JKBOPEE BSc NURSING ENTRANCE TEST SYLLABUS

Based on 12th Class Courses of Study | Physics | Chemistry | Biology

Total Marks: 180 (60 Physics + 60 Chemistry + 60 Biology)

Note: The marks distribution given in the syllabus is only illustrative. It will not accrue any right to the candidate if this distribution of marks is not strictly reflected in the question paper.

PHYSICS — Total Marks: 60

Unit 1: Physical World and Measurement (2 Marks)

• Need for measurement; units of measurement; systems of units; SI units; fundamental and derived units

• Significant figures

• Dimensions of physical quantities; dimensional analysis and its applications

Unit 2: Kinematics (3 Marks)

• Frame of reference; motion in a straight line; uniform and non-uniform motion; instantaneous velocity

• Uniformly accelerated motion; velocity-time and position-time graphs; relations for uniformly accelerated motion

• Scalar and vector quantities; position and displacement vectors; unit vector; addition and subtraction of vectors

• Resolution of a vector in a plane; scalar and vector product; projectile motion; uniform circular motion

Unit 3: Laws of Motion (2 Marks)

• Intuitive concept of force; inertia; Newton's first law of motion; momentum and Newton's second law; impulse

• Newton's third law of motion; law of conservation of linear momentum and its applications

• Equilibrium of concurrent forces; static and kinetic friction; laws of friction; rolling friction; lubrication

• Dynamics of uniform circular motion; centripetal force; vehicle on level and banked roads

Unit 4: Work, Energy and Power (2 Marks)

• Work done by constant and variable force; kinetic energy; work-energy theorem; power

• Potential energy; potential energy of a spring; conservative and non-conservative forces

• Motion in a vertical circle; elastic and inelastic collisions in one and two dimensions

Unit 5: Motion of System of Particles and Rigid Body (2 Marks)

• Centre of mass of two-particle system; momentum conservation; centre of mass of a rigid body and uniform rod

• Moment of force; torque; angular momentum; law of conservation of angular momentum

• Equilibrium of rigid bodies; rigid body rotation; equations of rotational motion

• Moment of inertia; radius of gyration; moments of inertia for simple geometrical objects

Unit 6: Gravitation (2 Marks)

• Kepler's laws of planetary motion; universal law of gravitation

• Acceleration due to gravity and its variation with altitude and depth
• Gravitational potential energy and gravitational potential; escape speed; orbital velocity of a satellite

Unit 7: Properties of Bulk Matter (2 Marks)

• Elasticity; stress-strain relationship; Hooke's law; Young's modulus; bulk modulus; shear modulus; Poisson's ratio
• Pressure due to fluid column; Pascal's law; viscosity; Stokes' law; terminal velocity; Bernoulli's theorem
• Surface energy and surface tension; angle of contact; capillary rise
• Thermal expansion of solids, liquids and gases; anomalous expansion of water; specific heat capacity; calorimetry
• Heat transfer — conduction, convection and radiation; Wein's displacement law; Stefan's law

Unit 8: Thermodynamics (3 Marks)

• Thermal equilibrium; zeroth law of thermodynamics; heat, work and internal energy
• First law of thermodynamics
• Second law of thermodynamics; isothermal, adiabatic, reversible, irreversible and cyclic processes

Unit 9: Behaviour of Perfect Gas and Kinetic Theory (2 Marks)

• Equation of state of a perfect gas; work done in compressing a gas
• Kinetic theory of gases — assumptions, concept of pressure; kinetic interpretation of temperature
• rms speed of gas molecules; degrees of freedom; law of equipartition of energy; mean free path; Avogadro's number

Unit 10: Oscillations and Waves (4 Marks)

• Periodic motion — time period, frequency, displacement as a function of time
• Simple harmonic motion (SHM) and its equations; phase; oscillations of a loaded spring; energy in SHM
• Simple pendulum and derivation of expression for its time period
• Wave motion — transverse and longitudinal waves; speed of travelling wave
• Principle of superposition; reflection of waves; standing waves in strings and organ pipes; beats

