PHYSICS – STANDARD XII

UNIT – 1 – CURRENT ELECTRICITY

Expected specific outcomes of learning (1)	Content in Terms of Concepts (2)	Curriculum Transactional Strategies (3)	Illustrations (4)	Evaluation (5)	No. of Periods allotted (6)
Understands the concept of motion of electrons.	1.1.Electric current – flow of charges in a metallic conductor. 1.2.Drift velocity and mobility and their relation with electric current.	Explains the flow of charges in a metallic conductor. Derives the expression for drift velocity.	Establishes the relationship among drift velocity, mobility and current.	Define drift velocity. What is the drift velocity of electron in a copper conductor having area 10 x 10^{-6} m^2 with a current of 20A. Assume that there are 10 x 10^{28} electrons/m^3.	1
Recalls ohm' s law and understands voltage current characteristics	1.3.Ohm' s law, electrical resistance. V-I characteristics.	Contructs the simple circuit and establishes the relationship between current and voltage.	Illustrates graphically ohms law and hence resistance of a conductor.	State ohms law.	1
Understands the resistivity and conductivity of materials.	1.4.Electrical resistivity and conductivity. Classification of materials in terms of conductivity.	Defines resistivity of a material. and conductivity. Gives their units.	Lists out the electrical resistivities of certain materials.	A manganin wire of length 2m having a diameter of 0.4mm with a resistance of 70 ohms. Find the resistivity of the material.	1
Appreciates the applications of superconductors .	1.5.Superconductivity (elementary idea)	Explain the idea of super conductivity. Demonstrates magnetic levitation one of the new High – temperature super conductors –(yttrium - barium – copper oxide) copper oxide.	Gives the examples of superconductin g materials. Gives the uses of super conductors and Superconductin g electromagnets .	What is the resistance of the material at superconducting temperature?	1
Identifies the colour code in resistors.	1.6.Carbon resistors – colour code for carbon resistors.	Explains to identify the colour codes and finds the value of resistance.	Discuss the type of colour code with the given resistor.	The colours of a resistor Brown, Black and red what is the value of resistor?	1
Understands the different combination of resistors.	1.7.Combriation of resistance – series and parallel	Explains the effective resistance of resistances connected in series and parallel.	Measures the effective resistance using multimeter and check the answer with the calculated value.	If the effective resistances are 10 ohm, 2.4 ohms when they are connected in series and parallel. What are resistances of the individual resistors.	1
Sees the relationship between variation of	1.8. Temperature dependence of resistance.	Explains the variation of resistance with temperature	Explains the temperature dependence on semi	A copper coil has a resistance of 20 ohms at 20^{o}C. Find its resistance at	1

resistance with temperature.		(thermistor) Gives the equations for variation of resistance with temperature.	conductors. Represents graphically variation of resistance and resistivity with temperature.	$60^{o}C$. Assume ?? 4 x 10^{-3} per degree.	
Understands the variation internal resistance with external resistance.	1.9.Internal resistance of a cell – (Potential difference and emf of a cell.	Explains with circuit diagram and finds the internal resistance of a cell.	Determines the internal resistance of cell using voltmeter.	A potential difference of a cell in open circuit is 6V but it falls to 4V when a current of 2A is drawn from it. What is internal resistance of the cell?	1
Understands the Kirchoff' s laws are based on conservation laws.	1.10.Krichoff' s law – illustration by simple circuits.	State Kirchhoff's laws and explains the circuit diagram.	Estimate the current and potential difference in the electrical circuits with numerical examples.	Mention the sign convention to be following while using the 2 laws.	2
Understands in comparison of the resistances in wheats tone network.	1.11.Wheatstone' s Bridge and its application for temperature coefficient of resistance measurement.	Obtains the condition for wheatstone bridge. Defines temperature coefficient of resistance.	Draws circuit diagram for measuring resistance of a given coil.	In a Wheatstone's bridge. If the galvanometer shows zero deflection P = 1000? Q = 10,000? R = 20? What is value of unknown resistance?	1
Applies the principle of wehatstones bridge.	1.12. Metrebridge – Special case of wheatstone bridge.	Explains with circuit diagram, the determination of specific resistance of the given wire.	Compares the resistance of two wires using metre bridge.	How are end errors of the wire eliminated?	2
Understands the principle of potentiometer and applies for measurement of emf.	1.13.Potentiometer – principle - application to measure potential difference and for comparing the emf of two cells.	Explains the principle of working of a potentiometer with schematic diagram. Discuss the difference between emf and potential differences.	Demonstrate an experiment to measure an emf with a potentiometer, hence compares two emf' s.	Name the material used in making potentio meter. Is emf is work or force?	1
Understands the measure of heating effect of an electric current.	1.14.Electric power	Explains the measurement of electrical energy. Gives its unit.	Measures energy suppled for few hours with the application of current at a potential difference –	An electric iron when hot a resistance of 80 ohms is used on 200volt circuit for 2 hours, find the electrical energy consumed.	1

