of the heart
 - (b) The effect of exercise on heartbeat
 - (c) The effects of named drugs on heart rate
 - (d) Heart attack and its causes
 - (e) Blood vessels: arteries, veins, capillaries
 - (f) Coronary heart disease
 - (g) Blood : composition and function
 - (h) The blood and the immune system

12. Respiration
 - (a) Definition and symbolic equation for aerobic respiration
 - (b) The word and symbolic equations for anaerobic respiration
 - (c) The role of anaerobic respiration in baking and brewing

13. Breathing and gaseous exchange
 - (a) The role of the ribs, intercostal muscles and diaphragm in the ventilation of the lungs
 - (b) The difference in composition between inspired and expired air
 - (c) The features of gaseous exchange surfaces
 - (d) The effects of physical activity on rate and depth of breathing
 - (e) The effects of cigarette smoke and air pollution on gaseous exchange structures

14. Excretion and Homeostasis in Humans
 - (a) Definition of excretion and homeostasis
 - (b) The role of the kidneys in excretion
 - (c) Importance of homeostasis

15. The Human Nervous System
 - (a) Importance of the nervous system
 - (b) Components of the nervous system
 - (c) Voluntary and involuntary actions
 - (d) Reflex actions and reflex arc

16. Receptors
 - (a) Receptors which respond to specific stimuli: light, sound , touch, temperature and chemicals
 - (b) Structure and function of the eye

17. Effectors
 - (a) Action of antagonistic muscles in the movement of the elbow joint
 - (b) Functions of tendons, ligaments, cartilage and synovial fluid

18. Hormones and Chemical Control
 - (a) The chemical control of metabolism by insulin and adrenaline
 - (b) Drug use and abuse – cocaine, alcohol, steroids

19. Sexual Reproduction in Plants
 - (a) Advantages and disadvantages of sexual reproduction
 - (b) Structure and function of a named dicotyledenous flower
 - (c) Pollination and fertilisation
 - (d) Differences between self-pollination and cross-pollination
 - (e) Structural adaptations of insect-pollinated and wind-pollinated flowers
 - (f) Seed formation and the structure of a non-endospermic seed
 - (g) Seed and fruit dispersal

20. Sexual Reproduction in Man
 - (a) Structure and function of the male reproductive system
 - (b) Structure and function of the female reproductive system
 - (c) The role of hormones in the development of the secondary sexual characteristics
 - (d) The menstrual cycle
 - (e) Formation of gametes
 - (f) Sexual intercourse, fertilization and implantation
 - (g) Development and birth
21. Methods of Birth Control
 - (a) Natural, chemical, mechanical and surgical methods
 - (b) Social and population aspects of birth control including artificial insemination
22. Sexually Transmitted Diseases
 - (a) Gonorrhoea and syphilis
 - (b) The human immune – deficiency virus (HIV)
23. Energy Flow, Food Chains and Food Webs
 - (a) Energy flow into biological system
 - (b) Food chains and food web
 - (c) Energy losses between trophic levels
 - (d) Advantages of short food chains and efficiency of feeding at the producer level
24. Ecology
 - (a) Ecosystems and habitat
 - (b) Human influences on an ecosystem
25. Pollution and its Effects
 - (a) Water pollution by sewage and inorganic wastes
 - (b) Air pollution and gaseous exchange surfaces
26. Conservation
 - (a) The need for conservation of natural resources, species and their habitats
 - (b) Recycling of materials – water and paper
27. Biotechnology
 - (a) Definition of biotechnology
 - (b) The economic importance of biotechnology
 - (c) Applications and examples of biotechnology: food technology, mariculture, cloning and hydroponics
 - (d) Detailed study of one method of biotechnology.

CHEMISTRY

1. The particulate nature of matter
 - (a) States of matter
 - (b) Interconversion of the states in terms of the Kinetic theory
2. Atoms, elements and compounds
 - (a) Definition and examples of atoms, elements and compounds
 - (b) Study of the first twenty elements of the Periodic Table - Name, Symbol and Atomic Number
3. Atomic Structure
 - (a) Size and composition of the atom
 - (b) Charges and approximate relative masses of the proton, electron and neutron
 - (c) Atomic mass/relative atomic mass; atomic number
 - (d) Determining the number of protons, neutrons and electrons in an atom
 - (e) Arranging protons, neutrons and electrons (electron configuration) in an atom
 - (f) Valency and its significance

