



Shiv Chhatrapati Shikshan Sanstha's

**RAJARSHI SHAHU MAHAVIDYALAYA**

**LATUR ( JUNIOR SCIENCE )**

*Rajarshi Shahu Screening Test*

**परिशिष्ट 'अ'**

**SYLLABUS - PCB GROUP**

**EXAM DATE**

**07 APRIL, 2024**

## **BASIC MATHEMATICS AND QUANTITATIVE APTITUDE AND REASONING**

1. Number system, HCF and LCM, Square and Square root, Cube and Cube root, Average, Ratios and Proportion, Partnership.
2. Algebraic Identities : Expansion of  $(A+B)^2$ ,  $(A-B)^2$ ,  $(A+B)^3$ ,  $(A-B)^3$ ,  $A^3-B^3$ ,  $A^3+B^3$  &  $(A+B+C)^2$
3. Discount and percentage : Profit & Loss ( Percentage based )
4. Logarithms : Defination, Properties of logarithms.
5. Time & Work, Time, Speed and Distance, Problems on trains, Boats and Streams.
6. Arithmetic Progression and geomatric progression.
7. Mensuration Surface areas & volumes.
8. Trigonometric ratios of standard angles, its application.
9. Plane geometry : ( Concept of line & angle, triangle, quadrilaterals and circle )
10. Co-ordinate geometry : Graph of line ( co-ordinate system) , Collinear points.
11. Probability, Permutation and combination.
12. S.I.Units & symbols.
13. Basic knowledge of vector : Vector quantities, Direction of vector, type of vector.

### **REASONING**

1. Syllogism reasoning.
2. Data sufficiency - Blood relation, Order and Ranking, Clock, Calender, Direction sence test, Distance, Coding Decoding, Seating arrangement.
3. Counting figure, Cube and Dice.
4. Venn diagram reasoning.

# Physics

**1. Motion in One Dimension :**

Motion of an Object, Displacement & Distance, Speed & Velocity, Uniform & Non-uniform Linear motion, Acceleration (+ ve, - ve & Zero acceleration), Effects of speed & direction on Velocity due to acceleration, Distance-Time graph (Uniform & Non-uniform motion), Velocity-Time graph (Uniform Motion & Uniformly Accelerated Motion). Equation of motion using graphical method, Kinematical Equations, Free fall.

**2. Laws of Motion :**

Contact & Non contact forces, Balanced & unbalanced forces, Newton's First, Second & Third law of motion & their applications, Momentum & Law of Conservation of Momentum.

**3. Work, Energy & Power :**

Work done by constant force, Mechanical Energy (Kinetic energy & its expression, Potential energy & its expression & their Applications), Law of conservation of energy, Power.

**4. Gravitation:**

Newton's universal law of gravitation, Acceleration due to gravity, Variation of acceleration due to gravity with height from surface of earth.

**5. Fluid Mechanics:**

Pressure on solids & Liquids, Buoyancy, Archimedes Principle, Flotation.

**6. Sound:**

Production of sound, Propagation of sound in medium, Frequency of sound waves, Velocity of sounds in different media, Reflection of sound, Applications of reflection of sounds (SONAR, Sound Board), Ultrasound & its Application for detecting defects.

**7. Heat :**

Heat & Temperature, Thermometer, Specific heat & calorimeter, effects of heat (Expansion of solids, Liquids & Gases-General Idea Only), Latent heat, Anomalous behavior of water, Heat Capacity & Specific heat capacity.

**8. Current Electricity :**

Current electricity, Electric cells, Combination of cells, Potential & potential difference, Free electron & Electric current, Resistance & Ohm's law, Graphs of Current V/s Voltage, Resistivity, Conductors & Insulators, Electric symbols, Resistor in series & parallel, Current Null Point, Electric Circuits, Electric Power

**9. Effects of Electric Current:**

Magnetic effect of electric current & their activities( straight conductor, circular loop, solenoid), Force on current carrying conductor due to Magnetic Field, Heating Effects of Electric current.

**10. Light:**

Mirrors (Reflection): Laws of Reflection & Their Activities, Regular & irregular reflection, Reflection of reflected light, Mirror & types of mirror, Spherical mirrors & images formed by them, Magnification due to spherical mirrors.

**11. Lens (Refraction) :**

Refraction of light, Laws of refraction, Refractive index, Dispersion of light, Lenses, Ray diagram of refracted light, Sign convention, Working of human eye & lens, Defects of vision and their correction, use of lens.