			Numerical examples.		
Understands the theory of electric conduction through liquids.	1.15.Chemical effect of current	Explains Faraday's law of electrolysis and experimentally verifies the first and second laws..	Experimentally verifies the principle using copper voltameter.	Mention some application of electrolysis.	1
Appreciates the process of chemical effect in designing the primary cells.	1.16.Electro chemical cells (Primary – (Voltaic, Lechlanche, Daniel and Dry cells)	Explains the principles and working of cells with diagrams.	Lists out the emf of electro chemical cells.	Distinguish between primary and secondary cells.	1
Recalls primary and secondary cells.	1.17.Secondary – rechargeable cell (lead acid accumulator) Alkali accumulator.	Explains the working of rechargeable cells and alkali accumulator.	Mentions the application of secondary cells and solid state cells.	Why automobile batteries have low internal resistance?	1
Appreciates the solid state cells in everyday life.	1.18.Solid state cells.	Observes the solid state cells used in watches.	Lists out the application of solid state cells.		
UNIT- 2 – EFFECTS OF ELECTRIC CURRENT					
Understands the heating effect of current. Understands the principle of thermo emf.	2.1.Heating effect. Joule' s law – Experimental verification. Thermoelectric effects – Seebeck effect – Peltier effect – Thomson effect – Thermocouple, thermoemf neutral and inversion temperature. Measurement of thermo emf using potentiometer – Thermopile.	Explains transformation of electrical energy into thermal energy. Explains the elementary idea of thermoelectricity based on electron theory. Explains the experimental measurement of thermo emf using potentiometer.	Verifies experimentally Joule' s law. Establishes the relation between neutral temperature and invesion temperature. Describes thermopile.	State Joule' s law. State peltier effect and Thomson effect.	2
Understands the idea of magnetic field from electric current.	2.2.Magnetic effect of electric current – Concept of magnetic field, Oersted' s experiment.	Demonstrate Oersteds' experiment and observes the deflection of magnetic needle under the influence of current carrying conductor.	Observes the direction of magnetic field by passing current through a conductor.	Is the magnetic field due to a current loop uniform? Explain.	1
Understands the principle of Biot-Savart law.	2.3. Biot-Savart law.	State and explains Biot Savart law, and gives its vector	Lists out the quantities involved in the magnetic field	Give various forms of Biot - Savart law.	1

		formula.	at point due to a current element.		
Understands the magnetic field arises due to the flow of current in a conductor.	2.4.Magnetic field due to an infinitely long current carrying straight wire and circular coil.	Dervies an expression for magnetic field due to an infinitely long current carrying straight wire and circular loop.	Observes the direction of magnetic field produced by straight conductor, circular coil at the centre and on the axis of a circular coil carrying current.	What is the unit of magnet field? Calculate the magnetic flux density at a distance of 0.01m from a very long straight conductor carrying a current of 10A.	2
Understands the construction and working of Tangent galvanometer.	Tangent galvanometer – Construction and working.	Uses Tangent law in T.G.	Deduces the reduction factor of T.G.	Explain how current is measured using a T.G.	1
Recognizes the magnetic lines around a solonoid. Applies Amperes' circuital law in solenoids.	2.5. Bar magnet as an equivalent solonoid – magnetic field lines. Ampere' s circuital law and its application to straight and Toroidal solenoids.	Explains magnetic field on a solenoid. Explains the Ampere' s circuital law and its application.	Explains the formation of magntic field lines. Derives an expression for straight and torroidal solenoids.	State End Rule Mention some applications of solenoids.	2
Understands the force on a moving charge.	2.6.Force on a moving charge in uniform magnetic field and Electric field.	Explains Lorentz force and direction with diagram. Explains the force on a charged particle in an magnetic field.	Explains the construction and working of cyclotron.	What are advantages and disadvantage of cyclotron? Name the particles which are usually accelerated by cyclotron.	1
Understands the force an current carrying conductor.	2.7. Force on current carrying conductor in a uniform magnetic field, forces between two parallel current – Carrying conductors – definition of ampere.	Derives an expression for force an a current carrying conductor and two parallel current – carrying conductor – hence. Defines the ampere.	Finds the direction of force using Fleming' s left hand rule. Discusses the cases :- Two conductors carrying current in the same direction and opposite direction.	State Fleming' s left hand rule. Two long parallel wires carrying currents of 3 ampere and 4 ampere respectively in opposite directions. The seperation between them is 0.1m calculate the force exerted per unti length by one over the other.	2
Understands the application of Lorentz force in moving coil galvanometer.	2.8.Torque experienced by a current loop in a uniform magnetic field-moving coil galvanometer.	Explains torque experienced by a current loop in a uniform magnetic field.	Explains construction and working of moving coil galvanometer.	Mention the advantages of a moving coil galvanometer.	2
Knows to	2.9.Convertion to	Explains the	Demonstrates	A rectangular coil of	2