Unit 11: Electrostatics (4 Marks)

• Electric charges; conservation of charge; Coulomb's law; superposition principle; continuous charge distribution
• Electric field; electric field lines; electric dipole; torque on a dipole; electric flux; Gauss's theorem
• Electric potential; potential difference; equipotential surfaces; electrical potential energy
• Conductors and insulators; dielectrics and electric polarization
• Capacitors and capacitance; combination of capacitors; energy stored in a capacitor

Unit 12: Current Electricity (4 Marks)

• Electric current; drift velocity; mobility; Ohm's law; V-I characteristics; electrical energy and power

• Electrical resistivity and conductivity; temperature dependence of resistance
• Internal resistance of a cell; emf of a cell; Kirchhoff's rules; Wheatstone bridge

Unit 13: Magnetic Effects of Current and Magnetism (5 Marks)

• Concept of magnetic field; Oersted's experiment; Biot-Savart law; Ampere's law and its applications
• Force on a moving charge; force on a current-carrying conductor; force between two parallel current-carrying conductors
• Torque on a current loop; moving coil galvanometer — conversion to ammeter and voltmeter
• Bar magnet; magnetic field intensity due to a magnetic dipole; torque on a magnetic dipole
• Magnetic properties of materials — para, dia and ferromagnetic substances; magnetization; effect of temperature

Unit 14: Electromagnetic Induction and Alternating Currents (4 Marks)

• Electromagnetic induction; Faraday's laws; induced EMF and current; Lenz's law; self and mutual induction
• Alternating currents; peak and RMS values; reactance and impedance; LCR series circuit; resonance
• Power in AC circuits; power factor; wattless current; AC generator; transformer

Unit 15: Electromagnetic Waves (3 Marks)

• Basic idea of displacement current; electromagnetic waves; their characteristics; transverse nature
• Electromagnetic spectrum — radio waves, microwaves, infrared, visible, ultraviolet, X-rays, gamma rays and their uses

Unit 16: Optics (7 Marks)

• Reflection of light; spherical mirrors; mirror formula; refraction of light; total internal reflection; optical fibers
• Refraction at spherical surfaces; lenses; thin lens formula; lens maker's formula; magnification; power of a lens
• Combination of thin lenses; refraction through a prism
• Optical instruments — microscopes and astronomical telescopes and their magnifying powers
• Wave front and Huygens' principle; reflection and refraction using wave fronts
• Interference; Young's double slit experiment; fringe width; coherent sources
• Diffraction due to a single slit; width of central maxima

Unit 17: Dual Nature of Matter and Radiation (2 Marks)

• Dual nature of radiation; photoelectric effect; Hertz and Lenard's observations
• Einstein's photoelectric equation; matter waves; wave nature of particles; de-Broglie relation

Unit 18: Atoms and Nuclei (3 Marks)

• Alpha-particle scattering experiment; Rutherford's model; Bohr model of hydrogen atom
• Expression for radius of nth orbit; velocity and energy of electron in nth orbit; hydrogen line spectra

• Composition and size of nucleus; nuclear force; mass-energy relation; mass defect; binding energy per nucleon

• Nuclear fission; nuclear fusion

Unit 19: Electronic Devices (4 Marks)

• Energy bands in conductors, semiconductors and insulators

• Intrinsic and extrinsic semiconductors — p and n type; p-n junction

• Semiconductor diode — I-V characteristics in forward and reverse bias; diode as a rectifier

CHEMISTRY — Total Marks: 60

Unit 1: Basic Concepts of Chemistry and Atomic Structure (4 Marks)

• Laws of chemical combination; Dalton's atomic theory; mole concept; molar mass; percentage composition

• Empirical and molecular formula; stoichiometry and calculations

• Discovery of electron, proton and neutron; atomic number; isotopes and isobars

• Thomson's model; Rutherford's model; Bohr's model; shells and sub-shells

• de-Broglie's relationship; Heisenberg's uncertainty principle; concept of orbitals; quantum numbers

• Shapes of s, p and d orbitals; Aufbau's principle; Pauli's exclusion principle; Hund's rule

• Electronic configuration of atoms; stability of half-filled and completely filled orbitals

Unit 2: Chemical Equilibrium (4 Marks)

• Equilibrium in physical and chemical processes; dynamic nature of equilibrium; law of mass action

• Equilibrium constant; Le-Chatelier's principle; ionization of acids and bases; pH; degree of ionization

• Hydrolysis of salts; buffer solutions; solubility product; common ion effect

Unit 3: Chemical Kinetics (2 Marks)

• Rate of reaction; factors affecting rate — concentration, temperature, catalyst

• Rate law; specific rate constant; order and molecularity; integrated rate expression; half-life period

• Collision theory; activation energy; Arrhenius equation

Unit 4: Solutions (2 Marks)

• Types of solutions; expression of concentration; solubility of gases in liquids

• Colligative properties — relative lowering of vapour pressure, Raoult's law, boiling point elevation, freezing point depression, osmotic pressure

• Determination of molecular masses; abnormal molecular mass; Van't Hoff factor

Unit 5: Chemical Thermodynamics (4 Marks)

• Concepts of system, surroundings, work, heat and energy; intensive and extensive properties; state functions

• First law of thermodynamics; internal energy; enthalpy; heat capacity; molar heat capacity

• Hess's law; enthalpy of bond dissociation, combustion, formation, atomization, sublimation, phase transition

• Entropy; free energy change; spontaneous and non-spontaneous processes and equilibrium

Unit 6: Redox Reactions and Electrochemistry (3 Marks)

• Concept of oxidation and reduction; oxidation number; balancing redox equations

• Conductance in electrolytic solutions; specific conductivity; molar conductivity; Kohlrausch's law

• Electrolysis and laws of electrolysis; dry cell; electrolytic and galvanic cells; lead accumulator

• emf of a cell; standard electrode potential; Nernst equation; Gibbs energy change; fuel cells; corrosion

Unit 7: Periodic Properties (2 Marks)

• Modern periodic law; present form of the periodic table

• Periodic trends — atomic radii, ionic radii, inert gas radii, ionization enthalpy, electron gain enthalpy, electronegativity, valency

Unit 8: Chemical Bonding and Molecular Structure (4 Marks)

• Valence electrons; ionic bond; covalent bond; bond parameters; Lewis structure; polar character of covalent bond

• Valence bond theory; resonance; geometry of covalent molecules; VSEPR theory

• Concept of hybridization involving s, p and d orbitals; shapes of simple molecules

• Molecular orbital theory of homonuclear molecules; hydrogen bond

Unit 9: Co-ordination Chemistry (4 Marks)

• Introduction to co-ordination compounds; ligands; co-ordination number; color; magnetic properties and shapes

• IUPAC nomenclature of mononuclear co-ordination compounds

• Bonding — Werner's theory, VBT and CFT; structural and stereoisomerisms

• Importance in qualitative analysis, extraction of metals and biological systems

Unit 10: Organic Chemistry – Some Basic Principles and Techniques (4 Marks)

• General introduction; methods of purification; qualitative and quantitative analysis

• Classification and IUPAC nomenclature of organic compounds

• Inductive effect, electromeric effect, resonance and hyperconjugation

• Homolytic and heterolytic fission; free radicals, electrophiles, nucleophiles, carbocations and carbanions

• Types of organic reactions

Unit 11: d and f-Block Elements (4 Marks)

• Electronic configuration; occurrence and characteristics of transition metals

• General trends in properties of first row transition metals

• Preparation and properties of K■Cr■O■ and KMnO■

• Lanthanides — electronic configuration, oxidation state, lanthanide contraction and its consequences

• Actinides — electronic configuration, oxidation states and comparison with lanthanoids

Unit 12: Hydrocarbons (4 Marks)

• Alkanes — nomenclature, isomerism, conformations, free radical mechanism of halogenation, combustion and pyrolysis

• Alkenes — nomenclature, structure of double bond, geometrical isomerism, addition reactions, Markownikov's addition, ozonolysis, mechanism of electrophilic addition

• Alkynes — nomenclature, structure of triple bond, acidic character, addition reactions

• Aromatic hydrocarbons — IUPAC nomenclature, benzene resonance, aromaticity, electrophilic substitution — nitration, sulphonation, halogenation, Friedel-Crafts reactions

Unit 13: Haloalkanes and Haloarenes (4 Marks)

• Haloalkanes — nomenclature, nature of C-X bond, physical and chemical properties, mechanism of substitution reactions, R-S and d-l configurations

• Haloarenes — nature of C-X bond, substitution reactions, stability of carbocations

• Uses and environmental effects of dichloromethane, trichloromethane, tetrachloromethane, iodoform, freon and DDT

Unit 14: Alcohols, Phenols and Ethers (4 Marks)

• Alcohols — nomenclature, methods of preparation, physical and chemical properties, mechanism of dehydration, methanol and ethanol

• Phenols — nomenclature, methods of preparation, physical and chemical properties, acidic nature, electrophilic substitution reactions

• Ethers — nomenclature, methods of preparation, physical and chemical properties

Unit 15: Aldehydes, Ketones and Carboxylic Acids (4 Marks)

• Aldehydes and Ketones — nomenclature, nature of carbonyl group, methods of preparation, mechanism of nucleophilic addition

• Reactivity of alpha hydrogen in aldehydes; physical and chemical properties

• Carboxylic Acids — nomenclature, acidic nature, methods of preparation, physical and chemical properties

Unit 16: Organic Compounds Containing Nitrogen (3 Marks)

• Amines — nomenclature, classification, structure, methods of preparation, physical and chemical properties, identification

• Cyanides and Isocyanides — structures, nomenclature, preparation, physical properties and chemical reactions

• Diazonium Salts — preparation, chemical reactions and mechanism of diazotization

Unit 17: Molecules of Life (4 Marks)

• Carbohydrates — classification (aldoses and ketoses), monosaccharides (glucose, fructose), oligosaccharides (sucrose, lactose, maltose), polysaccharides (starch, cellulose, glycogen)

• Proteins — amino acids; peptide bond; polypeptides; primary, secondary, tertiary and quaternary structure; denaturation; enzymes; lipids and hormones

• Nucleic Acids — DNA and RNA; purines and pyrimidines; nucleosides; nucleotides

• Vitamins — classification, functions, sources and deficiency diseases

BIOLOGY — Total Marks: 60

Unit 1: Diversity of Life (4 Marks)

• Variety of living organisms; need and history of classification — artificial, natural and phylogenetic

• Taxonomy and systematics; concept of species and taxonomical hierarchy; binomial nomenclature

• Two kingdom and five kingdom classifications; general characters of Monera, Protista and Fungi; lichens; viruses and viroids

Unit 2: Kingdom Plantae (3 Marks)

• Classification of plants into major groups; general characters of Algae, Bryophyta, Pteridophyta and Gymnosperms

• Morphology of flowering plants — root, stem, leaf, inflorescence, flower, fruit and seed

• Description of family Solanaceae

Unit 3: Plant Anatomy (3 Marks)

• Tissue systems in plants — epidermal, ground and vascular tissue systems

• Anatomy and functions of dicot and monocot root, stem and leaves

Unit 4: Plant Physiology (4 Marks)

• Cellular respiration; glycolysis; Kreb's cycle; electron transport system; ATP energetics; chemiosmotic hypothesis

• Aerobic and anaerobic respirations; amphibolic pathways; respiratory quotient

• Historical background and site of photosynthesis; photosynthetic pigments; light reaction and photosystems

• Cyclic and non-cyclic photophosphorylation; Calvin (C3) cycle and Hatch & Slack (C4) cycle; factors affecting photosynthesis; photorespiration

• Plant growth — characteristics, phases, growth rate, growth curve; differentiation and redifferentiation

• Plant growth regulators — discovery and physiological effects of Auxins, Gibberellins, Cytokinins, Ethylene and Abscisic Acid

Unit 5: Diversity in Living World (3 Marks)

• Animal kingdom — general characters and classification (non-chordates up to phyla level; chordates up to class level)

• National Parks — Dachigam, Kishtwar, Salim Ali, Kazinag and Hemis

• Concept of sanctuaries and biosphere reserves

Unit 6: Structural Organisation and Animal Biomolecules (3 Marks)

• Morphology, anatomy and functions of digestive, circulatory, respiratory, nervous and reproductive systems of Frog

• Basic chemical constituents of living bodies; structure and function of carbohydrates, proteins, lipids and nucleic acids

• Primary and secondary metabolites; enzymes — types, properties and functions

Unit 7: Cell Structure and Function (4 Marks)

• Cell theory; prokaryotic and eukaryotic cell; cell wall; cell membrane

• Cell organelles — plastids, mitochondria, ER, Golgi, ribosomes, lysosomes, nucleus, vacuoles, centrioles and cytoskeleton

• Cilia and flagella; nuclear organisation

• Cell cycle; mitosis and meiosis

Unit 8: Human Physiology (4 Marks)

• Respiratory system in humans; mechanism of breathing and its regulation; exchange of gases; respiratory disorders

• Composition of blood; blood groups and Rh factor; lymph; human circulatory system; cardiac cycle and ECG; disorders of circulatory system

• Human excretory system; urine formation; osmoregulation; kidney function; urinary disorders; artificial kidney

• Types of movement; muscle contraction; skeletal system; joints; disorders of muscular and skeletal systems

• Neuron and nerves; nervous system in humans; nerve impulse

• Human endocrine system; hormones; mechanism of hormone action; hormonal disorders

Unit 9: Reproduction in Flowering Plants (4 Marks)

• Flower structure; development of male and female gametophytes

• Pollination — types, agencies and examples; outbreeding devices; pollen-pistil interaction

• Double fertilization; post fertilization events — endosperm, embryo, seed and fruit development

• Apomixis, parthenocarpy and polyembryony; significance of seed and fruit formation

Unit 10: Genetics (4 Marks)

• Mendelian inheritance; deviations from Mendelism — incomplete dominance, co-dominance

• Multiple alleles and inheritance of blood groups; pleiotropy; polygenic inheritance; chromosomal theory of inheritance

• Search for genetic material; DNA as genetic material; structure of DNA and RNA; DNA packaging; DNA replication

• Central dogma; transcription; genetic code; translation; gene expression and regulation — lac operon

Unit 11: Biology and Human Welfare (4 Marks)

• Cellular totipotency; technique and application of tissue culture

• Microbes in food processing, industrial production, sewage treatment and energy generation (biogas)

• Microbes as bio-control agents; biopesticides and bio-fertilizers; antibiotics — production and judicious use

• Genetically modified organisms — BT crops; biopiracy and patents

Unit 12: Ecology and Environment (3 Marks)

• Population attributes and population growth; population interactions — mutualism, competition, predation, parasitism

• Ecosystems — patterns, components, productivity, decomposition, energy flow; ecological pyramids

• Biodiversity — concept, patterns, importance; loss and conservation; hotspots; endangered organisms; extinction

• Red Data Book; biosphere reserves; national parks; wildlife sanctuaries; Ramsar sites

Unit 13: Reproduction in Animals (4 Marks)

• Male and female reproductive systems; microscopic anatomy of testis and ovary

• Gametogenesis — spermatogenesis and oogenesis; menstrual cycle

• Fertilisation; embryo development up to blastocyst formation; implantation; pregnancy and placenta formation

• Elementary idea of parturition and lactation

• Need for reproductive health; prevention of STDs; birth control; contraception; MTP; amniocentesis

• Infertility and assisted reproductive technologies — IVF, ZIFT, GIFT

Unit 14: Genetics and Evolution (5 Marks)

• Sex determination in humans, birds and honey bee; linkage and crossing over

• Sex linked inheritance — haemophilia and colour blindness

• Mendelian disorders — thalassemia; chromosomal disorders — Down's syndrome, Turner's syndrome, Klinefelter's syndrome

• Genome and human genome project; DNA fingerprinting

• Origin of life; biological evolution and evidences; Darwin's contribution; modern synthetic theory of evolution

• Mechanism of evolution — mutation, recombination and natural selection; gene flow and genetic drift

• Hardy-Weinberg's principle; adaptive radiation; human evolution

Unit 15: Biology in Human Welfare (4 Marks)

• Basic concepts of immunology; vaccines; pathogens

• Human diseases — Hepatitis, Malaria, Dengue, Filariasis, Ascariasis, Typhoid, Pneumonia, Common cold, Amoebiasis, Ringworm and their control

• Cancer; HIV and AIDS; adolescence — drug and alcohol abuse

Unit 16: Biotechnology and Its Applications (4 Marks)

• Principles and processes of biotechnology; genetic engineering — recombinant DNA technology

• Application in health — human insulin production, vaccine production, stem cell technology, gene therapy

• Transgenic animals

Marks Distribution Summary

Physics (60 Marks)

Unit	Topic	Marks
1	Physical World and Measurement	2
2	Kinematics	3
3	Laws of Motion	2
4	Work, Energy and Power	2
5	Motion of System of Particles and Rigid Body	2
6	Gravitation	2
7	Properties of Bulk Matter	2
8	Thermodynamics	3
9	Behaviour of Perfect Gas and Kinetic Theory	2
10	Oscillations and Waves	4
11	Electrostatics	4
12	Current Electricity	4
13	Magnetic Effects of Current and Magnetism	5
14	Electromagnetic Induction and Alternating Currents	4
15	Electromagnetic Waves	3
16	Optics	7
17	Dual Nature of Matter and Radiation	2
18	Atoms and Nuclei	3
19	Electronic Devices	4
	Total	**60**

Chemistry (60 Marks)

Unit	Topic	Marks
1	Basic Concepts of Chemistry and Atomic Structure	4
2	Chemical Equilibrium	4
3	Chemical Kinetics	2
4	Solutions	2
5	Chemical Thermodynamics	4
6	Redox Reactions and Electrochemistry	3
7	Periodic Properties	2
8	Chemical Bonding and Molecular Structure	4
9	Co-ordination Chemistry	4
10	Organic Chemistry – Basic Principles and Techniques	4
11	d and f-Block Elements	4
12	Hydrocarbons	4
13	Haloalkanes and Haloarenes	4
14	Alcohols, Phenols and Ethers	4
15	Aldehydes, Ketones and Carboxylic Acids	4
16	Organic Compounds Containing Nitrogen	3
17	Molecules of Life	4
	Total	**60**

Biology (60 Marks)

Unit	Topic	Marks
1	Diversity of Life	4
2	Kingdom Plantae	3
3	Plant Anatomy	3
4	Plant Physiology	4
5	Diversity in Living World	3
6	Structural Organisation and Animal Biomolecules	3
7	Cell Structure and Function	4

8	Human Physiology	4
9	Reproduction in Flowering Plants	4
10	Genetics	4
11	Biology and Human Welfare	4
12	Ecology and Environment	3
13	Reproduction in Animals	4
14	Genetics and Evolution	5
15	Biology in Human Welfare	4
16	Biotechnology and Its Applications	4
	Total	**60**

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