# Chemistry

- 1. Inside the atom :** Charged particle in matter , Types of substances, Dalton's atomic theory, Thomson's Plum pudding model of atom, Rutherford's nuclear model of atom and scattering experiment, Bohr's atomic model, Drawbacks of Dalton's atomic theory, Thomson's Plum pudding model, Rutherford's Nuclear model, Subatomic particles (electron, proton, neutron), Atomic number, mass number, isotopes and isobars, valency , Electronic configuration of elements, Nuclear reactor.
- 2. Composition of Matter :** Characteristics of states of matter, evaporation, Types of elements, types of compounds, solution and concentration of solution, types of mixture, true and colloidal solution molecular formula and valency, dot and cross formula for writing chemical formula.
- 3. Metals and Nonmetals :** Physical properties of metals and non metals , chemical properties of metals and non metals , Uses of metals and non metals
- 4. Pollution :** Pollutants, Air Pollution, Green house effect, Acid rains, Water pollution, Prevention and control of pollution, soil pollution.
- 5. Acids bases and salts :** Introduction, Indicator, Effects of acid and bases on litmus paper, properties of acids and bases and neutralization.  
Arrhenius theory of acids and bases, Concept of Bronsted acid and base, Lewis acids and bases, classification of acids and bases, concentration of acids and bases, pH of solution, universal indicator, Reaction of acids and bases with metals metal oxides, Carbonates and bicarbonates, Types of Salts, Crystallisation of water, Electrical conductivity of ionic compounds Electrolysis of water.
- 6. Chemical Change and Chemical bond :** Introduction, Natural and manmade chemical changes, Ionic bond, Covalent bond, Coordinate bond , valency and lone pair of electron.
- 7. Substances in common use :** Importance of salts in daily life, NaCl, NaHCO<sub>3</sub>, Na<sub>2</sub>CO<sub>3</sub>, CaOCl<sub>2</sub>, Na<sub>2</sub>CO<sub>3</sub>, POP ( their preparation and reaction )  
Nature of radioactive radiation, Characteristics of  $\alpha$ ,  $\beta$ ,  $\gamma$  rays. , Uses of radioactive isotopes, Some chemical substances in day to day life., Food colours and essences, Dye, Artificial Colours, Deodorant, Teflon, Powder Coating, Anodizing, Ceramic and Porcelain.
- 8. Chemical Reaction and equations :** Chemical reaction, Combination, Decomposition, Displacement, Double Displacement, Chemical Equation and balancing of chemical equation, Types of Chemical reactions, Exothermic and endothermic reactions, Factors affecting the rate of chemical reactions, Oxidation and reduction, Oxidation number, oxidising agent and reducing agent, Corrosion and Rancidity.
- 9. Metallurgy :** Reactivity series of metals, Ionic Compounds and Properties of ionic compounds , Basic Principles of Metallurgy, Conc of Ores, Gravitation Method, Magnetic Separation Method, Froth Floatation Method, Leaching. Roasting and calcination.  
Extraction of reactive Metals, Moderately Reactive metals, Extraction of less reactive Metals, Extraction of Aluminium , Refining of Metals, Prevention of Corrosion. Different ores of iron , copper and aluminium.

- 10. Periodic Classification of elements :** Classification elements, Dobereiner's Triads, Newland's Law of Octaves, Mendeleev's Periodic table, Merits and demerits, Modern Periodic table and its structure, Groups, Periods and electronic configurations, Periodic trends in the modern periodic table, Valency, Atomic size, Ionic size, Metallic and Non metallic nature, Ionisation energy, Electronegativity.
- 11. Study of Gas Laws :** Properties Of Gases, Liquids And Solids, Boyle'S Law, Charle'S Law, Gas Equation, Absolute Zero Temperature, Standard Temperature, Pressure, N.T.P. And S.T.P. Dalton's law of partial pressure, Diffusion and Effusion of gases, Comparison study of ideal gas and real gas.
- 12. Measurement of Matter ( Mole Concept ) :** Laws Of Chemical Combination, Law of conservation of mass, Atom - Shape, Mass, Valency, Molecular Mass, Atomic Mass, Formula Mass, Radicals, Ions, Mole Concept - Avogadro's Number, Calculation Of Moles, Mass, Atoms, No. Of Particles, Relation of mole with mass, number & volume.
- 13. Carbon Compounds :** Valency, Catenation Of Carbon, Formation Of Double And Triple Bond, Isomerism Including Single, Homologous Series of Alkane, Alkene, Alkyne And Relation With Molecular Mass, Types of carbon and hydrogen (In terms of primary, secondary, tertiary and quaternary).
- Nomenclature Of Simple Compounds Having Functional Groups Including Double Bond And Triple Bond, Alcohol, Aldehyde and acid, Bond line representation of organo compound.
- Hydrocarbon, Method Of Preparation Of Alkane, Alkene And Alkyne And Chemical Properties And Uses Also, Combustion, addition, oxidation, substitution reactions.
- Preparation Properties ( Physical And Chemical Both ) Of Alcohol ( Ethanol) And Carboxylic Acid ( Acetic Acid ) Uses Of Alcohol And Acetic Acid. Soaps and detergents Method of cleaning action of soap.
- Occurance of carbon, allotropes, Carbondioxide and Methane : Occurance, Properties and Uses.
- 14. Synthetic Fibres and Plastics :** Natural and artificial fibres ( Synthetic )
- Types of synthetic fibres, Characetrstics of synthetic fibres.
- Plastics and its characteristics.
- Plastic and environment. (Biodegradable, Non Biodegradable)
- 15. Coal and Petroleum :** Natural resources, (Exhaustible and Inexhaustible ) Coal,
- Petrolum : Refining , Natural gas, Limited natural sources, Introduction of Octane number and Cetane number.
- Combustion and flame : Combustion and its types, flame, structure of flame , fuel and fuel efficiency and harmful product.