convert a galvanometer into voltmeter and ammeter.	ammeter and voltmeter.	sensitivity of galvanometer – current sensitivity. Explains the conversion of moving coil galvanometer to ammeter and voltmeter.	the conversion of galvanometer into voltmeter and ammeter.	side 5 cm and 3 cm having 1000 turns carrying current of 50 mA is placed in a uniform magnetic field of 0.05 Tesla directed along an x axis. What is maximum torque produced in the coil?	
Understands the current loop as a magnetic dipole.	2.10.Current loop as a magnetic dipole and its magnetic dipole moment.	Explains the current loop behaves as dipole hence Gives formula for dipole moment.	Identifies the direction of dipole moment and gives its unit.	If the magnet is cut into two equal parts what is the magnetic moment?	1
Understands magnetic dipole moment of a revolving.	2.11.Magnetic dipole moment of a revolving electron.	Derives an expression for magnetic dipole moment of a revolving electron.	Estimates the magnetic dipole moment of an electron in Hydrogen atom.	In a hydrogen atom electron moves in an orbit of radius 0.5Å making 10^{16} revolutions per second determine the magnetic moment associated with orbital motion of electron.	1
UNIT – 3 – ELECTROMAGNETIC INDUCTION AND ALTERNATING CURRENT					
Understands the production of induced emf and induced current.	3.1.Electromagnetic induction – Faraday's law – induced emf and current – Lenz' s law.	Explains the experiments of Faraday. Explains Faraday's laws and lenz' s law.	Demonstrates the induced emf with a coil and magnet.	A small piece of a wire is moved across the gap between the pole pieces of a magnet in 0.5 second. The magnetic flux is 8 x 10^{-4} wb. Calculate the emf induced in the wire.	2
Recognizes the process of inducing the back emf in a coil.	3.2.Self induction – Mutual induction – Self inductance of a long solenoid – mutual inductance of two long solenoids.	Explains and Defines coefficient of self-induction and coefficient of mutual induction.	Derives the expression for emf in terms of flux and rate of change of current. States and defines the unit of inductance.	If a rate of change of current of 2 A/s induces an emf of 10 mv in a solenoid. Find the self-inductance. Define coefficient of mutual induction.	2
Recalls the methods of inducing emf. Understands the production of A.C. by rotating the coil in uniform magnetic field.	3.3.Methods of inducing emf – (1) by changing magnetic induction (2) by changing area enclosed by the coil and (3) by changing the orientation of the coil (quantitative treatment) analytical treatment can also	Explains the three methods of inducing emf. Obtains the expression for the alternating emf.	Applies Faraday' s concept in the methods of inducing emf. Draws the sinusoidal curve.	The emf is given by e = 300 sin (314 t + ?/4) what is (i) the amplitude (ii) the frequency of rotation and (iii) the phase angle?	3

	be included.				
Understands the construction and working of AC generator. Recognises the distribution of three phase AC in the houses.	3.4.AC generator commercial generator. (Single phase, three phase) – Distribution of three phase AC (star connection, Delta connection)	Describes the construction and working of AC generator. Mentions the single phase and three phase AC generator.	Explains the electrical connections through which the three phase AC is being distributed.	What is the principle of AC generator? Draw the sketch of electrical connection in your house.	3
Understands the induced emf in a solid mass. Recognises the working of transformer.	3.5.Eddy current – Applications – Transformer – Long distance transmission.	Explains the eddy current and give its applications. Demonstrates the construction and working of a transformer.	Lists out the applications of eddy current. States the various losses in a transformer. Appreciates the power transmission through long distance with the use of transformer.	A step-down transformer having a power output of 10KW and efficiency 90% reduces the voltage from 11KV to 220V. Calculate the number of turns in the primary if the secondary has 100 turns. Can the transformer be used to step up the DC?	3
Understands the relation between rms value and peak value of current. Recognises the applications of resonance.	3.6.Alternating current – measurement of AC – AC circuit with resistance – AC circuit with inductor – AC circuit with capacitor - LCR series circuit – Resonance and Q – factor: power in AC circuits – LC oscillations – choke coil – Advantages and disadvantages of A.C. over D.C.	Explains the measurement of AC with its heating effect. Discusses about the AC circuits with (1) R (2) L (3) C and LCR. Explains the Q-factor or quality factor quantitatively and also with graph. Explains the oscillations produced in LC circuit. Explains how a choke coil is used to regulate the current.	Appreciates the uses of resonance. Observes that a higher Q - value indicates a small bandwidth and hence a sharper peak calculates the power in an AC circuit. Mentions the power factor. Observes that the energy stored in the inductor and capactor (LC) appears in the form of electromagneti c oscillations.	Define Q-factor. What is the frequency of LC oscillations? What is the use of choke coil? What are the advantages and disadvantages of AC over DC? Define resonant frequency?	3
UNIT – 4 – ELECTROMAGNETIC WAVES AND WAVE OPTICS					
Recalls the electro magnetic waves and their wavelength and frequency ranges.	4.1.Electromagnetic waves and their characteristics.	Explains Maxwell displacement current.	Derives dimensionally velocity of light $C = \frac{1}{\sqrt{\mu_o \varepsilon_o}}$	What are electro-magnetic waves? Describe briefly the history of electromagnetic waves.	1

