



MBBS SET SYLLABUS

(2016)

Chinese Pharmacological Society
China Campus Network



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Reference:

AIPMT & NEET

NEET 2013

<http://www.mycollegebag.in/uploads/9/2/0/3/9203182/neet-2013-solutions-code-w.pdf>

AIPMT 2014

<http://www.vidyalankar.org/AIPMT/AIPMT-2014-solution.pdf>

AIPMT 2015

http://www.vidyalankar.org/file/AIPMT-2015_Paper_Solutions.pdf



MBBS SET Syllabus

Biology

Assessment Objectives:

The examination will be designed to assess the candidate's ability to:

(1) Demonstrate knowledge and understanding of:

- a. biological facts and principles and use of appropriate terminology;
- b. appropriate practical techniques;
- c. the social, technological and environmental applications of biology.

(2) Acquire skills in:

- a. designing and conducting simple experiments to test them;
- b. making constructive criticisms of experimental designs;
- c. making, recording and communicating accurate observations in the form of tables, charts, graphs,
- d. interpreting data represented in tables, charts, graphs, diagrams, and photographs;
- e. problem solving by applying biological knowledge and understanding to problems, including those of the technological and environmental nature.

Scheme of Assessment:

The examination will be 50 minutes long, and an exam paper is given. The paper consists of 50 items and total 100 marks. The questions will be set in English and must be answered in English. Candidates are reminded of the necessity for good English and orderly presentation in their answers.

The Syllabus

S. No.	Contents	Note
1.	Characteristics and classification of living organisms	
2.	Structural organization of the organism	
3.	Cell structure and function	
4.	Cell metabolism	
5.	Human physiology	
6.	Reproduction	
7.	Genetics	
8.	Variation and selection	
9.	Biotechnology and its applications	
10.	Ecology and environment	



Syllabus Contents

UNIT 1: Characteristics and classification of living organisms

1.1 Characteristics of living organisms

Describe the characteristics of living organisms by defining the terms:

- Movement* as an action by an organism causing a change of position or place;
- Respiration* as the chemical reactions in cells that break down nutrient molecules and release energy;
- Sensitivity* as the ability to detect and respond to changes in the environment;
- Growth* as a permanent increase in size;
- Reproduction* as the processes that make more of the same kind of organism;
- Excretion* as removal from organisms of toxic materials and substances in excess of requirements;
- Nutrition* as taking in of materials for energy, growth and development.

1.2 Concept and use of a classification system

- State that *organisms* can be classified into groups by the features that they share;
- Define *species* as a group of organisms that can reproduce to produce fertile offspring;

1.3 Features of organisms

- List the features in the cells of all living organisms, limited to cytoplasm, cell membrane and DNA as genetic material;
- List the main features used to place animals and plants into the appropriate kingdoms;
- List the main features used to place organisms into groups within the animal kingdom.

UNIT 2: Structural Organization of the Organism

2.1 Plant tissues; Morphology, anatomy and functions of different parts of flowering plants: root, stem, leaf, inflorescence-cymose and recemose, flower, fruit and seed.

2.2 Animal tissues; Morphology, anatomy and functions of different systems, including digestive, circulatory, respiratory, nervous and reproductive systems, of an insect.

2.3 Levels of organization: Define tissue as a group of cells with similar structures, working together to perform a shared function; Define organ as a structure made up of a group of tissues, working together to perform specific functions; Define organ system as a group of organs with related functions, working together to perform body functions.

UNIT 3: Cell structure and function

3.1 Components of the cells and their functions

- Plant cells: cell wall, cytoplasm, nucleus, vacuole, and chloroplast.
- Animal cells: cytoplasm and nucleus.

In both cases indicate the position and function of the cell membrane.

3.2 Cell ultrastructure

Identification and function of cell organelles; Endomembrane system: endoplasmic reticulum, Golgi bodies, lysosomes, vacuoles; mitochondria, ribosomes, plastids, micro bodies; Cytoskeleton, cilia, flagella, centrioles; Nucleus: nuclear membrane, nucleolus, and chromatin.

3.3 Chemical constituents of the cells

- a. Biological molecules: structure and function of proteins, carbohydrates, fats, and nucleic acids;
- b. Enzymes: types, properties, substrates, enzyme action.

3.4 Cell division

Cell cycle, mitosis, meiosis, and their significances.

UNIT 4: Cell metabolism

4.1 Sources of Energy: cellular energy and solar energy.

4.2 Enzymes: enzyme protein nature, folded shape, and roles in plants and animals. Special reference to their roles in metabolism.

4.3 Photosynthesis: definition and role of photosynthesis; Location of chlorophyll within cells; Identification of the source of light, carbon dioxide, and water for photosynthesis in leaf cells.

4.4 Respiration: Definition and role of “aerobic respiration” and “anaerobic respiration”.

4.5 Movement through cell membranes: selective permeability of membranes surrounding the cells and within the cells; definition of the terms “diffusion” and “osmosis”. Examples of each.

UNIT 5: Human physiology

5.1 Digestion and absorption

Alimentary canal and digestive glands; Role of digestive enzymes and gastrointestinal hormones; Digestion, absorption and assimilation of proteins, carbohydrates, and fats; Caloric value of proteins, carbohydrates and fats; Nutritional and digestive disorders.

5.2 Breathing and Respiration

Respiratory system in humans; Mechanism of breathing and its regulation in humans; Disorders related to respiration, including Asthma, Emphysema, Occupational respiratory disorders.