# Biology

## Unit I:- Diversity in living Organism

1. **What is living ?**
  - What is the basis of classification.
  - Need of classification..
  - Binomial nomenclature. Rules of. Binomial nomenclature.
  - The hierarchy of classification.
2. **Biological classification**
  - R.H. Whittakersystem of classification.
  - Monera.( Brief idea)
  - Protista..( Brief idea)
  - Fungi definition, nutrition, its major class.
  - Plantae In brief. Animalia in brief.
  - Virus,,viroid, lichen..( Brief idea)
3. **Classification of plants.**
  - Basis of classification.
  - General characteristic feature of following groups.
  - Thallophyta, Bryophyta, Pteridophyta.
  - Gymnosperm, Angiosperm.
4. **Animal classification.**
  - New method of system of animal classification.
  - Different criteria for classification, Grade of organization,Body Organization, Germ layers, Body cavity, Body segmentation.
  - From phylum porifera to chordata. Non chordates up phylum level eleven and chordates up to class level.

## Unit:-II Cell biology and organisation

1. **The cell**
  - What are living Organism?
  - Structure of prokaryotic and, Eukaryotic cell in brief.
  - What is Cell Made Up?
  - Structure and difference between animal and plant Cell?
  - Concept of cell theory. In brief.
  - Plasma membrane or cell membrane and it's role
  - Cell Wall.
  - Nature of cytoplasm and cell organelles
  - Endoplasmic reticulum. Its type and role.
  - Golgi apparatus and it's function.
  - Plastid chloroplast, mitochondria.
  - Lysosome , Vacuole
  - Chromosomes structure in brief.
2. **Cell cycle and cell division**
  - Cell cycle phases.
  - Mitosis and its phases.
  - Significance of mitosis.
  - Meiosis and its phases.
  - Significance of meiosis.

3. **Biochemistry of living**
  - Bio molecule Concept
  - Introductory concept of major biomolecules like carbohydrate protein fat.
  - Metabolism
4. **Morphology of angiospermic plant**
  - Structure and modification of root, stem and leaves in brief.
  - structure of flower and their parts.
  - Placentation.
  - Aestivation.
  - Inflorescence and their major types.
  - Types of seed their structure.
5. **Plant Tissue**
  - Meristematic tissue and its different type.
  - Permanent tissue.
  - Types of simple and complex tissue.
6. **Animal tissue**
  - Types of epithelial tissue.
  - Types of connectivity.
  - Types of muscular tissue.
  - Types of nervous tissue.

**Unit:- III-I-Plant life processes.**

1. **Transport in plant.**
  - Transportation of water.
  - Transportation of food and other substances.
  - Means of transport.
  - Measurement of transpiration.
  - Types of transpiration.
  - Guttation and bleeding.
2. **Mineral nutrition implant**
  - Brief idea about the nutrition in plant.
  - Hydroponics introductory idea
  - Types of nutrient and their role
3. **Respiration.**
  - Aerobic and anaerobic respiration.
  - Living Organism and energy production.
  - Structure of ATP.
  - Glycolysis.
  - Tri carboxylic acid cycle.
  - Electron transport chain.
  - Energy from different food component.
  - Respiratory Quotient.
4. **Photosynthesis in higher plant.**
  - Definition redox reaction of photosynthesis.
  - Phases of mechanism of photosynthesis.
  - Photophosphorylation in brief.
  - Dark reaction. In brief.
  - Significance of photosynthesis.

**5. Plant growth and development**

- Concept of growth.
- Structure of seed.
- Types of seed germination
- growth and differentiation.
- Difference between growth regulators and growth inhibitors
- discovery and major role of hormones.

( auxin,, gibberellin,cytokinin, abscisic acid and ethylene.).