	4.2.Transverse nature of electromagnetic waves.	Explains accelerated charge is the source of electromagnetic waves – Hertz experiment.	Describe the transverse nature of electromagnetic waves.		1
Appreciates the application of electromagnetic spectrum	4.3.Electromagnetic spectrum Radio, microwaves. Infra red, optical, ultra violet – x – rays, gamma rays.	Explains briefly electromagnetic spectrum - Radio, Microwaves, infra red, visible, ultraviolet, X-rays, gamma rays.	Tabulates the frequency, wavelength and method of production of electromagnetic radiations. Methods of deduction of UV, Infra red radiation.	Write the wavelength of microwaves, ? ?rays radio waves, ultra violet rays.	1
Understands the propagation of electromagnetic waves in atmosphere.	4.4.Propagation of electro-magnetic waves in atmosphere.	Mentions the uses of electromagnetic waves.	Applies the use of microwaves for communication and radar.	Why is it necessary to use satellites for long distance TV transmission?	1
Understands the origin of emission and absorption spectra.	4.5.Emission and Absorption spectrum – Line, Band and continuous spectra	Explains emission and absorption spectra; continuous spectra line, and band.	Represents diagrammatically dark lines in the absorption spectrum of an element corresponds to bright lines in its emission spectrum.	Distinguish between emission and absorption spectra. Give example to each case.	1
Appreciates the propagation of light in two forms.	4.6.Theories of light – Corpuscular – Wave – Electromagnetic and Quantum theories.	Discusses the various theories of light.	Differentiates the various theories.	Distinguish corpuscle and photon.	1
Understands the phenomenon of scattering of light by molecules. Appreciates the scattering of light by minute particles – Blue colour of sky.	4.7.Scattering of light – Rayleigh' s scattering – Tyndal scattering – Raman effect – Raman spectrum. Blue colour of the sky and reddish appearance of the sun and sun rise and sun set.	Explains the phenonmenon of sctattering of light – Blue of sky. Explains Raman effect and explains Raman spectrum.	Explains Rayleigh' s law of scattering. Experimental arrangement for the study of Raman effect and Raman lines. Mentions the applications of Raman spectrum.	Mention the applications of Raman effect. What is Tyndal scattering?	1
Understands the wave nature of light. Identifies the types of wavefront.	4.8.Wavefront and Huygen' s principle – Reflection, Total internal reflection and refraction of plane wave at a plane surface using wavefronts.	Explains different wavefront diagrammatically. Proves geometrically laws of reflection and refraction by Huygen' s principle.	Demonstrates ripple tank method of study propagation of waves in wafer. Discuss the relation	What is wavefront? What is the shape of the wavefront (a) a finite distance from the source (b) an infinite distance from the source. What is the velocity of light in glass of	2

			between refractive index and velocity in different media.	refractive index 1.5?	
Understands the principle of superposition of waves. Understands the formation of Newton' s rings.	4.9.Interference – Young' s double slit experiment and expression for fringe width – coherent source interference of light. Formation of colours in thin films – analytical treatment – Newton' s rings.	Explains coherent sources and their importance in interference. Discusses the phenomenon of interference of light. Derives an expression for path difference between interfering waves.	Illustrates the principle of superposition of waves. Demonstrates young double slit experiment – and derives an expression for bandwidth. Mentions the condition for inference of light.	What is phase difference for path difference ?? What is the effect on the interference fringes in young' s double slit experiment if the seperation in between two slit is increased? - Why an oil film on the surface of water appears coloured?	2
Appriciates the diffraction effect through a single slit.	4.10.Diffraction – diffraction due to a single slit - Width of central maximum. Differences between interference and diffraction of light. Diffraction grating.	Decribes the theory of diffraction at a single slit. Calculate the width of central maxima. Mentions the differences between interference and diffraction of light.	Explain the condition for path difference to maxima and minima. Describes the plane transmission grating. Determines the wave-length of different colours of white light using spectrometer.	What is diffraction of light? What is grating element? What is maximum number of order of ' diffraction in grating' .	2
Appreciates the vibration of particle in a particular direction	4.11 Polarisation of light waves	Demonstrates the transverse nature of light by means of vibrating rope	Explains the phenomenon of polarization, production of plane plarised light in using tourmaline plate.	What is plane polarized light? Distinguish ordinary light and polarised light.	1
Understands polarisation by reflection by Brewster's law	4.12 Polarisation by reflection – Brewster' s law - double refraction Nicol prism	Establishes the relation between refractive index and polarising angle. Explain Nicol prism	How can plane polarized light be obtained by reflection. Hence discuss the working of a pile of plates.	Light is reflected from the surface of glass plate of ? = 1.56. Find angle of refraction? What is double refraction? Name few uniaxial and biaxial crystals.	1
Appreciates the use of polaroids in daily life.	4.13 Uses of plane polarised light and polaroids – Rotatory polarisation – polarimeter	Mentions the uses of polaroids in spectacle glasses, stereoscopic effects, motor car head lights, infrared filter.	Lists out the modern type of polarioids. Explains optical activity	How are polaroids used to create three dimensional effects?	1