4. Periodic Table
 - (a) Basis and structure of the Periodic Table – groups and periods
 - (b) Important facts about the Periodic Table
 - (c) Using the Periodic Table to explain the electron structure of groups I, II, VII, VIII.
5. Elements, molecules and compounds
 - (a) Difference between element and compound
 - (b) Definition and examples of molecules
 - (c) Differences between mixtures and compounds
 - (d) Differences between metals and non-metals
6. Ions and bonding
 - (a) Formation of ions
 - (b) Types of ions
 - (c) Formation of bonds
 - (d) Types of bonds
7. Stoichiometry (writing and balancing chemical equations)
 - (a) Writing of formulae of simple compounds
 - (b) Calculation of number of atoms in a simple compound
 - (c) Writing of word equations
 - (d) Writing and balancing simple symbolic equations
 - (e) Calculation of relative molecular mass
8. Solutions
 - (a) Definition of solute, solvent and solution
 - (b) Concentrated, dilute and percentage solutions
 - (c) Types of solutions and their uses
 - (d) Solvent properties of water and organic liquids
9. Methods of purification
 - (a) Methods of purification: filtration, crystallization, distillation and fractional distillation
 - (b) Application of methods to everyday life
10. Acids and bases (alkali)
 - (a) Definition of acid, base and alkali with household examples
 - (b) Characteristic properties of acids
 - (c) Characteristic properties of bases
 - (d) The pH scale and use of Universal Indicator
11. Natural Cycles
 - (a) Reservoirs of raw materials: earth, ocean and the atmosphere
 - (b) The carbon, nitrogen and water cycles
12. Water
 - (a) Purification of water supply: filtration and chlorination
 - (b) Hard and soft water
 - (c) Effects of soap and detergents on hard and soft water
 - (d) Water softeners
 - (e) Uses of water in home and industry
13. The Earth's Crust
 - (a) Composition of the earth's crust
 - (b) Common types of ores
 - (c) Relative ease of obtaining metals from their ores (Al and Cu)
 - (d) Uses of some metals (Al and Cu)

PHYSICS

1. Length and Volume
 - (a) The use of rulers and calipers to determine length
 - (b) The use of measuring cylinders and burette to determine volume
 - (c) The use of clocks and devices for measuring an interval of time
2. Mass and weight
 - (a) Difference between mass and weight
 - (b) Measurement of mass and weight
3. Temperature and heat
 - (a) Difference between temperature and heat
 - (b) Measurement of temperature using the Celsius, Fahrenheit and Kelvin scales
4. Speed, Velocity and Acceleration
 - (a) Definition of speed, average speed, velocity, distance, displacement and acceleration.
 - (b) Difference between speed and velocity
 - (c) Calculation of average speed
 - (d) Calculation of acceleration
 - (e) Drawing and interpreting speed-time graphs
5. Forces and motion effects of forces
 - (a) Definition, types and effects of forces
 - (b) Unit for measuring force
 - (c) The relation between force, mass and acceleration
6. Energy, Work and Power
 - (a) Definition and units of energy
 - (b) Forms of energy, its conversion and conservation
 - (c) Devices and processes in which energy is converted from one form to another
 - (d) Energy of motion (kinetic) and energy of position (potential)
 - (e) Calculation of kinetic energy ($KE = 1/2mv^2$)
 - (f) Major energy and alternative energy sources
 - (g) Definition and unit of work
 - (h) Calculation of work done ($W = FXD$)
 - (i) Definition and unit of power
 - (j) The relationship between power, energy and time ($P = E/T$)
 - (k) Calculation of energy using the equation, $E = P \times T$.
7. General Wave Properties
 - (a) Types of wave motions
 - (b) Wave properties: speed, vibration, amplitude, wave length, frequency
 - (c) Calculation of wave speed (speed = frequency x wave length)
8. Sound Waves
 - (a) Properties of sound waves
 - (b) Methods of producing sound waves
 - (c) Simple model to show transmission of sound
 - (d) Diffraction of sound
 - (e) The speed of sound from echo experiments
 - (f) Qualitative effects on the frequency of a vibrating string
9. Light
 - (a) Laws of reflection from a plane mirror
 - (b) Formation of images by concave and convex mirrors
 - (c) Effects of concave and convex mirrors
 - (d) Refraction of light

- (e) Calculation of refractive index
- (f) The use of a single lens as a magnifying glass
- (g) The process of seeing in humans
- (h) The use of lenses in eye-glasses

10. Electricity

- (a) (a) Atomic model and cause of charged particles
- (b) Current electricity
- (c) Conductors and insulators
- (d) A.C. and D.C.: difference, advantages and disadvantages
- (e) Electric charge and the electroscope
- (f) Law of charges
- (g) The rate of flow of charge ($I = Q/T$)
- (h) The use of an ammeter
- (i) Potential difference
- (j) The use of a voltmeter
- (k) Resistance ($R = V/I$)
- (l) Electric circuits : components, symbols and function
- (m) Household electrical system
- (n) Cost of electrical energy (energy = power x time)
- (o) The use of fuses and switches
- (p) Dangers of electricity

11. Magnetism

- (a) (a) Properties of magnets and ferromagnetic substances
- (b) Factors determining field strength
- (c) Methods of magnetization and demagnetization
- (d) Magnetic lines of force
- (e) The properties of magnetically hard and soft materials
- (f) The construction of an electromagnet
- (g) Electromagnetic induction