

Health Sciences Undergraduate (SRMEEN)

SRMEEN 2022 – EXAMINATION PATTERN & EXAM SYLLABUS

	No. of Questions
Physics	20
Chemistry	20
Biology	20
Health science Aptitude	20
English aptitude	20
Total	100

Total Duration: 2.30hrs

*No negative marks

Course for SRMEEN

College	Select program
SRM College of Nursing	B.Sc.-Nursing

SYLLABUS FOR PHYSICS, CHEMISTRY & BIOLOGY

PHYSICS (20 Questions)

Unit 1: Units and Measurement, Mechanics Units for measurement, system of units

S.I., fundamental and derived units, measurements - errors in measurement - significant figures, dimensions - dimensional analysis - applications. Laws of Motion: Concept of force - Newton's laws of motion - projectile motion - uniform circular motion - friction - laws of friction – applications - centripetal force. Work, Energy and Power: Work - energy - potential energy and kinetic energy – power - collision - elastic and inelastic collisions.

Unit 2: Gravitation, Mechanics of Solids and Fluids

Gravitation: The universal law of gravitation, acceleration due to gravity - variation of 'g' with altitude, latitude and depth - gravitation potential - escape velocity and orbital velocity - geostationary satellites. Mechanics of solids and fluids: Hooke's law - Moduli of elasticity - surface tension capillarity - applications – viscosity - Poiseuille's formula - Stokes law applications - streamline and turbulent flow Reynolds number - Bernoulli's theorem - applications.

Unit 3: Electrostatics

Electric charge - Conservation laws - Coulomb's law - principle of superposition - continuous charge distribution - electric field - electric field lines - electric dipole – electric in uniform electric field - Electric

flux - Gauss's theorem - field due to infinitely long straight wire - uniformly charged infinite plane sheet. Electric potential - potential difference - equipotential surfaces - electrical potential energy - Dielectrics and electric polarization - capacitors and capacitance - Combination of capacitors in series and in parallel - capacitance of a parallel plate capacitor with and without dielectric medium - energy stored in a capacitor

Unit 4: Current Electricity

Electric current - drift velocity - mobility - Ohm's law - V-I characteristics - electrical energy and power - electrical resistivity and conductivity - temperature dependence - Internal resistance of a cell - potential difference and emf of a cell - combination of cells in series and in parallel - Kirchhoff's laws – applications - Wheatstone bridge - Metre bridge - Potentiometer - comparison of EMF of two cells - measurement of internal resistance of a cell.

Unit 5: Magnetism and Magnetic effects of current

Earth's magnetic field and magnetic element - tangent law, tangent galvanometer deflection magnetometer - Magnetic effects of electric current – Biot Savart's law - moving coil galvanometer - conversion of a galvanometer into voltmeter and ammeter – Ampere's law.

Unit 6: Electromagnetic Induction,

Alternating Currents and Electromagnetic Waves Electromagnetic induction - Faraday's laws, induced EMF and current - Lenz's Law - Eddy currents - Self and mutual induction - Alternating currents, peak and RMS value of alternating current/voltage - reactance and impedance - LC oscillations - LCR series circuit - resonance - AC generator and transformer - Electromagnetic waves – characteristics - Electromagnetic spectrum.

Unit 7: Optics

Reflection of light - refraction of light - total internal reflection- optical fibers - refraction at spherical surfaces – lenses - thin lens formula - lensmaker's formula – magnification - power of a lens - combination of thin lenses in contact - refraction of light through a prism Wave front and Huygen's principle - reflection and refraction of plane wave at a plane surface- laws of reflection and refraction using Huygen's principle – Interference - Young's double slit experiment and expression for fringe width- Diffraction due to a single slit -width of central maximum – Polarisation.

Unit 8: Dual Nature of Radiation and Matter & Atomic Physics

Dual nature of radiation - Photoelectric effect - Hertz and Lenard's observations-Einstein's photoelectric equation- particle nature of light. Matter waves- wave nature of particles - de-Broglie relation- Alpha-particle scattering experiment - Rutherford's model of atom - Bohr model - hydrogen spectrum.