Unit 5 – ATOMIC PHYSICS					
Understands the properties of electon and the nuclear structure of the atom. Appreciates the experimental determination of specific charge and charge of electron.	5.1. Atomic structure – Discovery of the electron – specific charge (Thomsons method) (Millikan' s oil drop method) and charge the electron. Alpha – scattering – Rutherford's atom model.	Explains the properties of cathode rays and positive rays. Determination of specific charge and charge electrons. Explains the alpha ray – scattering experiment and Rutherford Atom model.	Identifies the charge and mass of an electron.	Explain the structure and stability of atom according to Rutherford atom model and (1) Describe Thomson' s method for determining the specific charge of electron. (2) Describe Millikan's experiment for determination of electronic charge.	2
Understands the Bohr' s model. Appreciates the line spectra of hydrogen. Sodium and mercury. Appreciates the quantised energy levels of atoms, excitation and ionization potentials.	5.2.Bohr' s model – energy quantisation – energy and wave number expression – Hydrogen spectrum – energy level diagrams – sodium and mercury spectra - excitation and ionization potentials. Experimental detrmination of critical potential – Frank and Hertz' s experiment.	States Bohr's postulates Derives the expression for energy of electron. Determines the critical potential by Frank and Hertz experiment. Explains spectral series of hydrogen atoms sodium and of mercury.	Calculates the excitation and ioniation potential of hydrogen atom. Lists the spectral lines of Hydrogen, sodium and mercury spectra.	1. State and explain Ritz combination principle. 2. Find the ionization potential and first exitation potential of hydrogen atom. Find the wavelength and frequencies spectral lines in Lyman, Balmer, Pascher Brackett Pfund Series.	3
Understands the Sommerfield' s relativistic atom model and vector atom model.	5.3.Sommerfield's atom model – Fine structure of the spectral line – vector atom model.	Explains the Sommerfield' s relativisitic atom model, n, s, p, d, f etc. Orbitals and electron and accounts for fine structure of H ? line.	Explains the concept of spatial and spin quantisation of electon quantum numbers associated with vector atom model.	1. List out the quantum numbers. 2. Explain Bohr' s – Sommerfield model of elliptical electron orbits of hydrogen atom. How does it account for the fine structure of hydrogen spectral lines?	2
Understands the magnetic moments of atoms and their space quantisation.	5.4.Quantum numbers – Paulis exclusion principle – periodic classification of elements. Magnetic moment – space quantisation – stern and Gerlach experiment – fine structure of sodium D line - wave mechanical concept of the atom.	Explains paulis exclusion principle and periodic classification of elements. Describes the stern and Gerlack experiment. Explains the fine structure of sodium D line outlines the wave mechanical model.	Illustrates the electronic configuration of common elements indicating their quantum nos. Makes models of atoms of simple elements and molecules.	Give Bohr's theory of hydrogen spectrum. Explains doublet structure of sodium spectrum in the basis of electron spin. State and explain Paulis exclusion principle. How many protons electrons and neutrons are there in 1 atom of $_{92}U^{235}$?	2

Understands the production, properties, delection and application of x-rays. Appreciates the diffraction of x-rays by crystals and working of x-ray spectrometer. Understands the main feature of continuous and characteristics x ray spectra. Appreciate moseley's law and its importance.	5.5.x-rays production properties, detection, absorption, diffraction of x-rays – Lave's experiment Bragg's law, Bragg's x ray spectrometer – x ray spectra - continuous and characteristic x – rays spectrum – Moseley's law and atomic number.	Explains the production properties, detection and applications of x-rays. Describes the working of Bragg's x – ray spectrometer. Explains the features of continuous and characteristics x-ray spectra. States the Mosley's law and explain its importance.	Lists the application of x-rays in science, industry and medicine.	State Mosley's law and explain its importance. Explain the origin of characteristics and continuous x-ray spectrum. Explain how x-ray spectrometer is used to study structure of crystals.	3
Appreciates the coherent nature of Laser. Understands the working of MASER, Ruby laser and He-Ne-Laser. Appreciates the properties and applications of laser. Appreciates recording and reproduction of 3D images in holograms.	5.6.MASERS and LASERS spontaneous and stimulated emission – Normal population and population inversion – MASER, RUBY Laser, He–Ne Laser –properties and applications of laser light. - holography	Explains the spontaneous and stimulated emission of radiation and population inversion. Explain the working of MASER, Ruby laser and He-Ne laser. Lists the characteristics of laser. Explains the applications of Laser light in science , industry and medicine. Explains recording and reconstruction of images.	Distinguishes the stimulated and spontaneous emission of radiation. Identifies the condition to achieve laser action. Lists out the characteristic and applications of Laser.	1. What is meant by population inversion? 2. How is laser light different from ordinary, light. 3. Name the active medium in Ruby, He – Ne – lasers. 4. A He – Ne laser emits radiation of wavelength 632.8 nm and a power for this 2.3 mw. At what rate the photons emitted by this device.	3
Unit – 6 – Dual Nature of Radiation and Matter					
Appreciates the dual nature of matter and photo-electric effect. Understands the laws of photo-electric emission.	6.1.Photo-electric effect. Light waves and photons. - Einstein's photo – electric equation-Laws of photo – electric emission. – Particle nature of energy. Experimental verification of Einstein –	Explains the photo – electric effect. Derives Einstein's photo electric equation. Verifies Experimentally variation of photo electric current with respect to frequency and applied voltage.	Explains the photo-electric effect, using the graph between photo electic current and voltage for different wave lengths of incident light.	The photo-electric cut-off voltage in a certain expt. Is 1.5V. What is the maximum kinelic energy of photo – electron emitted? ($e = 1.6 \times 10^{-19}C$) Define stopping potential.	2

