

SUBJECT: BASIC SCIENCE (PHYSICS + CHEMISTRY) [BSPC]**BASIC SCIENCE (PHYSICS) [BSPC (PHYSICS)]****CLASS XI
SEMESTER I****THEORY
FULL MARKS -35****(MCQ Type Question)**

UNIT	Topic	No of periods assigned	Marks
I	Physical world and measurement	4	04
II	Kinematics	10	09
III	Laws of motion	10	08
IV	Work ,Energy and Power	6	06
V	Oscillations	6	08
	Total	36	35

DETAIL SYLLABUS

UNIT	Topic / Sub Topic	No of periods assigned
I	<p align="center">Physical world and measurement</p> <p>Physics – scope and excitement; nature of physical laws; physics, technology and society. Need for measurement; units of measurement; systems of unit; SI units, accuracy and precision of measuring instruments; errors in measurement; significant figures; error analysis. Dimension of physical quantities, dimensional analysis and its applications, limitation of dimensional analysis.</p>	04
II	<p align="center">Kinematics</p> <p>Motion in a straight line; position-time graph, speed and velocity. Uniform and non-uniform motion, average speed; average and instantaneous velocity. Acceleration and retardation; uniformly accelerated motion, displacement-time, velocity-time, graphs. Average and instantaneous velocity and acceleration. Kinematical equations in one dimension: $s=ut$, $v=u+at$, $s=ut+\frac{1}{2}at^2$, $v^2=u^2+2as$, $S_{nth} = u+\frac{1}{2}a(2n-1)$</p> <p>Scalar and vector quantities: position and displacement vectors, equality of vectors, multiplication of vector by a real number; addition and subtraction of vectors. Unit vector; resolution of a vector in a plane-rectangular components. Scalar and vector products of vectors</p>	10
III	<p align="center">Laws of motion</p> <p>Frame of reference – inertial and non-inertial; examples; Newton’s first law – concept of force and inertia. Momentum and Newton’s Second Law – $F = ma$. Impulse and Impulsive force. Newton’s</p>	10

	third law of motion – action and reaction. Law of conservation of linear momentum and its applications. Static and kinetic friction, minimization of friction. Dynamics of uniform circular motion; centripetal force, examples of circular motion – vehicle on level circular road, vehicle on banked road.	
IV	<p style="text-align: center;">Work ,Energy and Power</p> Work done by a constant force; kinetic energy, power-units. Work-energy theorem. Notion of potential energy, potential energy of a spring. Conservative force – conservation of mechanical energy; non conservative forces.	06
V	<p style="text-align: center;">Oscillations</p> Periodic motion – period, frequency; displacement as a function of time. Simple harmonic motion [SHM]; Linear restoring force and force constant. Simple pendulum, free, damped and forced vibration, resonance.	06
	Total	36

**CLASS XI
SEMESTER II
THEORY**

FULL MARKS – 35

(SAQ AND LAQ Type Question)

UNIT	Topic	No of periods assigned	Marks
VI	Motion of system of particles	7	08
VII	Gravitation	6	07
VIII	Bulk Properties of Matter	12	10
IX	Thermodynamics	5	05
X	Behavior of perfect gases & kinetic theory of gases	6	05
	Total	36	35

DETAIL SYLLABUS

UNIT	Topic / Sub Topic	No of periods assigned
VI	<p style="text-align: center;">Motion of system of particles</p> Centre of mass of a two particle system - conservation of momentum and centre of mass motion. Moment of a force, torque, angular momentum, conservation of angular momentum with some examples Moment of inertia and radius of gyration.	7

VII	<p style="text-align: center;">Gravitation</p> <p>The universal law of gravitation. Acceleration due to gravity and its variation with altitude, depth and rotation due to the earth. Gravitational potential energy; gravitational potential. Kepler's laws of planetary motion, orbital velocity of satellite, escape velocity, geo-stationary satellite.</p>	6
VIII	<p style="text-align: center;">Bulk Properties of Matter</p> <p>Elastic behavior, stress-strain relationship, Hooke's law; Young modulus, bulk modulus, shear modulus of rigidity, Poisson's ratio; elastic energy. Hydrostatic pressure due to a fluid column ; Pascal's law and its applications [hydraulic lift, hydraulic brakes].</p> <p>Thermal physics – heat, temperature; thermal expansion of solids, liquids and gases; ideal gas laws, isothermal and adiabatic processes; anomalous expansion and its effect on marine life. Specific heat- calorimetry, change of state, latent heat, Cp, Cv.</p> <p>Heat transfer – conduction, convection and radiation. Newton's law of cooling, green house effect, thermal conductivity.</p>	12
IX	<p style="text-align: center;">Thermodynamics</p> <p>Thermal equilibrium, zeroth law of thermodynamics – definition of temperature. Heat, work and internal energy, first law of thermodynamics.</p>	5
X	<p style="text-align: center;">Behavior of perfect gases & kinetic theory of gases</p> <p>Equation of state of a perfect gas, work done in compression and expansion of a gas. Kinetic theory of gases assumptions, concept of pressure, kinetic energy and temperature. RMS speed of gas molecules</p>	6
	Total	36

PROJECT / PRACTICAL
CLASS XI
FULL MARKS - 15
NO OF PERIODS ASSIGNED - 36

DETAIL SYLLABUS

Every student has to perform at least 5 (Five) experiments out of the list of following experiments and to carry out one project under the guidance of teacher

Practicals

- 1) To determine the volume of the material of a hollow cylinder by slide calipers.
- 2) To measure the radius of curvature of a spherical surface by spherometer.
- 3) To determine specific gravity of granular substance insoluble in water using specific gravity bottle.
- 4) To measure the Young's modulus of the material of a wire.
- 5) To find the force constant of a helical spring by plotting a graph between load and extension.
- 6) To study the variation of volume with pressure for a sample of air at room temperature by plotting graph
between P and V and hence to verify Boyle's law.
- 7) To draw L-T² curve by determining time period of a simple pendulum for at least five different effective
lengths and to find the value of the acceleration due to gravity.
- 8) To study the relationship between the temperature of a hot body and time by plotting a cooling curve

BASIC SCIENCE (CHEMISTRY) [BSPC (CHEMISTRY)]**CLASS XI****SEMESTER I****THEORY****FULL MARKS – 35****(MCQ Type Question)**

UNIT	Topic	No of periods assigned	Marks
Unit I	Scope And Chemical Arithmetic	(8 Lectures)	10
Unit II	Basics of atomic structure, periodicity, and bonding	(12 Lectures)	15
Unit III	Hydrogen, Water, Hydrogen Peroxide & Compounds of s-block	(10 Lectures)	10

DETAIL SYLLABUS

UNIT	Topic / Sub Topic	No of periods assigned
Unit I	A Scope of Chemistry Chemical industries [including small scale industries] 1) Inorganic chemical industries 2) Organic chemical industries 3) Pharmaceutical industries. Brief mention of chemical industries in India B Chemical Equation and its significance. Mole concept and molar mass equivalent weight. Weight – weight, weight – volume, volume – volume calculations. C Percentage composition, empirical formula, molecular formula – including problems	(8 Lectures)
Unit II	A. Extranuclear Structure of Atom: concept of atomic orbits, sub-orbits, and orbitals. Idea of Quantum numbers [n, l, m, s]. Pauli exclusion principle, Hund's rule of spin multiplicity (maximum multiplicity) and Hund's rule of half-filled and fully filled configurations, Aufbau principle, Ground state electronic configuration of atoms and ions. B. Classification of Elements and Periodicity in Properties: Modern periodic law and present form of periodic table s –	(12 Lectures)

	<p>block and p - block elements. General periodic trend of elements - atomic radii, ionization enthalpy, electron affinity and electron attachment enthalpy, electronegativity</p> <p>C. Chemical Bonding and Molecular Structure Ionic bond, covalent bond, bond parameters [bond length, bond strength and directional character of covalent bond]. Hybridization involving s and p orbitals and shapes of some simple molecules - methane, ethane, ethylene, BeCl₂ , BF₃ . Hydrogen Bond: intermolecular and intramolecular</p>	
Unit III	<p>A. Large scale preparation of hydrogen [no technical details]. Uses</p> <p>B. Natural water: hard water and soft water. Expression of hardness of water. Estimation of hardness of water. Water for injection. Important water quality parameters and their significance: total dissolved solid [TDS], dissolved oxygen [DO], BOD, COD. Water purifiers. Rain - water harvesting</p> <p>C. Hydrogen Peroxide Preparative reaction. Anti-chlor, bleaching and anti-bacterial property. Volume strength of hydrogen peroxide; stability and preservation. Uses.</p> <p>D. Preparation and Uses of Sodium carbonate, sodium hydroxide, calcium oxide, bleaching powder, borax, industrial use of limestone.</p>	(10 Lectures)

CLASS XI
SEMESTER II
THEORY
FULL MARKS – 35

Question Type
(SAQ AND LAQ)

UNIT	Topic	No of periods assigned	Marks
Unit I	Gas Laws & Thermodynamics	(9 Lectures)	6
Unit II	Equilibrium and Acidimetry – Alkalimetry	(9 Lectures)	6
Unit III	Introduction to Organic Chemistry & Hydrocarbons	(10 Lectures)	10
Unit IV	Fuels, Petrochemical and Lubricants	(6 Lectures)	8
Unit V	Introduction to Environmental Chemistry	(8 Lectures)	5

DETAIL SYLLABUS

UNIT	Topic / Sub Topic	No of periods assigned
Unit I	<p>A. States of Matter Gaseous State of Matter Boyle’s Law Charle’s Law, Gay Lussac’s Law, Avogadro’s Law, Ideal Gas Equation, Universal Gas Constant – its unit, numerical problems. Liquification of gases Liquid State of Matter Vapour pressure, viscosity, surface tension [qualitative idea only]</p> <p>B. Thermodynamics System Types of system – open, closed, isolated [definition with example] Work, heat, energy, extensive and intensive property, First Law of Thermodynamics – internal energy and enthalpy $\Delta Q = \Delta H + P\Delta V$ [deduction not required] Entropy and Gibbs Free Energy. Second Law of Thermodynamics. Significance of the relation $\Delta G = \Delta H - T\Delta S$</p>	(9 Lectures)
Unit II	<p>A. Dynamic nature of equilibrium Law of Mass Action. Equilibrium constant, factors affecting equilibrium, Le Chatelier Principle – simple application.</p>	(9 Lectures)

	<p>B. Ionic product of water, concept of pH and pH scale. Buffer solution [definition with example of acid and basic buffer solutions] Universal pH paper and universal indicator. Simple calculation of pH</p> <p>C. Acidimetry and Alkalimetry Normal and molar solution. Neutralization reaction. Indicator and choice of indicator $S_1 V_1 = S_2 V_2$</p>	
Unit III	<p>A. Detection of elements present in organic compounds [N, S, Cl]. Estimation of nitrogen [Kjeldahl's Method]. Classification of organic compounds. IUPAC nomenclature</p> <p>B. Alkanes Physical properties: Chemical properties: combustion and substitution reaction [reaction of methane with chlorine in diffused sunlight]. Uses</p> <p>C. Alkenes Methods of preparation: By dehydration of alcohol and dehydro - halogenation of haloalkanes. Physical properties: Chemical properties - Addition Reactions [hydrogenation, hydration and addition of bromine], addition of HBr to propene - Markownikoff and Anti Markownikoff addition. Uses</p> <p>D. Alkynes Preparation by dehydrohalogenation of vicinal - dihalides. Physical properties Chemical properties - addition reaction [hydrogenation including partial hydrogenation]. Uses</p> <p>E. Arenes Introduction Substitution reaction [Nitration, Friedel - Crafts alkylation and acylation reaction of benzene]. Uses and health hazards of benzene, xylenes</p>	(10 Lectures)
Unit IV	<p>A. Fuels: Definition, characteristics of ideal fuel. Domestic and industrial importance of fuel. Calorific value of fuels. Solid Fuel, Liquid fuel: Petrol, Kerosene, Diesel, Biofuel. Gaseous Fuel: Hydrogen, natural gas, coal gas, petrol gas, biogas, LPG, CNG. Important properties of liquid fuels: viscosity, flash point, fire point, octane number, cetane number, knocking and anti-</p>	(6 Lectures)

	<p>knocking properties.</p> <p>B. Petrochemicals Some important primary petrochemicals and their uses</p> <p>C. Lubricants Lubrication, lubricants, solid, liquid and semi fluid lubricants. Important properties of lubricating oil, additives.</p>	
Unit V	<p>A Tropospheric Pollution, Common solid particulates, liquid and solid pollutants – their sources. Smog – photochemical smog. Selected smog species – their sources. PANS – their significance (a) Acid Rain – atmospheric formation of nitric acid and sulfuric acid (b) Green House Gases – green-house effect, global warming: danger and control.</p> <p>B Stratospheric pollution. Ozone layer and its depletion</p> <p>C Water Pollution Surface water – major pollutants and their sources [domestic, agricultural, industrial] Ground water – arsenic and fluoride in ground water. Arsenic determination in ground water [simple idea]. Status of arsenic and fluoride in ground water of West Bengal. Soil Pollution Major pollutants and their sources. Environmental pollution control strategy</p>	(8 Lectures)

PROJECT / PRACTICAL
CLASS XI
FULL MARKS – 15
NO OF PERIODS ASSIGNED – 36

A. Introduction to Chemical Laboratory General

Acquaintance with The Laboratory (2Periods)

- 1 Entrance and exit. Solid and liquid reagent racks. Concentrated acid rack .Disposal of solid and liquid wastes. General precautions [A chart should be hanged at a convenient place in the laboratory]
- 2 Acquaintance with Bunsen burner with fuel source/ spirit lamp/ LPG burner [whichever is used the laboratory]. Lighting the burner .Luminous and non-luminous flames. Controlling the flame height. Strike back – its remedy. Turning off the burner when not required.

B. Actual Experiments (Expt. 1 & 2 : 6 Periods) (Expt. 3 & 4 : 6 Periods)

Expt1

To cut glass-rod and glass-tube into two different lengths

To bend glass-tubes in different angles

To draw a jet

To bore a cork[both velvet and rubber corks]

Expt2

To compare pH values of 0.1M HCl, 0.1M CH₃COOH, 0.1M NaCl and 0.1M NaOH solution by universal pH paper or universal indicator.

Expt3

To estimate dissolved oxygen [DO] in water

Expt4

To estimate total hardness of water by EDTA.

Expt5

Qualitative Analysis Of An Inorganic Salt

To identify the basic radical and the acid radical present in a single salt sample by systematic analysis. The salt should be water or dilute hydrochloric acid soluble containing one basic radical and one acid radical from the following lists:-

Basic Radicals

Cu²⁺, Fe²⁺/Fe³⁺, Al³⁺, Ni²⁺, Zn²⁺, Ca²⁺, Mg²⁺, NH₄⁺

Acid Radicals

Cl⁻, NO₃⁻, S₄²⁻, SO₄²⁻, CO₃²⁻ [The students should be acquainted with the strengths of the reagents. They

Should not waste the valuable chemicals. They should learn the art of working with small amounts of samples and reagents].

22Periods

Marks Distribution

Sl. no.	Particulars	Marks
01	One of the Expts in ExptNo.1 and Expt No.2 OR One of the Expts between Expt. No.3 and Expt. No.4 [standard solutions will be supplied]	2+3 5
02	Expt.No. 5 [Only dry and preliminary tests and confirmatory test [wet test including preparation of the solution for the wet test] for the basic and acid radicals detected are to be written. Writing of group separation table is not required.	8
03	Laboratory Note Book regularly signed by teacher[s]	2
	Total	15