Unit 9: Nuclear Physics

Nuclear radius, mass, binding energy, density, isotopes, mass defect- Bainbridge mass spectrometer- nuclear forces neutron discovery-artificial radio activity-radio isotopes-radio carbon dating-radiation hazards. Nuclear fission-nuclear reactor- nuclear fusion- hydrogen bomb - cosmic rays- elementary particles.

Unit 10: Electronic Devices Semiconductors-doping-types-PN junction diode – biasing-diode as a Rectifier – Special purpose PN junction diodes – LED –photodiode - solar cell-transistors-transistor characteristics -logic gates-basic logic gates-NOT, OR, AND, NOR, NAND- universal gates-De Morgan's theorem

CHEMISTRY (20 Questions)

Unit 1: Solutions

Types of solutions, expression of concentration of solutions of solids in liquids, solubility of gases in liquids, solid solutions, colligative properties - relative lowering of vapour pressure, Raoult's law, elevation of boiling point, depression of freezing point, osmotic pressure, determination of molecular masses using colligative properties.

Unit 2: Electrochemistry

Redox reactions, conductance in electrolytic solutions, specific and molar conductivity, variations of conductivity with concentration, Kohlrausch's Law, electrolysis, EMF of a cell, standard electrode potential, Nernst equation and its application to chemical cells, Relation between Gibbs energy change and EMF of a cell.

Unit 3: Chemical Kinetics

Rate of a reaction (Average and instantaneous), factors affecting rate of reaction: concentration, temperature, catalyst; order and molecularity of a reaction, rate law and specific rate constant, integrated rate equations and half-life (only for zero and first order reactions), concept of collision theory (elementary and mathematical treatment), Activation energy, Arrhenius equation.

Unit 4: Surface Chemistry

Adsorption - Physisorption and chemisorption, factors affecting adsorption of gases on solids, colloidal state distinction between true solutions, colloids and suspension; lyophilic, lyophobic multi- molecular and macromolecular colloids; properties of colloids; Tyndall effect, Brownian movement, electrophoresis, coagulation

Unit 5: p -Block Elements

Group 16 Elements: General introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties, dioxygen: Preparation, Properties and uses, classification of Oxides, Ozone, Sulphur - allotropic forms; compounds of Sulphur: Preparation Properties and uses of Sulphur-dioxide, Sulphuric Acid: industrial process of manufacture, properties and uses; Oxoacids of Sulphur (Structures only). Group 17 Elements: General introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties; compounds of halogens, Preparation, properties and uses of Hydrochloric acid, interhalogen compounds (structures only). Group 18 Elements: General introduction, electronic configuration, occurrence, trends in physical and chemical properties, uses.

Unit 6: 'd' and 'f' Block Elements

General introduction, electronic configuration, occurrence and characteristics of transition metals, general trends in properties of the first row transition metals - metallic character, ionization enthalpy, oxidation states, ionic radii, colour, catalytic property, magnetic properties, interstitial compounds, alloy formation

Unit 7: Coordination Compounds

Coordination compounds -Introduction, ligands, coordination number, colour, magnetic properties and shapes, IUPAC nomenclature of mononuclear coordination compounds. Bonding, Werner's theory, VBT, and CFT, structure and stereoisomerism.

Unit 8: Haloalkanes and Haloarenes

Haloalkanes: Nomenclature, nature of C-X bond, physical and chemical properties, mechanism of substitution reactions, optical rotation. Haloarenes: Nature of C-X bond, substitution reactions (Directive influence of halogen in monosubstituted compounds only).