	photoelectric equation. – Work function.				
Understands the principle of photo-cells and their application.	6.2. Photo cells and their application.	Explains the role of photo cells in switch control system (Burglar's alarm)	Lists out the various applications (use) of photo-electric cells.	Describe the principle of photo-electric cells and give three of its applications.	1
Appreciates the phenomenon of wave nature of matter. Understands dual nature of matter.	6.3.Matter waves – wave nature of particles. – De–Broglie relation. – De–Broglie wave length of an electron – - Davisson and Germer Experiment. (Electron diffraction)	Compares wave theory and particle theory of radiation. Derives De–Broglie relation to find wave length of the radiation.	Explains dual nature of radiation. Demonstrates Davission and Germer Experiment to find the expression for wave length.	1. Calculate the de-Broglie wave lengths for (1) electron and (2) protons if their speed is 10^5 ms^{-1}. (2) What is the De Broglie wavelength When Broglie Kinetic energy is 120 eV. (3) In the Bohr model of the hydrogen atom, what is the de Broglie wavelength ? for the electron when it is in the n = 1 level (b) n = 4 level. In each case compare the De Broglie wave length to the circumference of the orbit.	3
Understands, a beam of electrons focuses by electric and magnetic fields.	6.4.electron microscope.	Compares optical and electron microscope. Understands the wave nature of the particle. Tabulates advantages and disadvantages of electron microscope.	Explains principle and construction of Electron microscope. Lists out the uses of electron microscope. Defines resolving power of electron microscope.	Explain the principle on which the electron microscope works. Compare this instrument with optical microscope.	2
Unit – 7 – Nuclear Physics					
Understands of size and properties of nuclei. Classifies nuclei into isotopes, isobars and isotones.	7.1.Nuclear properties – Nuclear Radii, Masses, Binding energy, density, charge. Isotopes, Isobars and isotones.	Explains the nuclear properties, and classifies the nuclei on the basis of atomic and mass numbers and number of neutrons with examples.	Calculates nuclear density of a nucleus of mass number `A' and radius 'R'. Lists out examples for istopes, isobars and isotones.	Calculate the density of nuclei matter. Express 1 amu in terms of MeV.	2
Appreciates nuclear mass defect and Binding energy.	7.2.Nuclear mass defect – binding energy. Stability of nuclei-Bain bridge mass	Explains mass defect and Binding energy. Draws binding energy – curve	Calculates and lists out binding energy per nucleon for representative	Calculate the Binding energy per nucleon $_{15}P^{31}$. (Mass = 30.973763 a.m.u.)	1

	spectrometer.	and explains the stability of nuclei.	nuclides.	Calculate the binding energy of ? particle m_p = 1.00758 amu m_n = 1.00088 amu. Mass of He 4.00028 amu.	
Understands various models for Nuclei to explain their characteristics.	7.3.Nuclear models – collective, independent particle and combined model – quark model.	Describes different models to explain nuclear properties. Lists out the characteristics and symbols of six different quarks.	Explains nuclear fission on the basis of liquid drop / model. Lists nuclear reactions in nuclear fission and nuclear fusion and calculate the energy released in fission and fusion reaction.	Explain the neutron cycle in a fission chain reaction. Calculate the amount of energy released when 50 gm of U^{235} is completely fissioned. List out the symbol mass and charge of (1) six different quarks and (2) the proton and neutron.	2
Understands the characteristics of Nuclear forces.	7.4. Nature of Nuclear forces.	Explains the nature of nuclear forces. Compares strong and weak nuclear forces with gravitational and electro magnetic forces.	Explains the force that holds the together. Describes the characteristic of protons and neutrons.	What are nuclear forces?	1
Understands the properties of neutron.	7.5.Neutron – discovery – properties – Artificial transmutation – particle accelerator	Explains the discovery and properties of neutron. Explains the artificial transmutation.	Lists out the properties of neutron.	How does a free neutron decay?	2
Understands the disintegration of the unstable nuclei by emission ? ? and ? rays. Recognises the applications of radio – Isotopes. Understands the detection of nuclear radiations.	7.6.Radioactivity – alpha, beta and gamma radiations and their properties – ? decay, ? – decay and ? decay. Radioactive decay law – half life – Mean life. Artificial radioactivity – Radio – Isotopes - effects and uses. Geiger – Muller counter and cloud chamber. Radio carbon dating Biological Radiation hazards,	Explains the radioactive phenomena of heavy elements. Explains the characteristics of ? ? rays. Explains the displacement law. Establishes the Radioactive decay law. Explains the induced radioactivity with examples. Describes the methods of producing radio – Isotopes. Describes the construction and working of G.M. counter and a cloud chamber.	Lists out the properties of ? ? and ? – rays. Gives out the examples of ? decay, ? decay and ? decay. Defines and relates half life and mean life of radio active material. Illustrates the induced radioactivity. Tabulates the various Radio – Isotopes and their uses. Lists out the half lves of some radio isotopes.	The initial number of atoms in a radioactive element is 8×10^{20} and its half life is 10 hr. Find the number of atoms which have decayed in 30 hr. Give an example for artificial transmutation. A radioactive isotope $_{88}Ra^{228}$ decays in series by the emission of three ? – particles and 8 ? particle. what is the isotope obtained finally? List out the Radio – Isotopes and their uses. Compare the natural and artificial radioactivity.	4

Understands how energy released in nuclear fission and fusion reactions. Understands the construction and working of a nuclear reactor. Appreciates the properties of cosmic rays fundamental particles.	7.7. Nuclear fission – chain reaction – Atom bomb – nuclear reactor – Nuclear fusion – Hydrogen bomb – cosmic rays – Elementary particles.	Explains the nuclear fission process. Explains the chain reaction in an atom bomb and in a nuclear reactor. Explains how energy is produced in sun and stars. Describes the basics of hydrogenbomb. Explains the properties of primary and secondary cosmic rays, latitude and altitude effects and fundmental particles.	Illustrates the nuclear fission with an example. Mentions the various parts and their functions in a nuclear reactor. Calculates the energy released in splitting 1 Kg uranium. Explains the proton – proton cycle and carbon – Nitrogen cycle. Lists out the advantages and disadvantages of nuclear energy. Tabulates the elementary particles and their properties.	Calculate the energy released in the fission of 1 kg $_{92}U^{238}$. What is the condition for sustained chain reaction? Fusion reaction is not easily possible. Why? Differentiate the pair production and annihilation. Name the groups of elementary particles and give examples for each group.	3
Unit - 8 - RELATIVITY					
Realizes the concept of space, time and mass	8.1 Concept of space, time and mass	Explains the concept of space, time and mass	Gives the meaning of absolute space, mass and time.	What do you mean by motion and rest?	1
Identifies the system of co-ordinate axes	8.2 Frame of reference	Defines the frame of reference.	Explains the frame of reference	What is inertial frame of reference?	1
Understands the concept of Newtonian Relativity.	8.3.Newtonian relativity.	States the Newtonian principle of relativity.	Explain the Newtonian principle.	What is Newtonian relativity?	1
Understands the transformation from one inertial system to another	8.4.Galielean transformation Equations. Michelson – Morle experiment.	Proves Galilean transformation equations. Explains Michelson – Morley experiment.	Illustrate with experimental set up.	What is the result of Morley' s experiment?	1
Understands the difference in length mass and time when motion is involved.	8.5.Special theory of relativity.	Explains all motion is relative and speed of light is same for all observers.	Mentions the two postulates of special theory of relativity.		1
	Lorentz transformations	Explains the Lorentz transformation on	Proves the Lorentz transformation	Derive the relativistic length contraction using Lorentz	

		equation for pairs of events.	equation.	transformation.	
Understands the relativity of length and time.	8.6. Relativity of length Relativity of time. Variation of mass with velocity – Mass – Energy equivalence.	Explains time dilation, length contraction and variation of mass with velocity.	Examples of time dilation and length contraction. Derives the formule for relativistic variation of mass with velocity. Proves $E = mc^2$	Deduce the formula for relativistic variation of mass with velocity what is the meaning of mass – energy equivalence? How fast would a rocket have to go relative to an observer for its length to be contracted to 99% of its length at rest? At what speed is a particle moving if the mass is equal to three times its rest mass?	2
Applies, Doppler effect in case of light.	Doppler effect of light.	Explain Doppler effect for light waves.	Analyses the Doppler effect in light in various situation.	Mention the application of Doppler effect in radar and radio communication.	2
Unit – 9 – Semiconductor devices and their applications					
Identifies the classification of materials on the basis of energy band theory. Understands the concept of energy gap.	9.1.Semiconductor theory. Energy band in solids – Difference between metals, insulators and semiconductors based on band theory.	Classifies the materials on the basis of energy bands. Identifies energy gap as forbidden gap.	Develops energy level diagram for conductors insulators and semiconductors . Lists out trivalent, tetravalant and pentavalant elements used in forming semiconductors .	Define the terms : forbidden gap and energy bands. Explain the term electron flow in conduction band and hole flow in the valence band. What is the effect of temperature on semi conductors?	1
Understands the concept of doping a semiconductor	9.2 Semiconductor doping – Intrinsic and Extrinsic semi conductors.	Identifes the process of doping and its importance. Lists out the impurities for doping Pand N type materials. Differentiates N and P – type semi conductors.	Sketches out the structure of Si and Ge crystals containing donar and acceptor atoms.	Explain how Si and Ge crystals behave as semi conductors. What are the majority and minority carriers in N – type and P – type semi conductors? Differentiate N. type and P-type semi conductors.	1
Understands the characteristics of a PN junction.	9.3.Formation of P-N Junction – Barrier potential and deplection layer.	Explains the working of junction and identifies the potential barrier.	Explains the formation of junction and identifies the depletion region.	Which P-N junction Si or Ge has higher barrier potential?	1
Understands the	9.4.P-N Junction	Gives the	Identifies the P	Give a method of	1

working of junction diode as an active element in electronic circuits.	diode – Forward and reverse bias characteristics.	construction of a P-N junction diode and explains forward and reverse bias characteristics.	and N ends of different types of diodes and diagrammatically represents diodes.	testing a P-N junction diode.	
Appreciates the application of diode as a rectifier.	9.5. Diode as a rectifier.	Compares the working principle of Half wave, full wave (2 diodes) and bridge rectifiers (4 diodes)	Explains voltage and current regulation properties of a rectifier circuit.	Determine the rectifier D.C. potential of a bridge rectifier when the input voltage is 9 V a.c.	1
Appreciates the uses of diode as voltage doubler.	9.6.Voltage doubler and tripler.	Explains the construction of voltage doubler circuit using two diodes.	Explains voltage and current regulation properties of voltage doubler.	Give a circuit of voltage tripler.	1
Understands the construction and working of a Zener diode. Identifies the break – down voltage. Appreciates the role of Zener diode as a voltage regulator.	9.7. Zener diode. Zener diode as a voltage regulator.	Explains the construction of Zener diode and the avalanche breakdown.	Explains with the necessary circuit how a zerner diode can be used as voltage regulater.	Explain V_z and I max with reference to Zener diode.	1
Appreciates the working and applications of LED, LCD, Solar cells and photodiodes. Appreciates the conversion of energy using solar cells.	9.8.LED, LCD – Seven segment display – Solar cells – photo diode.	Describes the principles and construction of LED and LCD. Explains the formation of the seven segment display with LED / LCD. Explains the working of solar cells and photo diode.	Explains the working principle of LCD and LED. Collects details of solar energy devices using solar cells.	Explain how LCD, LED are used as a seven segment display device. List the advantages and disadvantages of solar energy devices.	1
Understands the construction of PNP and NPN bi-polar junction transistors.	9.9.Junction - transistors - characteristics transistor as a switch.	Explains the construction and working of PNP and NPN transistors. Draws the circuits for CE, CB and CC configuration.	Defines the parameters input impedance, output impedance and current amplification factor. Establishes these parameters for CE, CB configurations from their characteristics.	Why is CE mode preferred over CB mode in transistor amplifiers? Explain how a transister acts as a switch?	1
Recgonises the action of	9.10.Transistor as an amplifier –	Explains the three methods of	Explains the function of	Differentiate the working principle of	1

transistor as an amplifer.	Transistor biasing – RC, LC coupled and transformer coupling in amplifier.	biasing a transistor. Describes the working of RC coupled amplifier.	each passive element in an RC coupled amplifier. Describes the significance of low frequency, mid – frequency and high frequency range of an amplifier circuit.	RC, LC and transformer coupled amplifiers.	
Understands the need for the positive and negative feedback.	9.11.Feeback amplifier – positive and negative feed back – advantages of negative feedback amplifier. Oscillator – condition for oscillator – colpit and Hartley oscillators.	Explains the principle of feedback in amplifiers. Deduces the condition for oscillations.	Lists the advantages of negative feedback in amplifier. Explains the working of Hartley and colpitts oscillator.	Find out the voltage gain after feedback if the gain before feeback is 100 and feedback ratio is 0.05. Find out the frequency of oscillations in colpitts oscillator if $C_1 = C_2 = 0.05$?F and L = 50 mH.	2
Develops the ideas of fabricating basic gates using resistors, diodes and transistors. Differentiates analog and digital signals.	9.12.Logic gates – OR, AND, NOT using discreat components – NAND and NOR gates as universal gates.	Constructs OR, AND, Not gates using resistors, diodes and transistors and explains their action with truth tables. Explains the NAND and NOR gates as universal gates.	Represents symbolically OR, AND, NOT, NAND ang NOR gates.	Identifies the analog and digital signals from the following. 1. Square wave 2. Sine wave 3. triangular wave 4. rectangular wave	1
Appreciates the characteristics of unipolar transistors. Understands the integration of several passive component on a single chip.	9.13.Unipolar transistors. FET – Characteristics – Integrated circuits – medium, small and very large scale integration – Fabrication and applications – TTL and CMOS IC' s.	Identifies TTL, IC and CMOS IC's Understands MSI, LSI, VLSI. Classifies different types of ICS into linear and digital IC' s.	Lists out the advantages of IC' s over discreate components.	Differentiate between linear ICS and digitial ICS.	1
Appreciates the laws of Boolean algebra.	9.14.Laws and theorems of Boolean' s algebra.	Lists out laws and theorems of Boolean algebra. States De Morgan' s theorems.	Proves laws of Boolean algebra and De Morgan' s theorems.	Using laws and theorems of Boolean algebra, simplify y = AB + AB + BC Draw a logic circuit using N AND gates for Y = A + BC.	1
Analysiss and appreciates the parameters of pin-out configuration of operational amplifier.	9.15.Operational amplifier – parameters – pin-out configuration Basic applications. Inverting amplifiers. Non-inverting	Sketches the pin out configuration of the IC 741 (Op.amp) and identifies the pins. Explains the	Explains some important characteristics of operational amplifier and their significance.	Design an inverting amplifier with operational amplifier for the gain of 10. What is the difference between Linear IC and digital IC?	1

Appreciates the uses of operational amplifier in basic operations.	amplifiers – summing amplifiers.	basic operations such as inverting, non-inverting summing and difference amplifiers using suitable circuits.			
Understands the construction and working of multimeter and cathode ray oscilloscope. