

## **SYLLABI FOR COMMON ENTRANCE TEST 2012**

### **PHYSICS**

#### **UNIT 1: PHYSICAL WORLD AND MEASUREMENT**

Physics – scope and excitement, society and technology, S I units, Fundamental and derived units. Accuracy and precision of measuring instruments, Errors in measurement, Significant figures.

Dimensions of Physical quantities, dimensional analysis and its applications.

**Marks 02**

#### **UNIT 2: KINEMATICS**

Motion in a straight line: Position-time graph, speed and velocity. Uniform and non-uniform motion, average speed and instantaneous velocity. Uniformly accelerated motion, velocity-time graph, position-time graphs, relations for uniformly accelerated motion, (graphical treatment and calculus approach).

Scalar and Vector quantities, addition and Subtraction of vectors, general Vector and notation, Relative Velocity.

Scalar and Vector products of two vectors with properties, Unit Vector, Resolution of a Vector in plane rectangular components, Motion in a plane, Projectile Motion, cases of Uniform velocity and uniform acceleration.

**Marks 04**

#### **UNIT 3: LAWS OF MOTION**

Concept of force and Inertia, Newton's First Law of motion; Momentum and Newton's Second Law of motion, Impulse; Newton's Third Law of motion. Law of conservation of linear momentum and its applications, Equilibrium of concurrent forces. Friction, static and kinetic friction, laws of friction, rolling friction.

Dynamics of uniform circular motion: Centripetal force and examples of circular motion (vehicle on level circular road, vehicle on banked road.)

**Marks 03**

#### **UNIT 4: WORK, ENERGY AND POWER**

Concept of scalar products of vectors, Work done by a constant force and variable force; kinetic energy, work energy theorem, power.

Potential energy, Potential energy of spring, conservative forces, conservation of mechanical energy (K.E. and P.E.), non-conservative forces; Elastic and inelastic collisions in one and two dimensions.

**Marks 03**

#### **UNIT 5: MOTION OF SYSTEM OF PARTICLES AND RIGID BODY**

Centre of mass of a two-particle system, Centre of mass of a rigid body;

Concepts of vector product of vectors: moment of a force, torque, angular momentum, conservation of angular momentum with some examples.

Moment of inertia, radius of gyration. Values of moment of inertia for simple geometric objects (no derivation), statement of parallel and perpendicular axes theorems and their applications. Rigid body rotation and equations of rotational motion.

**Marks 03**

#### **UNIT 6: GRAVITATION**

The universal law of gravitation. Acceleration due to gravity and its variation with altitude, depth and shape, Kepler's laws of planetary motion. Gravitational potential; gravitational potential energy. Escape velocity. Orbital velocity of satellite. Geo-stationary satellites.

**Marks 03**

#### **UNIT 7: PROPERTIES OF BULK MATTER**

Elastic behavior, Stress-strain relationship. Hooke's Law, Young's modulus, bulk modulus, shear modulus of rigidity.

Pressure due to a fluid column; Pascal's law and its applications (hydraulic lift and hydraulic brakes)

Viscosity, Stokes' law, terminal velocity, streamline and turbulent flow, Reynolds number. Bernoulli's theorem and its applications

Surface energy and surface tension, angle of contact, applications of surface tension – ideas to drops, bubbles and capillary rise.

Heat, temperature, thermal expansion; specific heat, calorimetry; change of state-latent heat. Heat transfer-conduction, convection and radiation, Newton's law of cooling.

**Marks 03**

### **UNIT 8: THERMODYNAMICS**

Thermal equilibrium and definition of temperature (zeroth law of thermodynamics),. Heat work and internal energy. First law of thermodynamics. Second law of thermodynamics: reversible and irreversible processes. Heat engines and refrigerators (concept only)

**Marks 02**

### **UNIT 9: BEHAVIOUR OF PERFECT GAS AND KINETIC THEORY**

Equation of state of a perfect gas, work done on compressing a gas.

Kinetic theory of gases – assumptions, concept of pressure. Kinetic energy and temperature: rms speed of gas molecules; Degrees of freedom, Law of equipartition of energy (Statement only) and applications to specific heat capacities of gases; concept of Mean free path, Avagadro's number.

**Marks 03**

### **UNIT 10: OSCILLATIONS AND WAVES**

Periodic motion – Period, frequency, displacement as a function of time. Periodic functions. Simple harmonic motion (S.H.M.) and its equation; phase; oscillations of a spring-restoring force and force constant; energy in S.H.M. – kinetic and potential energies; Simple pendulum-derivation of expression for its time period; Free, forced and damped oscillations, resonance.

Wave motion. Longitudinal and transverse waves, speed of a wave. Displacement relation for a progressive wave. Principle of superposition of waves, reflection of

waves, Standing waves in strings and organ pipes, fundamental mode and harmonics, Beats, Doppler effect.

**Marks 05**

### **UNIT 11: ELECTROSTATICS**

Electric charges: Conservation of charge, Coulomb's law-forces between two point charges, forces between multiple charges; superposition principle and continuous charge distribution. Electric field: Electric field due to a point charge, Electric field lines, Electric dipole, Electric field due to a dipole, Torque on a dipole in uniform electric field.

Electric flux, Statement of Gauss's theorem and its applications to find field due to infinitely long straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell (field inside and outside).

Electric potential, electric potential due to a point charge, a dipole and system of charges; Equipotential surfaces, Electrical potential energy of a system of two point charges and of electric dipole in an electrostatic field.

Conductors and insulators, Dielectrics and electric polarization, capacitor and capacitance, combination of capacitors in series and in parallel, capacitance of parallel plate capacitor with and without electric medium between the plates, Energy stored in a capacitor.

**Marks 05**

### **UNIT 12: CURRENT ELECTRICITY**

Electric current, Drift velocity, Ohm's law, Electrical resistance, V-I characteristics (linear & non-linear), Electrical energy and power, Electrical resistivity and conductivity, Colour code for carbon resistors; Temperature dependence of resistance.

Internal resistance of a cell, potential difference and emf of a cell, combination of cells in series and in parallel. Kirchhoff's laws and their applications. Wheatstone bridge, Metre bridge. Potentiometer – principle and its application to measure the potential difference and for comparing e.m.f. of two cells; measurement of internal resistance of a cell.

**Marks 05**

### **UNIT 13: MAGNETIC EFFECTS OF CURRENT AND MAGNETISM**

Biot – Savart law and its application to current carrying circular loop. Ampere's law and its applications to infinitely long current carrying straight wire, straight and toroidal solenoids.

Force on moving charge in uniform magnetic and electric fields. Cyclotron.

Force on a current-carrying conductor in a uniform magnetic field. Force between two parallel current-carrying conductors-definition of ampere. Torque experienced by a current loop in uniform magnetic field; Moving coil galvanometer, its current sensitivity and conversation with examples.

Current loop as a magnetic dipole and its magnetic dipole moment, magnetic field lines; Earth's magnetic field and magnetic elements. Para-, dia- and ferromagnetic substances with examples.

Electromagnets and factors affecting their strength, permanent magnets.

**Marks 05**

### **UNIT 14: ELECTROMAGNETIC INDUCTION AND ALT. CURRENTS**

Electromagnetic induction: Faraday's law, induced emf and current; Lenz's Law. Eddy currents. Self and mutual inductance.

Alternating currents, peak and rms value of alternating current/voltage; reactance and impedance; LC oscillations (qualitative treatment only) & LCR circuits series, resonance; power in AC circuits, wattless current. AC generators and transformer.

**Marks 05**

### **UNIT 15: ELECTROMAGNETIC WAVES**

Electromagnetic waves and their characteristics. Transverse nature of electromagnetic waves.

Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, Xrays, gamma rays) including elementary facts about their uses.

**Marks 02**

## **UNIT 16: OPTICS**

Ray optics-Reflection of light, spherical mirrors, mirror formula, refraction of light-Total internal reflection and its applications, Refraction at spherical surfaces, lenses, thin lens formula, Lens-makers Formula, Magnification, Power of a Lens. Combination of thin lenses in contact, Microscope and Astronomical Telescope (reflecting and refracting) and their magnifying powers.

Wave optics: wave front and Huygens' principle, reflection and refraction of plane wave at a plane surface using wave fronts. Proofs of laws of reflection and refraction using Huygen's principle. Interferences, Young's double slit experiment and expression for fringe width, coherent sources and sustained interference of light.

Diffraction due to a single slit, width of central maximum. Resolving power of microscopes and astronomical telescopes, Polarisation, plane polarized light; Brewster's law, uses of plane polarized light and Polaroid's.

**Marks 09**

## **UNIT 17: DUAL NATURE OF MATTER AND RADIATION**

Dual nature of radiation. Photoelectric effect, Hertz and Lenard's observations; Einstein's photoelectric equation; particle nature of light.

Matter waves-wave nature of particle, de Broglie relation. Davission-Germer experiment.

**Marks 02**

## **UNIT 18: ATOMS AND NUCLEI**

Alpha-particle scattering experiment; Rutherford's model of atom; Bohr's model of atom, energy levels, hydrogen spectrum. Composition and size of nucleus, atomic masses, isotopes, isobars; isotones. Radioactivity-alpha, beta and gamma particles/rays and their properties; radioactive decay law. Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number, nuclear fission and fusion.

**Marks 04**

## **UNIT 19: ELECTRONIC DEVICES**

Semiconductors; semiconductor diode: I-V characteristics in forward and reverse bias; diode as a rectifier; I-V characteristics of LED, photodiode, solar cell and Zener diode; Zener diode as a voltage regulator. Junction transistor and its action, characteristics of a transistor; transistor as an amplifier (common emitter configuration) and oscillator. Logic gates (OR, AND, NOT) concept of NAND and NOR gates. Transistor as a switch.

**Marks 04**

## **UNIT 20: COMMUNICATION SYSTEM**

Basic elements of communication system (block diagram only), Bandwidth of signals (speech, TV and digital data); Bandwidth of Transmission medium, Propagation of electromagnetic waves in the atmosphere, sky and space wave propagation.

Need for modulation: Production and detection of an amplitude modulated wave.

**Marks 03**

*Note:*

- 1. 20% of the question should be of numerical type, containing not more than 15 marks.*
- 2. Each numerical should be of the type, it can be solved in about 1/1/2 minutes of time.*

## **SYLLABI FOR COMMON ENTRANCE TEST 2012**

### **CHEMISTRY**

#### **UNIT 1: CHEMICAL ARITHMETIC, ATOMIC STRUCTURE AND NUCLEAR CHEMISTRY**

- a. Laws of chemical combination, mole concept (numericals) calculations using chemical equations. Equivalent weight of oxidizing and reducing agents.
- b. Atomic structure, Bohr's model of Hydrogen atom, Quantum numbers, Pauli's exclusion principle, Hund's rule and Aufbau principle. Heisenberg's uncertainty principle, de-Broglie wave equation and its significance.

**Marks 07**

#### **UNIT 2: CHEMICAL EQUILIBRIUM**

- c. Law of mass action, Le-Chatelier's principle, and its application to physical and chemical equilibria. Ionisation of weak electrolytes (Ostwald's dilution law)
- d. Acids and bases: Acid base equilibria. Bronsted-Lowry and Lewis concept, of acids and bases. Ionic product of water . pH and pOH scales, pKa & pKb values, solubility product, buffer solutions common ion effect, hydrolysis of salts

**Marks 04**

#### **UNIT 3: CHEMICAL KINETICS**

Effect of concentration and temperature on rate of chemical reactions, (Arrhenius Equation) Temperature Co-efficient, Concept of activation energy, First and second order reactions, half-life period, Units of rate constants for zero, first and second order reactions.

**Marks 03**

#### **UNIT 4: SOLUTIONS**

Different ways of expressing the concentration of solutions (molarity, molality, mole fraction, ppm and normality), vapour pressure, Raoult's law, ideal and non-ideal solutions, colligative properties, determination of molecular masses of non-volatile solutes involving various colligative properties, abnormal molecular masses and Van't Hoff Factor.

**Marks 04**

#### **UNIT 5: CHEMICAL THERMODYNAMICS**

Energy changes during chemical reactions, internal Energy and enthalpy changes, Enthalpy of combustion solution and neutralization, Hess's Law (Numerical problems) First, second & third law of thermodynamics, concepts of entropy and Free energy, spontaneity of a chemical reaction and Thermodynamic equilibrium.

**Marks 04**

#### **UNIT 6: REDOX REACTIONS AND ELECTROCHEMISTRY**

Determination of oxidation numbers, oxidation and reduction in terms of electron transfer, dependence of electrode and cell potential on concentration (Nernst Equation), electrode potential as a criteria for product formation in electrolysis. E.M.F. of Galvanic cell, relationship between free energy change and E.M.F. of a cell, definition and units of equivalent, molar and specific conductivity.

**Marks 04**

#### **UNIT 7: SOLID STATE & STATES OF MATTER**

Boyle's Law, charle's law, Dalton's law of partial pressure, Graham's law of diffusion of gases, causes of deviation from ideal behaviour, ideal gas equation and nature of 'R', Vander Waal's equation, surface tension and viscosity of liquids, crystalline and amorphous solids, crystal lattice, crystal types, Packing efficiency, calculation of density of unit cell, number of atoms per unit cell in a cubic cell, co-ordination number, stoichiometric defects (Schottky, Frenkel and interstitial defects.), Properties of solids(electrical, magnetic & dielectric)

**Marks 03**

## **UNIT 8: SURFACE CHEMISTRY & POLYMERS**

Freundlich absorption isotherm, preparation of colloidal solutions by physical and chemical methods, electrical properties (cataphoresis, electrosmosis, coagulation and protective colloids) homogeneous and heterogeneous catalysis. Classification of polymers, addition and condensation free radical cationic and anionic polymerization, commercially important polymers.

**Marks 03**

## **UNIT 9: PERIODIC PROPERTIES**

Classification of elements into s, p, d, and f blocks, variation of ionization energy, electron affinity, electronegativity, atomic and ionic radii along the period and down the group.

**Marks 02**

## **UNIT 10: CHEMICAL BONDING AND MOLECULAR STRUCTURE**

Types of chemical bonds, Ionic & covalent bonds, Bond parameters, quantum theory of covalent bond, pi and sigma bonds, hybridization involving s, p and d-orbitals, dipole moments and hydrogen bond. VSEPR-theory and shapes of simple molecules like H<sub>2</sub>O, NH<sub>3</sub>, SO<sub>2</sub>, CO<sub>2</sub>, PCl<sub>3</sub>, PCl<sub>5</sub>, ClF<sub>3</sub>, BF<sub>3</sub>, SF<sub>4</sub>, XeF<sub>2</sub>, XeF<sub>4</sub>

Molecular orbital theory, bond order and its significance, electronic configuration of H<sub>2</sub>, H<sub>2</sub><sup>+</sup>, He<sub>2</sub>, O<sub>2</sub>, O<sub>2</sub><sup>+</sup>, O<sub>2</sub><sup>-</sup>, O<sub>2</sub><sup>2-</sup> & F<sub>2</sub>.

**Marks 04**

## **UNIT 11: CHEMISTRY OF REPRESENTATIVE ELEMENTS.**

(S and P Block Elements)

Electronic configuration, oxidation states and trends in various properties like ionization energy, electron affinity, atomic radii, electronegativity and diagonal relationship of s and p block elements.

- a. Alkali metals: Hydration of ions, action with ammonia, flame colouration, solubility of hydroxides, carbonates and sulphates.
- b. Alkaline Earth Metals: Solubility of carbonates, hydroxides and sulphates.

- c. Boron Family: Structure of halides, relative acid strength of trihalides of boron.
- d. Carbon family: Hydrides and oxides.
- e. Nitrogen family: Oxides of nitrogen and phosphorous, Reducing nature, basic strength and boiling points of their halides.
- f. Oxygen family: Volatility, thermal stability, and acid character, reducing character and bond angles of their hydrides, oxyacids of sulphur.
- g. Halogen family. Bond energy, colour and oxidizing power, boiling point, acid strength and dipole moment, thermal stability, reducing power of hydrides, relative acidity and oxidizing power of oxyacids of halogens.

**Marks 04**

#### **UNIT 12: TRANSITION METAL INCLUDING LANTHANIDES**

Electronic configuration, oxidation states, colour and magnetic properties of transition elements oxides of V, Cr and Mn, alloys of copper silver and iron, oxidation states of lanthanides.

**Marks 04**

#### **UNIT 13: CO-ORDINATION CHEMISTRY AND ORGANOMETALLICS**

Werner's coordination theory, nomenclature, isomerism in co-ordination compounds (ionization, linkage, hydrate, co-ordination, geometrical and optical), bonding in co-ordination compounds on the basis of V.B. theory, stability of co-ordination compounds in solution, Ferrocene and Zeise's salt.

**Marks 04**

#### **UNIT 14: CHEMISTRY OF METALS**

General aspects of Metallurgy, metallurgy of iron, copper and zinc and their properties, various forms of iron.

**Marks 03**

## **UNIT 15: NOMENCLATURE AND BASIC CONCEPTS IN THE ORGANIC CHEMISTRY**

Nomenclature of organic compounds (monofunctional and polyfunctional groups), inductive, electromeric resonance and hyperconjugation effects, reaction intermediates, carbocations, carbanions and free radicals with their general stability order, types of organic reactions (addition, substitution, elimination and redox reactions), aromaticity on the basis of Huckel rule. Ortho, meta and para directing groups.

**Marks 04**

## **UNIT 16: HYDROCARBONS**

Structural isomerism in alkanes, alkenes, alkynes and arenes, stereoisomerism: geometrical and optical isomerism, chirality, origin of chirality, specific rotation, racemisation and resolution, conformations in ethane and cyclohexane, relative configuration (D,L-Nomenclature), absolute (R and S system of nomenclature).

Reactions of hydrocarbons:-Addition, Substitution and Oxidation reactions, electrophiles and nucleophiles; acidic character of alkynes.

**Marks 04**

## **UNIT 17: ORGANIC CHEMISTRY BASED ON FUNCTIONAL GROUP-I**

(Haloalkanes, haloarenes, alcohols and phenols) General methods of preparation and properties of haloalkanes, haloarenes, alcohols, phenols, chloroform, iodoform.

**Marks 04**

## **UNIT 18: ORGANIC CHEMISTRY BASED ON FUNCTIONAL GROUP-II**

(Ethers, aldehydes and ketones, monocarboxylic acids). General methods of preparation and properties of ethers, aldehydes, ketones and monocarboxylic acids, derivatives of monocarboxylic acids like acid halides, acid anhydrides, acid amides and esters, relative strength of carboxylic acids

**Marks 04**

### **UNIT 19: ORGANIC CHEMISTRY BASED ON FUNCTIONAL GROUP-III**

(Cyanides, isocyanides, nitrocompounds and amines) General methods of preparation and properties of cyanides, Isocyanides, nitrocompounds and amines, relative basic character of amines

**Marks 04**

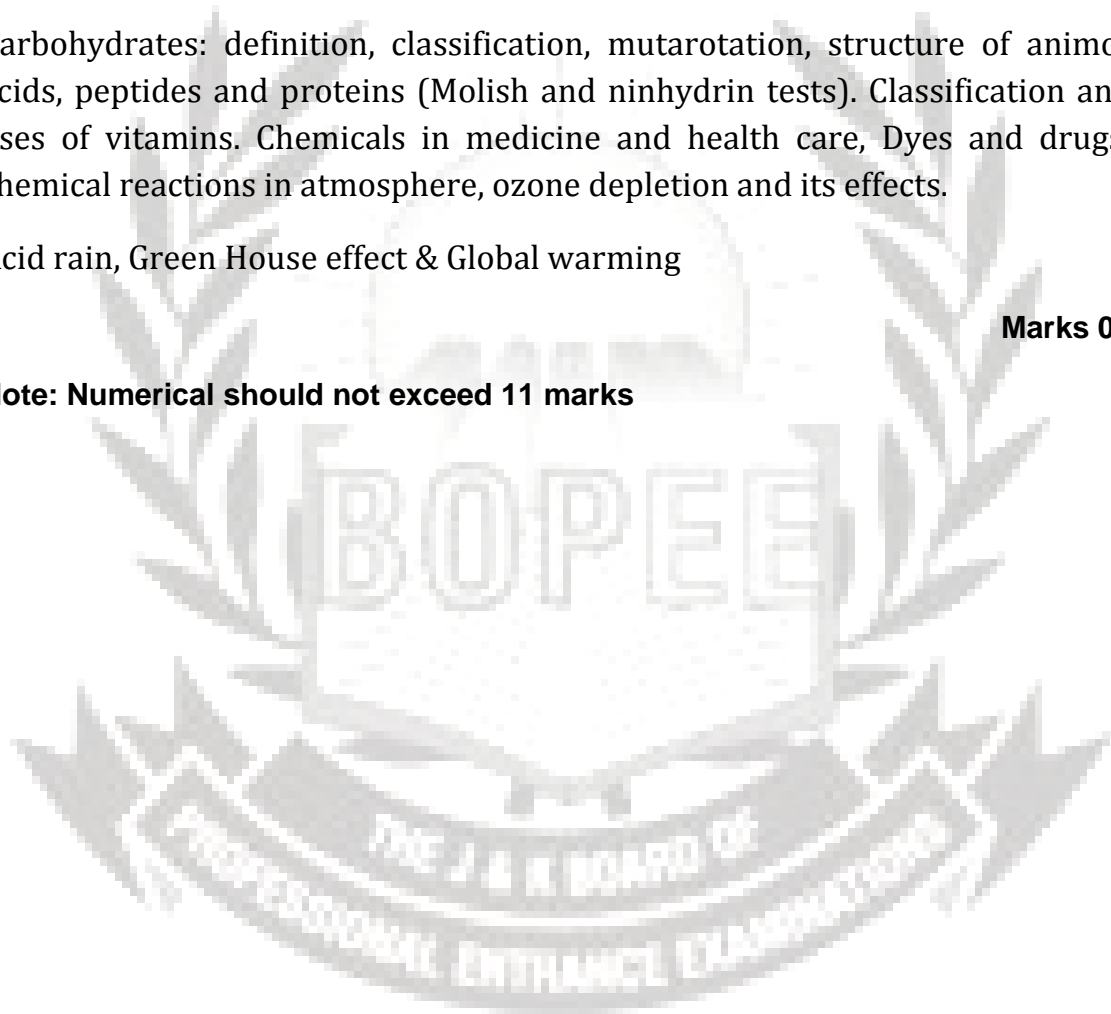
### **UNIT 20: MOLECULES OF LIFE**

Carbohydrates: definition, classification, mutarotation, structure of amino-acids, peptides and proteins (Molish and ninhydrin tests). Classification and uses of vitamins. Chemicals in medicine and health care, Dyes and drugs, chemical reactions in atmosphere, ozone depletion and its effects.

Acid rain, Green House effect & Global warming

**Marks 02**

**Note: Numerical should not exceed 11 marks**



## **SYLLABI FOR COMMON ENTRANCE TEST 2012**

### **BIOLOGY**

#### **BOTANY**

##### **UNIT-1: DIVERSITY AND CLASSIFICATION OF PLANTS**

Systematics—need and history; Salient features of two and five kingdom systems and their merits and demerits; types of classifications (artificial, natural and phylogenetic); General characters of algae, fungi, bryophytes, pteridophytes, gymnosperms and angiosperms; Status of some acellular organisms like viruses and viroids; Lichens---basic characteristics.

**Marks 04**

##### **UNIT-2: MORPHOLOGY AND ANATOMY OF PLANTS**

Morphology of root, stem and leaf and their modifications; types of inflorescence, flower, fruit and seed. Description of Liliaceae, Fabaceae, Solanaceae.

Tissues and tissue system: Types of tissues (meristematic and permanent) and their functions.

Anatomy of dicot and monocot root, stem and leaves; secondary growth.

**Marks 04**

##### **Unit-3: Plant Physiology**

Transport in plants: Mechanisms of transport—diffusion, facilitated diffusion, passive and active transport.

Plant water relations: Water potential; osmosis; plasmolysis; imbibition; long distance transport of water; apoplast, symplast pathways; ascent of sap; root pressure theory and transpirational pull theory.

Transpiration: Types and significance; mechanism of opening and closing of stomata, guttation; phloem transport (Mass Flow hypothesis)

Mineral Nutrition: Criteria for essentiality of nutrients; macro and micro nutrients—their role and deficiency symptoms. Mechanism of nutrient uptake by plants from soil.

Nitrogen metabolism—nitrogen cycle, biological nitrogen fixation.

Photosynthesis: Historical background; site of photosynthesis; various photosynthetic pigments; mechanism of light reaction; photophosphorylation (cyclic and non-cyclic); Dark reaction-fixation of carbon dioxide ( $C_3$  cycle,  $C_4$  cycle); factors affecting photosynthesis; photorespiration.

Respiration: Introduction; glycolysis, Krebs cycle, Electron Transport System; Aerobic and anaerobic respiration; respiratory quotient.

Growth and Development: Characteristics and phases of plant growth; growth curve; differentiation, dedifferentiation and redifferentiation; plant growth regulators-discovery, nature and physiological effects of auxins, gibberellins, cytokinins, ethylene and abscisic acid. Photoperiodism and vernalisation.

**Marks 07**

#### **UNIT-4: REPRODUCTION IN FLOWERING PLANTS**

Modes of reproduction in flowering plants (Vegetative, asexual and sexual); flower structure, development of male and female gametophytes; Pollination—types, agencies and examples; in-breeding and out-breeding, factors promoting out-breeding, pollen-pistil interaction; double fertilization; post-fertilization events; development of endosperm, embryo, seed and fruit; apomixis and polyembryony—types and importance.

**Marks 06**

#### **UNIT-5: GENETICS**

Heredity and variation (somatic and germinal); Mendel's laws of inheritance; deviations from Mendelism; incomplete dominance; co-dominance; multiple alleles; pleiotropy; chromosomal theory of inheritance.

Evidence for DNA as genetic material; structure of DNA and RNA; DNA packaging; DNA replication; Protein synthesis—transcription, translation, genetic code; gene expression and regulation (lac-operon).

**Marks 06**

## **UNIT-6: ECOLOGY AND ENVIRONMENT**

Meaning of ecology, community, ecosystem and niche.

Population and ecological adaptations: Characteristics of populations (birth rate (natality/fecundity), death rate (mortality) and age distribution; population interactions...competition, predation, parasitism and mutualism.

Ecosystems: Biotic and abiotic components; energy flow, nutrient cycling (carbon and phosphorus), litter decomposition and primary productivity; pyramids of number, biomass and energy; ecological succession types.

Biodiversity and its conservation: Levels of biodiversity; threats to biodiversity; megabiodiversity countries and biodiversity hotspots; IUCN threat categories; in situ and ex situ methods of biodiversity conservation.

Environmental issues: Causes and consequences of air and water pollution and their control; solid waste management; agrochemicals and their effect; greenhouse effect and global warming; stratospheric ozone layer depletion—causes and consequences.

**Marks 07**

## **UNIT- 7: BIOLOGY AND HUMAN WELFARE**

Plant breeding: Introduction, steps in plant breeding and application of plant breeding.

Tissue culture: Cellular totipotency; technique and application of tissue culture

Microbes in human welfare: Role of microbes in food processing; industrial production; sewage treatment; energy production (biogas); biopesticides and biofertilizers

Elementary idea of Genetically Modified Organisms (GMOs); biopiracy and patents.

**Marks 03**

# ZOOLOGY

## UNIT-8: DIVERSITY IN THE LIVING WORLD.

Characteristic features of living organisms

Salient features of different animal phyla (non-chordates upto phylum level, chordates upto class level)

National parks of J&K State:- Dachigam National Park, Hemis High altitude National Park and Kishtwar High altitude National Park.

**Marks 04**

## UNIT-9: HISTOLOGY & MORPHOLOGY

Animal Tissues:- Epithelial, Connective, Muscular and Nervous

Elementary knowledge on morphology & anatomy of Frog, Earthworm and Cockroach.

**Marks 03**

## UNIT-10: CELL-STRUCTURE & FUNCTION

Modern cell theory, Prokaryotic and eukaryotic cells, cell wall, cell membrane structure & function (fluid mosaic model), cell organelles (Plastids, Mitochondria, Endoplasmic reticulum, Golgi bodies/ dictyosomes, Ribosomes, Lysosomes, Nucleus, Vacuoles, Centrioles, cilia & Flagella)

**Cell division:** Cell cycle, Mitosis and Meiosis

**Bio molecules:** Structure and function of carbohydrates, proteins, lipids and nucleic acids, primary and secondary metabolites, metabolism

**Enzymes:** Types, properties functions and factors controlling enzyme activity

**Marks 05**

## UNIT-11: HUMAN PHYSIOLOGY

Alimentary canal, digestion and absorption of food, disorders of digestive system (jaundice, vomiting, diarrhea, constipation, indigestion etc.)

Respiratory organs, mechanism of breathing, respiratory volumes and capacities, transport of gases (oxygen and carbon dioxide), disorders of respiratory system (asthma, emphysema, fibrosis etc.)

Circulatory system:- Blood & lymph and their functions, blood groups, coagulation of blood, human heart, cardiac cycle, ECG, double circulation, disorders of circulatory system. (hypertension, coronary artery disease, angina, heart failure)

Human excretory system, urine formation, functions of tubules, mechanism of concentration of the filtrate, regulation of kidney function, micturition, role of other organs in excretion (lungs, liver and skin), haemodialysis and peritoneal dialysis, disorders of the excretory system (kidney failure, glomerulonephritis, renal calculi)

Types of movement (amoeboid, ciliary and muscular), different types of muscles, structure of contractile proteins (actin and myosin), mechanism of muscle contraction, joints, disorders of muscular and skeletal system (Myasthenia gravis, muscular dystrophy, tetany, arthritis, gout, osteoporosis)

Human nervous system, neuron as a structural and functional unit of nervous system, generation and conduction of nerve impulse, transmission of impulses, reflex action and reflex arc, structure and functioning of the sense organs (eye and ear)

Endocrine glands, Mechanism of hormone action, hormones of heart, kidney and gastrointestinal tract.

**Marks 07**

## **UNIT-12: REPRODUCTION**

Asexual reproduction:- Characteristics and types of asexual reproduction (binary fission, sporulation, budding, gemmules, fragmentation, regeneration)

Human reproduction:- male and female reproductive system, microscopic anatomy of testis and ovary, spermatogenesis and oogenesis, menstrual cycle,

fertilization, embryo development upto blastocyst formation, implantation, pregnancy and placenta formation, parturition and lactation

Reproductive health:- need for reproductive health, sexually transmitted diseases and their control and prevention, birth control, (its need and methods), contraception and medical termination of pregnancy (MPT), amniocentesis, infertility and associated reproductive technologies (IVF,ZIFT,GIFT).

**Marks 07**

### **UNIT-13: GENETICS AND EVOLUTION**

Sex determination in humans, birds and honey bee.

Inheritance pattern of Mendelian disorders in humans (colour blindness, haemophilia, cystic fibrosis, sickle- cell anaemia, phenylketonuria, thalesemia )

Chromosomal disorders in humans:- Down's syndrome, Turner's syndrome and Klinefelter's syndrome

Genome and human genome project. DNA fingerprinting.

Origin of life, theories and evidences for evolution with special reference to Darwinian theory, and Modern synthetic theory, Hardy-Weinberg principle, Adaptive radiation

**Marks 05**

### **UNIT-14: BIOLOGY AND HUMAN WELFARE**

Health and Diseases:- basic concepts of immunology, vaccines, common diseases in human beings (their causative agents, symptoms and prevention and control) with reference to thyphoid, hepatitis, malaria, filariasis, bubonic plague, ascariasis, common cold, amoebiasis and ring worm,

Detailed account of diseases like cancer and HIV/ AIDS.

Insects and human welfare:- Silk, honey and lac producing insects, their life- cycle and usefulness of their products.

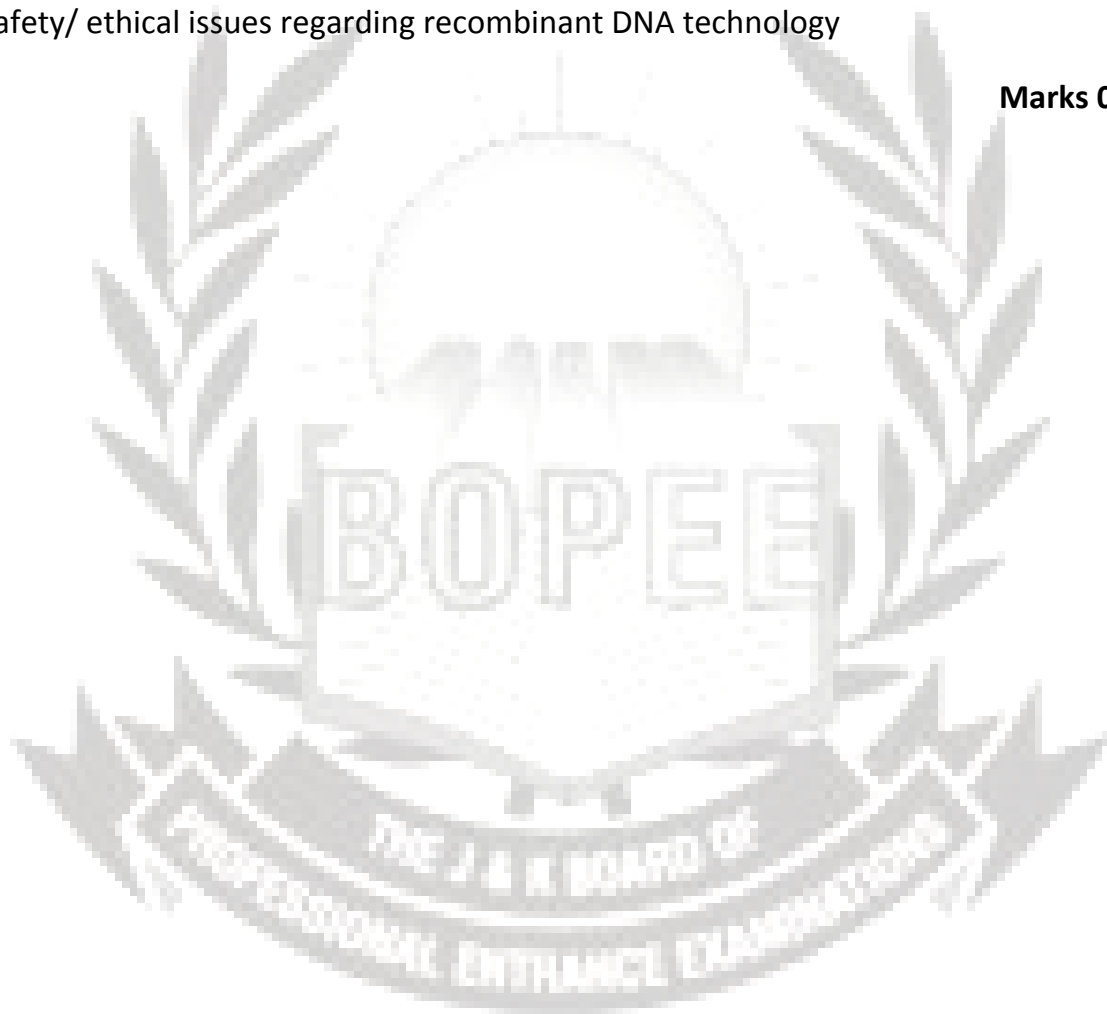
Adolescence and drug and alcohol abuse (effects of drug/ alcohol abuse, prevention and control.

**Marks 04**

### **UNIT -15: BIOTECHNOLOGY AND ITS APPLICATIONS**

Genetic engineering (recombinant DNA technology), cloning. Biotechnological production of human insulin, vaccines and growth hormone. Gene therapy. Bio safety/ ethical issues regarding recombinant DNA technology

**Marks 03**



## **SYLLABI FOR COMMON ENTRANCE TEST 2012**

### **MATHS**

#### **UNIT 1: SETS, RELATIONS AND FUNCTIONS**

**Sets** and their representation, finite and infinite sets, empty set subsets, subset of real numbers especially intervals, power set, universal set. Venn diagram, union and intersection of sets. Difference of sets, Compliment of a set.

Ordered pairs, Cartesian product of sets, number of elements in the Cartesian product of two finite sets. Cartesian product of real with itself (upto  $R \times R \times R$ ). **Relation**, Domain, co- domain and range of relation, types of relations , reflexive, symmetric, transitive and equivalence relations.

**Function** as special kind of relation from one set to another, domain, co-domain and range of a function. One to one, onto functions. Real valued functions of the real variable, constant identity, polynomial, rational modulus signum and greatest integer functions with their graph. Sum, difference, product and quotients of functions. Composite of functions, inverse of a function, binary operations.

**Marks 07**

#### **UNIT 2: COMPLEX NUMBER; LINEAR INEQUATION; LINEAR PROG.**

**Complex number:** Conjugate complex number, modulus and amplitude (argument) of a complex number, Argand's plane and polar representation of complex numbers, algebraic properties of complex numbers. Fundamental theorem of algebra, solution of Quadratic equation in the complex number system.

**Linear inequation:** Algebraic solution of linear inequalities in one variable and their representation on the number line. Graphical solution of linear inequalities two variables.

**Linear programming:** Introduction , definition of related terminology such as constraints, objective function, optimization, different type of linear programming problem (L.P), mathematical formulation of L.P problem, graphical

method of solution for problems in two variables, feasible and infeasible regions, feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constraints).

**Marks 08**

### **UNIT 3: SEQUENCE AND SERIES, PERMUTATION AND COMBINATION**

**Sequence and series:** Arithmetic progression (A.P), arithmetic mean (A.M), nth term, sum to n-terms of an A.P, Geometric progression (G.P) , Geometric Mean (G.M) nth term, sum to n-terms and sum to infinity of a G.P. Relation between A.M and G.M. Sum to n terms of  $\sum n$ ,  $\sum n^2$ ,  $\sum n^3$  .

**Permutation and combination:** Fundamental principle of counting, factorial n. permutations  $P(n,r)$  and combinations  $C(n,r)$ , derivation of formulae and their connections, simple applications.

**Mathematical Induction and Binomial Theorem:** The principle of mathematical induction and simple applications. Binomial theorem, statement and proof of Binomial theorem for positive integral power. Pascal's triangle, general and middle terms in the Binomial expansion, simple application.

**Marks 08**

### **UNIT 4: TRIGONOMETRIC AND INVERSE TRIGONOMETRY FUNCTIONS**

Positive and negative angles, measuring angles in radians and in degrees, Conversion from one measure to another. Definition of trigonometric functions with the help of unit circle, identity  $\sin^2 x + \cos^2 x = 1$  for all  $x$ . Sign of **Trigonometric functions** and their graphs. Expression of  $\sin(x \pm y)$  and  $\cos(x \pm y)$  in terms of  $\sin x$ ,  $\sin y$ ,  $\cos x$  and  $\cos y$ . Deductions:

$$\tan(x \pm y) = \frac{\tan x \pm \tan y}{1 \mp \tan x \tan y} ,$$

$$\cot(x \pm y) = \frac{\cot x \cot y \pm 1}{\cot y \pm \cot x} ,$$

$$\sin x + \sin y = 2 \sin \frac{x+y}{2} \cos \frac{x-y}{2}$$

$$\sin x - \sin y = 2 \cos \frac{x+y}{2} \sin \frac{x-y}{2}$$

$$\cos x + \cos y = 2 \cos \frac{x+y}{2} \cos \frac{x-y}{2}$$

$$\cos x - \cos y = -2 \sin \frac{x+y}{2} \sin \frac{x-y}{2}$$

Identities related to  $\sin 2x$ ,  $\cos 2x$ ,  $\tan 2x$ ,  $\sin 3x$ ,  $\cos 3x$ , and  $\tan 3x$ . General solution of trigonometric equations of the type  $\sin \theta = \sin \alpha$ ,  $\cos \theta = \cos \alpha$ ,  $\tan \theta = \tan \alpha$ . Sine and Cosine formulae and their simple applications.

**Inverse trigonometric functions**, defunction, range, domain, principal value branches. Graphs of inverse trigonometric functions, elementary properties of inverse trigonometric functions.

**Marks 07**

## **UNIT 5: MATRICES AND DETERMINANTS**

**Matrices**, concepts, notation, order, equality, types of matrices, Zero matrix, transpose of matrix, Symmetric and skew symmetric matrices. Addition, multiplication scalar multiplication of matrices, simple properties of addition, multiplication and scalar multiplication of matrices. Non-cummulative of multiplication of matrices and existence of non-zero matrices whose product is the zero matrix (order  $2 \times 2$ ). Concept of elementary row and column operation, Invertible matrices and uniqueness of inverse, if it exists. (Matrices with real entries).

**Determinants** of square matrix (upto  $3 \times 3$  matrices) properties of determinants, minors, cofactors and applications of determinants in finding area of a triangle. Adjoint and inverse of a square matrix. Consistency, inconsistency and number of solutions of system of linear equations by examples, solving system of linear equations in two or three variables using inverse of a matrix. Cramer's Rule and its applications.

**Marks 05**

## **UNIT 6: LIMIT, CONTINUITY AND DIFFERENTIATION**

Concept of limit of a function. Theorems on Limits Evaluation of limits using standard results.

$$\lim_{x \rightarrow 0} \frac{1}{x},$$

$$\lim_{x \rightarrow 0} \frac{1}{x},$$

$$\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^x$$

$$\lim_{x \rightarrow 0} (1+x)^{\frac{1}{x}},$$

$$\lim_{x \rightarrow 0} \log \frac{(1+x)}{x},$$

$$\lim_{x \rightarrow 0} \frac{e^x - 1}{x}$$

**Continuity** of a function at a point. Continuity of Sum, product and quotient of functions.

**Derivative:** definition of a derivative of a function, geometrical interpretation of the derivative.

- Derivative of sum, difference, product and quotient of two or more functions.
  - Derivative of algebraic and composite functions.
  - Derivative of trigonometric and inverse trigonometric functions.
  - Chain rule, derivative of implicit functions.
  - Derivative of logarithmic and exponential functions.
  - Logarithmic differentiation.
  - Derivative of functions expressed in parametric forms.
- Second order derivatives.
- Rolle's and Lagrange's Mean Value Theorem and their geometrical interpretation and their simple applications.
  - Chain Rule, derivative of implicit functions.

**Application of Derivative:** rate of change, increasing and decreasing functions, tangents and normals, approximation, maxima and minima (first derivative and second derivative test). Simple problems.

**Marks 09**

## **UNIT 7: INTEGRATION AND DIFFERENTIAL EQUATIONS**

Integration as inverse process of differentiation.

Integration of variety of functions by Substitution, by parts, by partial fractions.

Simple integrals of the type:

- $\int \frac{dx}{\sqrt{x^2 \pm a^2}}$ ,  $\int \frac{dx}{x^2 \pm a^2}$ ,  $\int \frac{dx}{\sqrt{a^2 - x^2}}$ ,
- $\int \frac{dx}{ax^2 + bx + c}$ ,  $\int \frac{dx}{\sqrt{ax^2 + bx + c}}$ ,  $\int \frac{px + q}{ax^2 + bx + c} dx$ ,
- $\int \frac{px + q}{\sqrt{ax^2 + bx + c}} dx$ ,  $\int \sqrt{a^2 \pm x^2} dx$ ,  $\int \sqrt{x^2 - a^2} dx$
- $\int \sqrt{ax^2 + bx + c} dx$ ,  $\int (px + q) \sqrt{ax^2 + bx + c} dx$ ,
- $\int \frac{dx}{a + b \cos x}$ ,  $\int \frac{dx}{a + b \sin x}$ ,

Definite integrals as a Limit of a sum.

Fundamental Theorem of calculus.

Basic properties of definite integrals

Evaluation of definite integrals.

**Application of integrals:** Application in finding the area under simple curves, especially lines.

Areas of circles, parabolas and ellipses (in standard form)

Area under the curve  $y = \sin x$ ,  $y = \cos x$ , area between the above two curves.

**Differential Equations:** Definition, order and degree of a differential equation.

General and particular solutions of a differential equation.

Formation of a differential equation whose general solution is given.

Solution of differentiation equation by method of separation of variables.

Solution of Homogeneous differential equation of first order and first degree.

Solution of linear differential equation of the type:

i.  $\frac{dy}{dx} + PY = Q$ , where  $P, Q$  are functions of  $x$  alone

ii.  $\frac{dx}{dy} + RX = S$ , where  $R, S$  are functions of  $y$  alone

**Marks 09**

## **UNIT 8: STRAIGHT LINES AND CONIC SECTIONS**

Distance between two points, section, slope of a line, angle between two lines, various forms of equations of lines, point-slope form, intercept form, two point form, and normal form. General equation of a line, distance of a point from a line.

Conic Section: Sections of a cone, circles, parabola, ellipse, hyperbola, a point, a straight line and a pair of intersecting lines as a degenerated case of conic section. Standard equation of a circle, parabola, ellipse, and hyperbola and their simple properties.

**Marks 07**

## **UNIT 9: STATISTICS AND PROBABILITY**

Measure of dispersion, mean, deviation, variance and standard deviation of ungrouped/ grouped data. Analysis of frequency distribution with equal means but different variances.

**Random Experiment:** outcome, sample spaces.

**Events:** Mutually exclusive events. Axiomatic (set theoretic) probability, probability of an event, probability of “Not” and “Or” events. Multiplication theorem on probability, conditional probability, independent events, total probability, Baye’s theorem, random variable and its probability, distribution, mean and variance of a random variable. Repeated independent (Bernouli) trials and Binomial distribution.

**Marks 07**

## **UNIT 10: VECTORS AND THREE DIMENSIONAL GEOMETRY**

Vectors and scalars, magnitude and direction of a vector Direction Cosines and ratios of a vector. Types of vector, equal, zero, unit, parallel and collinear vectors. Position vector of a point , negative of a vector, components of a vector, addition of vectors, Scalar multiplication, position vector of a point dividing a line segment in a given ratio. Scalar (dot) product of vectors, projection of a vector on a line. Vector (cross) product of vectors, Scalar triple product.

Coordinate axes and Coordinate planes in three dimensions of a point, distance between two points and sectional formula. Direction cosines and direction ratios of a line joining two points. Cartesian and vector equation of a line, coplanar and skew-lines, shortest distance between two lines. Cartesian and vector equation of a plane. Angle between:

- i. Two lines
- ii. Two planes.
- iii. A line and a plane
- iv. Distance of a point from a plane.

**Marks 08**

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