Unit 9: Alcohols, Phenols and Ethers

Alcohols: Nomenclature, methods of preparation, physical and chemical properties (of primary alcohols only), identification of primary, secondary and tertiary alcohols, mechanism of dehydration. Phenols: Nomenclature, methods of preparation, physical and chemical properties, acidic nature of phenol, electrophilic substitution reactions, uses of phenols. Ethers: Nomenclature, methods of preparation, physical and chemical properties, uses.

Unit 10: Aldehydes, Ketones and Carboxylic Acids

Aldehydes and Ketones: Nomenclature, nature of carbonyl group, methods of preparation, physical and chemical properties, mechanism of nucleophilic addition, reactivity of alpha hydrogen in aldehydes, uses. Carboxylic Acids: Nomenclature, acidic nature, methods of preparation, physical and chemical properties; uses.

Unit 11: Organic compounds containing Nitrogen

Amines: Nomenclature, classification, structure, methods of preparation, physical and chemical properties, uses, identification of primary, secondary and tertiary amines.

Unit 12: Biomolecules

Carbohydrates - Classification (aldoses and ketoses), monosaccharides (glucose and fructose), D-L configuration
Proteins -Elementary idea of - amino acids, peptide bond, polypeptides, proteins, structure of proteins - primary, secondary, tertiary structure and quaternary structures (qualitative idea only), denaturation of proteins
Nucleic Acids: DNA and RNA.

BIOLOGY (20 QUESTIONS)

Unit 1: Diversity in Living World

Biodiversity, Importance of classifications, Taxonomy & Systematics, Concept of species and taxonomical hierarchy, Binomial nomenclature, Tools for study of Taxonomy. Five kingdom classification: Monera, Protista and Fungi into major groups; Lichens; Viruses and Viroids. Salient features of them.

Classification of plants into major groups - Algae, Bryophytes, Pteridophytes, Gymnosperm and Angiosperm - salient and distinguishing features. Angiosperms - classification up to class, characteristic features and examples. Alternation of generation in plant life cycles.

Classification of animals- non chordate up to phyla level and chordate up to class's level - salient and distinguishing features with a few examples of each category.

Unit 2: Structural Organization in Animals and Plants

Plant tissues: Morphology and modifications, Tissues, Anatomy and functions of different parts of flowering plants : Root, stem, leaf, inflorescence, flower, fruit and seed. Description of families: Fabaceae, Solanaceae and Liliaceae. Animal tissues: Morphology, anatomy and functions of different systems (digestive, circulatory, respiratory, nervous and reproductive) of an insect (cockroach)

Unit 3: Cell Structure and Function

Cell theory, Structure of prokaryotic and eukaryotic cell, Plant cell and animal cell. Cell envelope, cell membrane, cell wall. Cell organelles - structure and function: Endomembrane system- endoplasmic reticulum, Golgi bodies, lysosomes, vacuoles, mitochondria, ribosomes, plastids, micro bodies: Cytoskeleton, cilia, flagella, and centrioles. Nucleus – nuclear membrane, chromatin, nucleolus.

Chemical constituents of living cells: Biomolecules – structure and function of proteins including Enzymes – types, properties, enzyme action, carbohydrates, lipid and nucleic acids. Cell division: Cell cycle, mitosis, meiosis and their significance.

Unit 4: Plant Physiology

Transport in plants: Movement of water, gases and nutrients, Cell to cell transport – Diffusion, active transport; Plant – water relations – Imbibition, water potential, osmosis, plasmolysis; Long distance transport of water – Absorption, apoplast, symplast, transpiration pull, root pressure and guttation; Transpiration – Opening and closing of stomata; Uptake and translocation of mineral nutrients – Transport of food, phloem transport, mass flow hypothesis.

Mineral nutrition: Essential minerals, macro and micronutrients and their role, Deficiency symptoms, Mineral toxicity, Elementary idea of Hydroponics, Nitrogen – metabolism, cycle and fixation.

Photosynthesis: Significance - site of photosynthesis, pigments - Photochemical and biosynthetic phases of photosynthesis, Cyclic and non-cyclic photophosphorylation; Chemiosmotic hypothesis; Photorespiration; C3 and C4 pathways; Factors affecting photosynthesis.

Respiration: Cellular respiration – glycolysis, fermentation (anaerobic), TCA cycle and electron transport system (aerobic); Energy relations – Number of ATP molecules generated; Amphibolic pathways; Respiratory quotient.

Plant growth and development: Seed germination, Phases of plant growth and plant growth rate, Conditions of growth, Differentiation, dedifferentiation and redifferentiation, Sequence of developmental process in a plant cell, Growth regulators: auxin, gibberellin, cytokinin, ethylene, ABA. Seed dormancy, Photoperiodism, Vernalisation.

Unit 5: Human Physiology

Digestion and absorption: Alimentary canal and digestive glands, Role of digestive enzymes and gastrointestinal hormones, Peristalsis, digestion, absorption and assimilation of proteins, carbohydrates and fats, Egestion; Nutritional and digestive disorders – indigestion, constipation, vomiting, jaundice, diarrhea.

Breathing and Respiration: Respiratory organs in animals, Respiratory system in humans, Mechanism of breathing and its regulation in humans – Exchange of gases, transport of gases and regulation of respiration, Respiratory volumes, Disorders related to respiration - Asthma, Emphysema, Occupational respiratory disorders.

Body fluids and circulation: Composition of blood, blood groups, coagulation of blood, Composition of lymph and its function, Human circulatory system – Structure of human heart and blood vessels, Cardiac cycle, cardiac output, ECG, Double circulation, Regulation of cardiac activity, Disorders of circulatory system

-Hypertension, Coronary artery disease, Angina pectoris, Heart failure. Excretory products and their elimination: Modes of excretion – Ammonotelism, ureotelism, uricotelism, Human excretory system – structure and function, Urine formation, Osmoregulation, Regulation of kidney function – Renin - angiotensin, Atrial Natriuretic Factor, ADH and Diabetes insipidus, Role of other organs in excretion, Disorders - Uremia, Renal failure, Renal calculi, Nephritis, Dialysis and artificial kidney, kidney transplant.

Locomotion and Movement: Types of movement – amoeboid, ciliary, flagellar, muscular, skeletal muscle – contractile proteins and muscle contraction, Skeletal system and its functions, Joints, Disorders of muscular and skeletal system – Myasthenia gravis, Tetany, Muscular dystrophy, Arthritis, Osteoporosis, Gout.

Neural control and coordination: Neuron and nerves, Nervous system in humans– central nervous system, peripheral nervous system. Generation, conduction and transmission of nerve impulse, Reflex action, Sensory perception, Sense organs, Elementary structure and function of eye and ear.

Chemical coordination and regulation: Endocrine glands and hormones, Human endocrine system - Hypothalamus, Pituitary, Pineal, Thyroid, Parathyroid, Thymus, Adrenal, Pancreas, Gonads. Hormones of heart, kidney, and gastrointestinal tract. Mechanism of hormone action, Role of hormones as messengers and regulators, Hypo- and hyperactivity and related disorders: Common disorders

e.g. Dwarfism, Acromegaly, Cretinism, goiter, exophthalmic goiter, diabetes, Addison's disease.

Unit 6: Reproduction

Reproduction in Organisms: Reproduction, a characteristic feature of all organisms for continuation of species, modes of reproduction - asexual and sexual reproduction, asexual reproduction – binary fission, sporulation, budding, gemmule formation, fragmentation, vegetative propagation in plants. Events in sexual reproduction.

Sexual Reproduction in Flowering

Plants: Flower structure, development of male and female gametophytes, pollination - types, agencies and examples, out breeding devices, pollen-pistil interaction, double fertilization, post fertilization events - development of endosperm and embryo, development of seed and formation of fruit, special modes apomixis, parthenocarpy, polyembryony, Significance of seed dispersal and fruit formation.

Human Reproduction: Male and female reproductive systems, microscopic anatomy of testis and ovary, gametogenesis - spermatogenesis and oogenesis, menstrual cycle, fertilization, embryo development up to blastocyst formation, implantation, pregnancy and placenta formation, parturition, lactation.

Reproductive Health: Need for reproductive health and prevention of Sexually Transmitted Diseases (STDs), birth control - need and methods, contraception and medical termination of pregnancy (MTP), amniocentesis, infertility and assisted reproductive technologies - IVF, ZIFT, GIFT, AI.

Unit 7: Genetics and Evolution

Principles of Inheritance and Variation: Heredity and variation, Mendelian inheritance, deviations from Mendelism – incomplete dominance, co-dominance, multiple alleles and inheritance of blood groups, pleiotropy, polygenic inheritance, chromosome theory of inheritance, chromosomes and genes, Sex determination in humans, birds, grasshopper and honey bee, linkage and crossing over. Mutation, Pedigree analysis, sex linked inheritance - haemophilia, colour blindness, Mendelian disorders in humans – sickle cell anemia, Phenylketonuria, thalassemia, chromosomal disorders in humans, Down's syndrome, Turner's and Klinefelter's syndromes.

Molecular Basis of Inheritance: DNA as genetic material, Structure of DNA and RNA, DNA packaging and replication, Central dogma, transcription, genetic code, translation, gene expression and regulation - lac operon, genome and human genome projects, DNA fingerprinting.

Evolution: Origin of life, biological evolution and evidences for biological evolution (paleontology, comparative anatomy, embryology and molecular evidences), Lamarck's theory, Darwin's contribution, modern synthetic theory of evolution, mechanism of evolution - variation (mutation and recombination) and natural selection with examples, types of natural selection; Gene flow and genetic drift; Hardy - Weinberg's principle; adaptive radiation; human evolution.

Unit 8: Biology and Human Welfare Human

Health and Diseases: Pathogens, parasites causing human diseases (malaria, dengue, chickengunia, filariasis, ascariasis, typhoid, pneumonia, common cold, amoebiasis, ring worm) and their control, Basic concepts of immunology – vaccines, cancer, HIV and AIDS, Adolescence - drug and alcohol abuse. Strategies for Enhancement in Food Production: Improvement in food production, Plant breeding, tissue culture, single cell protein, Biofortification, Apiculture and Animal husbandry.

Microbes in Human Welfare: In household food processing, industrial production, sewage treatment, energy generation and microbes as bio-control agents and bio- fertilizers. Antibiotics - production and judicious use.

Unit 9: Biotechnology and Its Applications

Biotechnology - Principles and processes: Genetic Engineering (Recombinant DNA Technology). Biotechnology and its Application: Application of biotechnology in health and agriculture: genetically modified organisms -Bt crops; RNA interference. Human insulin, gene therapy, molecular diagnosis, transgenic animals, biosafety issues, bio piracy and patents.

Unit 10: Ecology and Environment Organisms and Populations:

Organisms and environment: Habitat and niche, abiotic factors, ecological adaptations, population interactions - mutualism, competition, predation, parasitism, commensalism, population attributes - growth, birth rate and death rate, age distribution.

Ecosystem: Structure and function, productivity and decomposition, energy flow, pyramids of number, biomass, energy, nutrient cycles (carbon and phosphorous), ecological succession, ecological services - carbon fixation, pollination, seed dispersal, oxygen release.

Biodiversity and its Conservation: Biodiversity - Concept, patterns, importance, loss of biodiversity, biodiversity conservation, hotspots, endangered organisms, extinction, Red Data Book, Sacred Groves, biosphere reserves, national parks, wildlife, sanctuaries and Ramsarsites.

Environmental Issues: Air pollution and its control, water pollution and its control, agrochemicals and their effects, solid waste management, radioactive waste management, greenhouse effect and climate change impact and mitigation, ozone layer depletion, deforestation, any one case study as success story addressing environmental issue(s).