5.3 Body fluids and circulation

Composition of blood, blood groups, coagulation of blood; Composition of lymph and its function; Structure of human circulatory system, including heart and blood vessels; Cardiac cycle, cardiac output, Double circulation; Regulation of cardiac activity; Disorders of circulatory

system: Hypertension, Coronary artery disease, Angina pectoris, Heart failure.

5.4 Excretory products and their elimination

Modes of excretion: Ammonotelism, ureotelism, uricotelism; Structure and function of human excretory system; Urine formation, Osmoregulation; Regulation of kidney function: Renin-angiotensin, Atrial Natriuretic Factor, ADH and Diabetes insipidus; Disorders; Uraemia, Renal failure, Renal calculi, Nephritis; Dialysis and artificial kidney.

5.5 Locomotion and movement

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

5.6 Chemical coordination and regulation

Endocrine glands and hormones; Human endocrine system: Hypothalamus, Pituitary, Pineal, Thyroid, Parathyroid, Adrenal, Pancreas, Gonads; Mechanism of hormone action; Role of hormones as messengers and regulators, Hypo- and hyperactivity and related disorders.

UNIT 6: Reproduction

6.1 Asexual and Sexual reproduction

Reproduction, a characteristic feature of all organisms for continuation of species; Modes of reproduction: Asexual and sexual; Asexual reproduction, a process resulting in the production of genetically identical offspring from one parent; Identify examples of asexual reproduction from information provided; Sexual reproduction, a process involving the fusion of the nuclei of two gametes (sex cells) to form a zygote and the production of offspring that is genetically different from each other. Define fertilization as the fusion of gamete nuclei.

6.2 Sexual reproduction in plants

Identify and draw the sepals, petals, stamens, filaments and anthers, carpels, style, stigma, ovary and ovules, of an insect-pollinated flower; State the functions of the sepals, petals, anthers, stigmas and ovaries; Distinguish between the pollen grains of insect-pollinated and wind-pollinated flowers; Development of male and female gametophytes; Development of seed and formation of fruit; Special modes-apomixis, parthenocarpy, polyembryony; Significance of seed and fruit formation.

6.3 Sexual reproduction in humans

- a. Identify and name on diagrams of the male reproductive system: the testes, scrotum, sperm ducts, prostate gland, urethra and penis, and state the functions of these parts;
- b. Identify and name on diagrams of the female reproductive system: the ovaries, oviducts, uterus, cervix and vagina, and state the functions of these parts;

- c. Describe fertilisation as the fusion of the nuclei from a male gamete (sperm) and a female gamete (egg cell);
- d. State that in early development, the zygote forms an embryo which is a ball of cells that implants into the wall of the uterus;
- e. Outline the growth and development of the fetus in terms of increasing complexity in the early stages and increasing size towards the end of pregnancy.

6.4 Reproductive health

Need for reproductive health and prevention of sexually transmitted infections (STIs); Methods of birth control; Assisted Reproductive Technology; Infertility and assisted reproductive technologies, including IVF, ZIFT, and GIFT.

UNIT 7: Genetics

7.1 Mendelian Inheritance; Deviations from Mendelism-Incomplete dominance, Co-dominance, Multiple alleles and Inheritance of blood groups, Monogenetic inheritance; polygenic inheritance; Monohybrid inheritance; Chromosomes, genes, and proteins; Sex determination: in humans, birds, honey bee; Linkage and crossing over; Sex linked inheritance: Haemophilia, Colour blindness; Monogenetic and polygenetic diseases in humans; Chromosomal disorders in humans: Down's syndrome, Turner's and Klinefelter's syndromes.

7.2 Molecular basis of inheritance: search for genetic material and DNA as genetic material; Structure of DNA and RNA; DNA packaging; DNA replication; Central dogma; Transcription, genetic code, translation; Gene expression and regulation; Genome and human genome project.

UNIT 8: Variation and selection

8.1 Variation

Definition and role of variation; Distinguish between phenotypic variation and genetic variation; State that continuous variation results in a range of phenotypes between two extremes, e.g. height in humans; State that discontinuous variation results in a limited number of phenotypes with no intermediates, e.g. tongue rolling; Record and present the results of investigations into continuous and discontinuous variation; Definition and feature of mutation; Mutation is the way in which new alleles are formed; Ionising radiation and some chemicals increase the rate of mutation.

8.2 Adaptive features

Adaptive feature is an inherited feature that helps an organism to survive and reproduce in its environment; Interpret images or other information about a species to describe its adaptive features.

8.3 Selection

- a. Natural selection: variation within populations; production of many offspring; competition for resources; struggle for survival; reproduction by individuals that are better adapted to the environment than others; passing on of their alleles to the next generation
- b. Selective breeding: selection by humans of individuals with desirable features; crossing these individuals to produce the next generation; selection of offspring showing the desirable features.

UNIT 9: Biotechnology and its applications

9.1 Biotechnology

Describe the role of anaerobic respiration in yeast during production of ethanol for biofuels; Describe the role of anaerobic respiration in yeast during bread-making; investigate and describe the use of pectinase in fruit juice production; Investigate and describe the use of biological washing powders that contain enzymes; Define genetic engineering (recombinant DNA technology) as changing the genetic material of an organism by removing, changing or inserting individual genes; the principles and process of genetic engineering.

9.2 Application of Biotechnology in health and agriculture

State examples of Biotechnology: the insertion of human genes into bacteria to produce human insulin; the insertion of genes into crop plants to confer resistance to herbicides; the insertion of genes into crop plants to confer resistance to insect pests; the insertion of genes into crop plants to provide additional vitamins; Transgenic Animals; Gene therapy.

UNIT 10: Ecology and environment

10.1 Food chains and food webs

Define a food chain as showing the transfer of energy from one organism to the next, beginning with a producer; State that energy is transferred between organisms in a food chain by ingestion; Construct simple food chains; Define a food web as a network of interconnected food chains; Define consumer as an organism that gets its energy by feeding on other organisms; State that consumers may be classed as primary, secondary and tertiary according to their position in a food chain; Use food chains and food webs to describe the impacts humans have through over-harvesting of food species and through introducing foreign species to a habitat.

10.2 Ecosystem

Definition, diversity, patterns, and components; productivity and decomposition; Habitat; Environmental Factors: abiotic factors, biotic factors, and climatic factors; Energy flow; Niche; Nutrient cycling (Outline of the Carbon cycle and the Nitrogen cycle); Ecological succession; Ecological services: Carbon fixation, pollination, oxygen release.

10.3 Ecology and human welfare

Health and Disease; Pathogens; parasites causing human diseases (Malaria, Filariasis,



Typhoid, Pneumonia, amoebiasis, ring worm); Basic concepts of immunology-vaccines; Cancer, HIV and AIDS; Drug and alcohol abuse; Improvement in food production; Apiculture and animal husbandry; Microbes in human welfare: Household food processing, industrial production, sewage treatment, energy generation and as biocontrol agents and biofertilizers.

10.4 Human impact on ecosystem

Food supply—state how modern technology has resulted in increased food production; Habitat destruction—describe the reasons for habitat destruction, and state that through altering food webs and food chains, humans can have a negative impact on habitats; Pollution—definition, areas of effect, its control. Study the effects of any one pollutant; Definition of conservation; Waste management—problems associated with waste disposal; Importance of waste minimisation. Conservation—Definition of a sustainable resource, and explain why organisms become endangered or extinct, limited to climate change, habitat destruction, hunting, pollution and introduced species.



MBBS SET Syllabus

Chemistry

I. Examination Rules

1 . Content and Ratio

Basic Theory: 40% , Element and compounds: 20% , Organic Chemistry: 25% ,
Calculation: 15%.

2 . Question Type:

Multiple-Choice : 50 Questions

3 . Method and Total Grade

Closed Textbook Exam , Total Grade: 100

4 . Exam Time : 50 min

II. Examination Requirements

Requirements : Know(A)、 Understand(B)、 Master(C)

- Know (A) : Identify and Memorize of Learning Content
- Understand (B) : Understand The Exact Meaning Of The Learning Content And Can Be Used To Analyze And Solve Problems.
- Master (C) : Focus On the Learning Content to Explain Some of the Chemical Problems.

III. Examination Content

1. Basic Theory

Subject	Content	Level	Instruction
Atomic Structure	Atom	A	(1) The Discovery of Atomic Structure (2) Isotopes and Mass Number (3) Average relative atomic mass of an element
	Electron Configurations	B	(1) The meaning and writing of electronic structure of element 1-18 (2) The meaning and writing of the schematic diagram of atomic structure of element 1-18
	Ions	B	(1) Electronic structure of simple ions, hydroxyl ion and ammonium ion (2) Electronic structure of simple ions (Atomic Number 1-18)
Chemical Bond	Ionic Bond	C	(1) Concept of chemical bond (2) Representative substance of Ionic bond, Covalent Bond and Metallic Bond (3) Using electronic structure to describe the formation of Ionic bond and Covalent Bond
	Covalent Bond	B	
	Metallic Bond	A	
Energy Transformation	Energy Changes in Solution	B	(1) Dissolution Equilibrium and Crystallization Process (2) Transformation during the Process of Dissolution
	Energy Changes During Chemical Reaction	C	(1) Thermal Effect of Chemical Reaction (2) Exothermic and Endothermic reaction (Neutralization Reaction is Exothermic Reaction) (3) Thermochemical Equation
Chemical Reaction Rate and Chemical Equilibrium	Chemical Reaction Rate	B	Definition
	Factors Affecting the Chemical Reaction Rate	C	Effects of Concentration, Pressure, Temperature and Catalyst on Reaction Rate
	Reversible Reaction And Chemical Equilibrium State	C	Equilibrium constant calculation

	Factors Affecting the Movement of Chemical Equilibrium	B	Effects of Concentration, Pressure and Temperature on the Chemical Equilibrium Shift
	Le Châtelier's Principle	C	Explain the Impact of Concentration, Pressure and Temperature to Chemical Equilibrium With Le Châtelier's Principle
	Application of Chemical Equilibrium	C	Equilibrium Concentration
Periodic Table	Periodic Law	B	(1) Rule of Properties Changing of Main Group Elements (2) Rule of Properties Changing of Short Period Cycle
	Periodic Table	C	(1) Structure of Periodic Table (2) The Relationship between Periodic Table And Atomic Structure (3) Application of Periodic Table
Electrolyte Solution	Electrolyte, Nonelectrolyte, Strong Electrolyte and Weak Electrolyte	B	(1) Classification of different kinds of Electrolyte
	Ionization, Ionization Equation And Ionization Equilibrium	B	(1) Concept of Ionization Concept (2) Ionization Equation (Strong Electrolyte, Weak Electrolyte and Nonelectrolyte) (3) Factors Affecting Ionization Balance
	Water Ionization and pH Value	C	(1) Water is Weak Electrolyte. (2) Definition of pH Value (3) The Relationship between pH Value and the Acid-Base Properties of Solution
	Acid-Base Indicator	A	Litmus and Phenolphthalein
	Ionic Equations	C	Ion Equation for Replacement Reaction and Decomposition Reaction
	Hydrolysis of Salts and Applications	B	The pH value of the common strong acid weak base salt and strong base weak acid solution

Redox Reaction	Oxidizing And Reducing Agent	C	(1) The Definition of Redox Reaction (2) Determine the Oxidizing and Reducing Agents by Oxidation Numbers
	Balancing Redox Reaction Equation	B	Balancing Redox Reaction Equation
	Voltaic Cells	B	Principle of Copper Zinc Voltaic Cell

2. Elements and Compounds

Subject	Content	Level	Instruction
Halogens	Physical Properties	A	Color, State, Water Solubility and Toxicity
	Chemical Properties	C	(1) Laboratory Preparation of Chlorine gas (2) Reaction of chlorine gas with iron, hydrogen gas, sodium hydroxide and water
	Bleaching Powder	A	Components, Manufacturing Methods and Principles of Bleaching
	Extraction of Bromine from Sea Water and Iodine from Kelp	A	(1) Main Principles and Procedures of Extracting Bromine from Seawater and Extracting Iodine from Kelp (2) Color Characteristics of Iodine and Starch
	Comparison of Chlorine, Bromine and Iodine	B	the difference of non-metallic properties of chlorine, bromine and iodine from the atomic structure
Alkali and Alkaline earth metals	Physical Properties	A	Color, State, density
	Chemical Properties	C	(1) Reactions of Na and Mg with oxygen, water, halogens (2) Preparation and Properties of Na_2CO_3 , NaCl, NaOH and NaHCO_3
	Electronic Configuration	B	Electronic Configuration
	Industrial use of lime and limestone	B	Application of lime and limestone
	Hard water	A	Hard water
Sulfur	Sulfur	B	Physical and Chemical Properties
	Hydrogen Sulfide	C	Toxicity, odor, and strong reduction property

	Sulphur Oxides	C	(1) Oxidation and Reduction properties of sulfur dioxide (2) Chemical principles of sulfur dioxide formation of acid rain (3) The reaction of sulfur dioxide with water and the weak acid of sulfuric acid
	Characteristics of Concentrated Sulfuric Acid	C	Water Absorption, Dehydration, Strong Oxidation
	Application of Sulfuric Acid and Sulfates	A	Application of BaSO ₄ in clinics
Nitrogen	Ammonia	A	(1) Physical Properties of Ammonia
		C	(2) Chemical Properties of Ammonia (Reaction with Water, Hydrogen Chloride and Oxygen)
		B	(3) Principle of Industrial Ammonia Synthesis
	Ammonium Salt	B	(1) Reaction of ammonium ion with Basic Solution (2) Instability of Ammonium Salt
	Chemical Properties of Nitric Acid	B	Acidity, Instability and Oxidation Properties
Iron	Chemical Properties	C	(1) The Reaction between Iron and oxygen, sulfur, chlorine, hydrochloric acid, copper sulfate solution and water (2) Passivation of iron in concentrated sulfuric acid
	Iron Alloy and Application	A	(1) Concept and its Excellent Characteristics of Alloy (2) Properties and Applications of Iron Alloys
Aluminum	Physical Properties Chemical Properties of Aluminum	C	(1) Atomic Structure and Chemical Properties of Aluminum (2) Reaction of Aluminum with Oxygen, Hydrochloric Acid, Water and Sodium Hydroxide Solution

	Aluminum Alloy and Application	A	Aluminum Alloy and Application
	Alumina and Aluminium Hydroxide	C	Reaction with Hydrochloric Acid or Sodium Hydroxide Solution

3. Organic Chemistry

Subject	Content	Level	Instruction
Organic Chemistry	Properties	A	Characteristics of Organic Substance
	Homologue	B	(1) Concept of Homologous Compounds (2) Similarity of Chemical Properties of Homologous Compounds
	Isomers	B	(1) Concept of Isomers (2) C4-C5 Isomers of Alkanes
	Structure and Skeleton Symbol	B	Concept of Organic Functional Groups
	Reaction Types of Organic Compounds	B	(1) Substitution Reaction, Addition Reaction, Elimination Reaction, Polymerization Reaction (2) Characteristics of Organic Reactions
Methane and Alkanes	Molecular Structure of Methane	B	Tetrahedral Structure and Spatial Symmetry
	Physical Properties of Methane	A	(1) Prediction of boiling point and melting point
	Chemical Properties of Methane	C	(1) Reaction of Methane with Oxygen and Chlorine (2) Decomposition Reaction of Methane and Application of its Product
	Alkanes	B	(1) Alkyl, General Formula, Nomenclature, Isomers, Homologue and Molecular Formula
Ethylene	Molecular Structure	B	Carbon Carbon Double Bond Functional Group, Unsaturated Double Bond
	Physical Properties	A	(1) Prediction of boiling point and melting point
	Chemical Properties of Ethylene	C	(1) Relationship between Functional Groups and Chemical Properties (2) Addition Reaction of Ethylene (Hydrogen, Hydrogen Chloride, Bromine and Water)

	Laboratory Preparation Application	A	(1) Reaction Principle and Apparatus
Acetylene	Molecular Structure	B	(1) Carbon Carbon Triple Bond Functional Groups, Unsaturated Properties of Triple Bond
	Chemical Properties	C	(1) Relationship between Functional Groups and Chemical Properties (2) Addition Reaction of Acetylene (Hydrogen, Hydrogen Chloride, Bromine and Water) (3) Properties of vinyl chloride
	Laboratory Preparation of Acetylene	A	Reaction Principle and Apparatus
Benzene	Molecular Structure	B	The Specificity of Carbon Carbon Bond in Benzene Ring
	Physical Properties	A	Nonpolar solvent
	Chemical Properties	C	Substitution reaction (Liquid bromine), nitration reaction and addition reaction (Hydrogen gas) of Benzene
Ethanol	Molecular Structure	B	Hydroxyl groups and their properties
	Physical Properties	A	Intermolecular hydrogen bond
	Chemical Properties	C	Elimination, oxidation, esterification reaction
	Industrial Preparation and Application	A	Method of food fermentation and ethylene hydration
Acetaldehyde	Molecular Structure	B	Aldehyde groups and their properties
	Chemical Properties	C	Reduction, oxidation, and addition reaction
Acetic Acid	Molecular Structure of Acetic Acid	B	Carboxyl group and its properties
	Physical Properties	A	Prediction of acidity
	Chemical Properties	B	Esterification of acetic acid

4. Experiment

Subject	Content	Level	Instruction
Matter Properties	Comparison of Chlorine, Bromine and Iodine	B	Substitution reaction between chlorine, bromine and iodine
	Properties of Aluminium And its Compounds	B	(1) Aluminum React with Acid and Strong Alkali Solution (2) Aluminum Hydroxide React With Acid And Strong Alkali Solution (3) Aluminum Salt With Alkali Solution
	Properties of Ethylene	B	(1) Combustion of Ethylene (2) Ethylene React with Potassium Permanganate and Bromine Solution
	Properties of Acetylene	B	(1) Combustion of Acetylene (2) Ethylene React with Potassium Permanganate and Bromine Solution
	Properties of Acetaldehyde	B	Acetaldehyde React with Silver Ammonia Solution and Fresh Copper Hydroxide Reaction System
Separation of Substance	Extraction of Iodine from Kelp	B	Extraction principle and operation
Laboratory Preparation of Simple Organic Compound	Laboratory Preparation of Ethylene	B	Principle and Apparatus
	Laboratory Preparation of Acetylene	B	Principle and Apparatus
	Laboratory Preparation of Ethyl Acetate	B	Principle and Apparatus
Ions Test	Anion Test	B	Cl ⁻ , Br ⁻ , I ⁻ , OH ⁻ , CO ₃ ²⁻ , SO ₄ ²⁻
	Cation Test	B	NH ₄ ⁺ , Fe ³⁺ , H ⁺
Quantitative Experiment	Preparation of Solution With Certain Molarity	B	(1) the Concept and calculation of Molarity (2) Using of volumetric flask and Preparation of Solution With Certain Molarity
	Neutralization Titration	B	(1) Using of burette (2) Determination and Control the Equivalence Point of Titration



5. Calculation

Content	Level	Instruction
Moles, Molar Mass and Mass	C	Moles, Molar Mass and Mass
Calculation According to Chemical Formula	C	Calculation According to Chemical Formula
Calculation of Solution	C	(1) Calculation of solubility (2) Calculation of Molarity and mass fraction (3) Calculate the ph value of the solution (strong acid and strong base solution)
Calculation According to Chemical Equation	C	Calculation According to Chemical Equation



MBBS SET Syllabus

Physics

UNIT 1: Introduction

- **Unit:** know SI units, fundamental and derived units; understand unit consistency and conversion.
- **Scalar and vector quantities:** know position vector and displacement, know general vectors and notation.
- **Expression of vectors:** understand coordinate system and know how to create a two-dimensional coordinate system (x-y); be able to express a 2-dimensional vector in its components or in terms of magnitude and direction; understand the conversion between two different expressions of a vector.
- **Calculation of vectors:** multiplication of vectors by a real number, addition and subtraction of vectors.

UNIT 2: Straight Line Motion

- **Variables describing the motion of a particle:** understand position, displacement, average velocity, instantaneous velocity, average acceleration, instantaneous acceleration; understand the differences between displacement and distance, velocity and speed.
- **Motion in a straight line with constant velocity*:** be able to calculate with formula $s = vt$; understand position-time graph and velocity-time graph.
- **Motion in a straight line with constant acceleration*:** be able to calculate with formulas $v_x = v_{0x} + a_x t$, $x = x_0 + v_{0x} t + \frac{1}{2} a_x t^2$ and $v_x^2 - v_{0x}^2 = 2a_x(x - x_0)$; understand position-time graph, acceleration-time graph and velocity-time graph; be able to extract information of acceleration, velocity, position and displacement from graphs.
- **Free falling bodies:** be able to calculate with formulas; understand the acceleration of gravity.
- **Relative velocity:** know reference frame; understand the relativity of velocities.

UNIT 3: Interaction and Forces

- **Force:** understand the general concept of a force (strength, direction and functional point); know graphic notation of a force.
- **Fundamental forces:** know concepts and mathematic expressions of some

fundamental forces, including gravity, normal force, tension force, elastic force and friction; understand the acting direction of these fundamental forces and affecting factors of each force; understand the relation between gravity and normal force; know Hooke's law, know types of friction and understand the difference (static friction and kinetic friction); be able to calculate with formula $f = \mu N$.

- **Internal and external forces:** understand the concepts of internal force and external force; understand the differences between internal force and external force.
- **Force analysis:** be able to diagram the forces acting on a body; understand the pulley system.
- **Superposition and decomposition of forces:** understand the net force and be able to calculate.

UNIT 4: Newton's Laws

- **Newton's laws of motion:** know the statements and understand the interpretations of Newton's laws of motion.
- **Free-body diagram:** understand and be able to draw free-body diagram.
- **Application of Newton's laws of motion*:** understand the condition of static equilibrium; be able to identify the status of a body (in static equilibrium or straight-line motion with acceleration); be able to apply the Newton's first law to find the magnitude and direction of a force acting on a body which is in static equilibrium; be able to apply the Newton's second law, combining with kinematic of straight line motion, to find the magnitude of a force acting on a body or the acceleration of a body with several external forces acting on; be able to apply Newton's laws on the two physics bodies system (two physics bodies connected with a massless and non-stretching string).
- **Apparent weight:** understand the phenomenon of apparent weight; be able to explain apparent weight with Newton's laws of motion.

UNIT 5: Curvilinear Motion

- **Curvilinear motion:** know concept of curvilinear motion; understand the changes in both direction and magnitude of velocity in a curvilinear motion.
- **Projectile motion*:** understand the composition and decomposition of motion;

understand the motion and trajectory rules of a projectile; be able to solve projectile problems with its initial velocity either vertically or horizontally.

- **Uniform circular motion:** know concept of linear speed, angular speed and period in a circular motion; know the relations between linear speed, angular speed and period ($v = r\omega$, $T = 2\pi r/\omega$).
- **Centripetal acceleration and centripetal force*:** understand concepts of centripetal acceleration and centripetal force; understand the relation between centripetal acceleration and centripetal force with Newton's second law; be able to explain centrifugal phenomena.
- **Law of universal gravitation:** know the statement and equation of the law of universal gravitation; understand the relation between gravitational force and weight; know Kepler's laws of planetary motion.

UNIT 6: Work, Energy and Power

- **Work:** understand the concept of work; be able to calculate the work done by a constant force or the net force acting on a particle that undergoes a straight-line displacement ($W = Fs \cos \theta$).
- **Power:** know definition of power; understand the relation between the average power and average speed.
- **Kinetic energy:** know the definition of kinetic energy.
- **Work-energy theorem*:** understand the theorem; be able to solve problems with the theorem.
- **Potential energies:** know definition of gravitational potential energy and concept of elastic potential energy; understand the relation between gravitational potential energy and work done by gravity; understand the independence of gravitational potential energy of a body from the path it takes; understand the gravitational potential energy is relative depending on how the zero potential is chose.
- **Conservation of mechanical energy*:** understand the concept of mechanical energy; understand on what condition the mechanical energy is conserved and on what condition the mechanical energy is not conserved; be able to explain the conversion of mechanical energy from kinetic energy to gravitational potential energy in a system (a body in projectile motion or in a vertical circular motion); be able to apply the conservation law to solve problems.
- **Conservation of energy:** understand the difference between conservation of

mechanical energy and conservation of energy.

UNIT 7: Linear Momentum

- **Momentum:** understand concept of momentum and be able to calculate the momentum of a particle.
- **Impulse:** understand the concept of impulse.
- **Impulse-momentum theorem:** understand the theorem and be able to apply the theorem on a body moving along a straight line.
- **Conservation of momentum*:** understand this law of conservation and know the conditions of application; be able to apply this law of conservation in collision of two bodies along the straight line.
- **Collisions:** know the characteristics of elastic and inelastic collision in one dimension.

UNIT 8: Oscillations and Waves

- **Simple harmonic motion (SHM):** know variables describing SHM (period, frequency, displacement, amplitude, angular velocity); understand the oscillation of a spring oscillator; know how the variables (amplitude, velocity, acceleration, restoring force, potential energies) change in SHM of a spring oscillator; understand the graphs.
- **Simple pendulum:** understand derivation of expression for its time period; know the notions of free oscillation, forced oscillation and damped oscillation, resonance.
- **Wave motion:** understand concept of longitudinal and transverse waves; know the phenomenon and conditions of interference and diffraction.

UNIT 9: Thermal Physics & Thermodynamics

- **Parameters describing the status of a gas:** understand concepts of temperature, absolute temperature, volume, pressure; know Avogadro's number and number of moles.
- **Ideal gas law:** understand ideal gas law ($PV = NkT$ or $PV = nRT$); be able to apply the law solving problems.
- **Phase transitions:** understand the definition of heat, specific heat capacity, latent heat; be able to calculate the latent heat required to produce a phase change.



- **Laws of thermodynamics:** know the statements of laws of thermodynamics.
- **Thermodynamics processes:** know constant-pressure process, constant-volume process and constant-temperature process; be able to identify the type of process from the P-V diagram.

UNIT 10: Electric Forces, Fields and Potential

- **Electric charge:** know types of charge; understand the law of conservation of charge; know the concept of elementary charge.
- **Electrostatic induction:** understand electrostatic phenomenon; be able to identify the type of the induced charges.
- **Coulomb's law:** be able to calculate the electric force between two point charges (both the magnitude and direction), electric forces between multiple charges.
- **Electric field and electric field lines:** know the concept and definition of electric field; understand concept of electric field lines; be able to sketch electric field lines of an isolated point charge; understand superposition principle of electric field.
- **Electric potential:** know the concept and definition of electric potential energy; know the concept and definition of electric potential; know the expression of potential due to a point charge or in a uniform electric field; know the concept of equipotential surface; be able to sketch the equipotential surface of a point charge or in a uniform electric field.
- **Motion of a point charge in a uniform electric field:** be able to solve problems in which the initial velocity of the point charge is perpendicular or parallel to the electric field.
- **Capacitors and capacitance:** know concept of capacitor and parallel plate capacitor; know definition of capacitance; understand factors affecting capacitance of parallel plate capacitor.

UNIT 11: Electric Current, Circuits and Alternating Current

- **Electric current:** know definition of electric current; understand the direction of current flow.
- **Electric current density:** know concept of electric current density; understand the relation of electric current and electric current density.
- **Electromotive force (Emf):** understand definition of emf of battery; know circuit symbol of battery; know existence of internal resistance of a battery; know

difference of emf and terminal voltage of a battery.

- **Resistance and resistivity:** know definition of resistance; understand the relation of resistance and resistivity; understand factors affecting the resistance of a long wire; know circuit symbol of resistor.
- **Ohm's law*:** understand the relation of electric current, resistance and potential difference of a resistor.
- **Measuring currents and voltages:** know ammeter and voltmeter are instruments measuring current and potential difference in a circuit; know circuit symbols of ammeter and voltmeter; understand how ammeter and voltmeter should be connected in circuit to measure electric current and potential difference through resistor.
- **Series and parallel circuits*:** know concepts of series and parallel circuits; understand the relation of currents through each resistors in a series circuit, voltages across each of the resistors in parallel circuit. (In a series circuit, the current through each of the resistors is the same, and the voltage across the circuit is the sum of the voltages across each resistor. In a parallel circuit, the voltage across each of the resistors is the same, and the total current is the sum of the currents through each resistor.)
- **Circuit analysis:** be able to calculate the equivalent resistance for two or more resistors in series or parallel; be able to simplify circuit by replacing parallel and series resistors with equivalent resistor;
- **Energy and power in electric circuits:** be able to calculate power delivered by a resistor with formula $P = I^2R$ or $P = U^2/R$;
- **Alternating currents:** know sinusoidal expressions of alternating current and voltage; be able to identify amplitude of current or voltage from the expression.

UNIT 12: Magnetic Forces and Fields

- **Magnetic field:** know the concept of magnetic field; understand concept of magnetic field lines; understand the differences and commons between magnetic field lines and electric field lines; be able to identify the direction of magnetic field due to a long straight wire and a solenoid.
- **Ampere's force*:** understand the motion of a charged particle in a uniform magnetic field; be able to identify the magnitude and direction of the magnetic force on a charged particle moving perpendicularly or horizontally to the magnetic

field; be able to find the magnetic force on a current-carrying wire in a uniform magnetic field (the wire and magnetic field are parallel or perpendicular to each other).

- **Ampere's rule***: be able to find the direction of the magnetic field due to a long straight wire, a circular current loop and an ideal solenoid; know factors affecting the magnitude of the magnetic field due to a long straight wire, a circular current loop and an ideal solenoid.

UNIT 13: Electromagnetic Induction

- **Electromagnetic induction**: know electromagnetic induction phenomena; know concept of motional emf and factors affecting the value of motional emf.
- **Faraday's law***: understand the concept of magnetic flux, induced emf; understand the relation of the induced emf and the change in magnitude of magnetic fields.
- **Lenz's law**: be able to identify the direction of induced current of a loop.
- **Transformers**: know the structure of a simple transformer, the concept of primary coil, secondary coil; know the relation between ratio of the emfs induced by primary coil and secondary coil and the turns ratio of primary and secondary coils

UNIT 14: Electromagnetic Waves and Optics

- **Electromagnetic waves**: understand the generation of electromagnetic waves and the characteristics; know transverse nature of electromagnetic waves; know electromagnetic spectrum; know arrangement of the wavelength and frequency of visible light in the spectrum.
- **Nature of light**: understand the wave-particle duality of light; know the speed of light in vacuum; understand the concepts of wavefront and ray.
- **Reflection and refraction**: know concept and definition of index of reflection; understand the laws of reflection and refraction; be able to apply the laws to find the angle of reflection or refraction and index of reflection of material.
- **Image formation by a mirror**: be able to sketch the diagram to find image of a point or an extended object formed by a plane mirror; know principle rays for a spherical mirror; be able to sketch the diagram to find image of a point or an extended object formed by a concave mirror or a convex mirror with principle rays; know the relations of object distance, image distance and focal length for

spherical mirrors ($\frac{1}{s} + \frac{1}{s'} = \frac{1}{f}$).

- **Thin lenses:** know concepts of converging lens and diverging lens; know principle rays for lens; be able to sketch diagram to find images formed by a converging lens or a diverging lens; know the relations of object distance, image

distance and focal length for thin lenses ($\frac{1}{s} + \frac{1}{s'} = \frac{1}{f}$).

- **Optical instruments:** know how human eyes work; know image formation and accommodation of eyes; understand correction of eye defects (myopia and hypermetropia) using lenses.
- **Interference:** understand conditions for constructive and destructive interference; know Young's double-slit experiment; understand the factors affecting the pattern of double-slit interference.
- **Diffraction:** understand diffraction by a single slit; understand the single-slit pattern, including intensity, width of central maximum; be able to identify the factors affecting the single-slit pattern.

UNIT 15: Atoms and Nuclei

- **Structure of atoms:** understand Rutherford's model of atom; know the concepts of protons, neutrons, nucleons, isotopes; know the relation of nucleon number, atomic number and neutron number; understand the difference between isotopes; understand the level structure of atoms with Bohr's model.
- **Fission and fusion:** understands the concept of fission and fusion; be able to complete the fission chain reaction; understand definition of alpha decay, Beta-minus decay and Beta-plus decay and Gamma decay; understand concept of half-value period and be able to calculate.
- **The photoelectric effect:** know description of photoelectric effect; understand the concepts of threshold frequency and stopping potential.
- **Wave-particle duality:** understand the wave nature of a particle; know the concept of De Broglie wave;

*Topics with * marks are topics need to be mastered.*

MBBS SET Syllabus

Mathematics

Scope of Syllabus			
1	Sets, Real Number System	5	Equations and Inequalities
2	Plane Geometry and Solid Geometry	6	Ratio, Rates and Percentages
3	Relations, Functions and Graphs	7	Trigonometry
4	Algebraic Expressions	8	Vectors in a Plane

Syllabus Contents

Unit 1: Sets, Real Number System

- Number of subsets in a set
- Relations between sets
- Laws of algebra of sets.
- Regions of a Venn diagram in terms of the set operations-union, complement
- Field axioms and order axioms
- Representing a number in a real line (including inequality)
- Expressing recurring decimals as common fractions
- Properties of operations on real numbers
- Concept of absolute value

Unit 2: Plane Geometry and Solid geometry

- Calculating the angles at a point
- Properties of parallel lines
- Exterior angle theorem of triangles
- Properties of special triangles
- Properties of quadrilaterals
- Drawing circles for given radii
- Circle theorems
- Identifying the tangent as perpendicular to the radius at the point of contact
- Verifying that the angle between the tangent and the chord at the point of contact is equal to the angle in the alternate segment
- Verifying that tangents drawn from an external point to the same circle are equal when measured from their points of contact

- Sums of interior angles and exterior angles of a polygon
- Length of an arc of a circle
- Perimeter of plane figures
- Areas of sectors, segments and quadrilaterals
- Dihedral angle
- Respective volume inside a right circular cone, a right circular cylinder and a sphere

Unit 3: Relations, Functions and Graphs

- Order pairs and Cartesian products
- Various types of relations
- Identifying functions from other relations
- Rule for a given mapping
- Types of functions
- Rule for the inverse function
- Drawing linear, quadratic and cubic graphs for given functions
- Finding the gradient of a straight line, given the coordinates of two points on the line
- Equation of a straight line
- Distance between two points
- Changing the subject of a relation
- Properties of composite functions
- Properties of exponential functions and logarithmic functions
- Transformation of graphs

Unit 4: Algebraic Expressions

- Statements in mathematical symbols
- Addition and subtraction of algebraic expressions
- Multiplication of two binomial expressions
- Factorization of algebraic expressions
- Difference of two squares
- Operations on simple algebraic fractions
- Determining the conditions under which algebraic fraction is undefined or zero

Unit 5: Equations and Inequalities

- Solution sets for linear equations in one variable
- Solving linear inequalities in one variable and illustrating the result on the number line
- Solution sets of two given linear equations in two variables
- Identifying and solving quadratic equations by factorization
- Solving quadratic equations by graphical method

- Minimum, maximum values and points from graphs
- Identifying the axis of symmetry and writing its equation
- Solving simultaneous equations one linear and one quadratic using graphs
- Using quadratic graph to solve related equations
- Range of values of x for which y is increasing or decreasing
- Range of values of x for which y is positive or negative

Unit 6: Ratio, Rates and Percentages

- Dividing a quantity in a given ratio
- Interpretation of scales used in drawing plans and maps and using them to calculate distances between two points
- Common rates
- Drawing travel graphs and interpret them
- Comparing two amounts or quantities by expressing one as a percentage of the other
- Money-making calculations with percentages
- Money-spending calculations with hire purchase
- Compound interest

Unit 7: Trigonometry

- Sine, cosine, tangent and cotangent of an acute angle in degrees
- Values of trigonometric ratios of 30° , 45° , 60° and 90°
- Using the calculator to read the values of sine, cosine and tangent of angles up to 360°
- Inverse of trigonometric ratios
- Angles of elevation and angles of depression
- Applying the use of trigonometric ratios to calculate distances and heights
- Drawing the graphs of simple trigonometric functions and identify maximum and minimum values
- Drawing the graphs of trigonometric functions and interpret

Unit 8: Vectors in a Plane

- Scalar and vector quantities
- Representing vectors in various forms
- Addition and subtraction of vectors
- Multiplying a vector by a scalar
- Express $\cos\theta$, θ is the angle between two plane vectors
- Applying dot product to plane trigonometry
- Expressing the components of a vector in column form
- Adding two vectors using the triangle law of vector addition



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- Conditions for two vectors to be equal or parallel
 - Vector product of two vectors
 - Properties of vector product
 - Negative vector of a given vector
 - Magnitude and direction of a vector.