**Unit-III-II ANIMAL LIFE PROCESSES.**

**1. Nervous coordination..**

- Structure of neuron..
- Nervous system in humans.
- Central nervous system.
- Peripheral nervous system..
- Autonomous nervous system.
- Reflex action..
- Chemical control..

**2. Hormonal Co ordination**

- Different endocrine gland in human.
- Pituitary gland and their hormone.
- Thyroid gland and their hormone.

**3. Respiratory system in human.**

- Respiratory system in human.
- Structure of lungs.
- External respiration..
- Internal respiration.
- Cellular level respiration.
- Breathing.
- Effect of Altitude on breathing.
- Asphyxiation, Emphysema, Hypoxia.

**4. Digestion in human..**

- Digestive system in human.
- Different organ of digestive system and their Histology..
- Glands related to the digestive system..
- Physiology of digestion.
- Diseases related to the digestive system..

**Unit:- IV Reproduction BIOLOGY**

**1. Asexual reproduction in organism**

- Binary fission multiple fission budding fragmentation regeneration vegetative propagation spore formation.
- Concept of grafting.
- Importance of asexual reproduction

**2. Sexual reproduction In plant**

- Typical flower and its part and their role.
- Pollination self and cross.
- significance of pollination.
- Agents of pollination.
- Male female gamete formation
- Fertilization and double fertilization .



3. **Sexual reproduction In human being.**
  - Male and female reproductive system..
  - Histology of testis and ovary..
  - Menstrual cycle.
  - Gamete formation..
  - Fertilization.
  - Development and birth.

4. **Reproductive health..**
  - Definition and concept of reproductive health major.
  - Reproduction and modern technique. IVF.
  - Sperm bank.

#### **Unit:-V Genetic sand general biology**

1. **Genetic basis of inheritance**
  - Concept of inheritance or heredity- Definition of heredity, hereditary traits in plant animal bacteria and human being.
  - Important terms to understand the Mendelism. – Dominant recessive homozygous heterozygous genotype phenotype genes allelomorph.
  - Mendelian procedure of crossing technique.
  - Mendel's principle of heredity → monohybrid cross and dihybrid cross with example and problem.
  - Mendel's laws of inheritance → Law of dominance law of segregation law of independent assortment backcross with respect to monohybrid and dihybrid polygene incomplete dominance Co dominance multiple allele.
2. **Chromosomal basis of inheritance**
  - Chromosomal theory in brief, structure of chromosome, types of chromosome, HGP in brief.
  - sex determination → In insect fruit fly human being and honey bee.
  - Genetic disorder → Disorder due to chromosomal abnormalities, monogenic disorder, polygenic disorder, mitochondrial disorder.
  - Pedigree.
3. **Molecular basis of inheritance**
  - Structure of nucleotide.
  - Nature and bonds in polynucleotide.
  - Structure of DNA.
  - Replication of DNA.
  - central dogma of protein synthesis.
  - Structure of RNA and transcription.
  - Translation in brief.
  - HGP in brief.
4. **Introduction to biotechnology**
  - Biotechnology Concept yeah
  - main area and benefits in biotechnology.
  - Commercial application of biotechnology in the field of agriculture and medicine.
  - Green white and blue revolution.
  - tissue culture technique
  - change in agriculture management due to biotechnology
  - Application of biotechnology in floriculture nursery and for history.
  - Agri- tourism.

5. **Useful and harmful microbes**
  - Useful microorganism like Lactobacillus rhizobium yeast antibiotic producing microorganism.
  - Harmful microorganism like Clostridium and other microbes.
6. **Health and disease.**
  - Health immunity..
  - Types of immunity.
  - Disease and its causes..
  - Acute and chronic diseases.
  - Infectious and non infectious diseases..
  - Disease causing agents..
  - Means of spreading of disease.
  - Treatment and prevention  
(T.B, typhoid hepatitis, rabies, polio. AIDS, diarrhoea.)
7. **Social health.**
  - Factors affecting on the social health.
  - Mental stress.
  - Addiction..
  - Incurable diseases.
  - Government scheme for vaccine and vaccination.
8. **Evolution**
  - Different theory of evolution
  - Evidences of evolution. Morphological anatomical paleontological embryological vestigial organ
  - Homologous and analogous organ.
  - Connecting link.
  - Darwin's theory of natural selection.
  - Lamarckism.
  - Speciation.
  - Human evolution in brief.
  - Tracing evolutionary relationship.
  - Fossils.
9. **Energy flow in an ecosystem.**
  - Food chain and food web.
  - Energy pyramid.
  - Energy flow. And it's important.
  - Producers, Consumers. And decomposers.
  - Succession in brief.
  - Biogeochemical cycles. Carbon, oxygen and nitrogen.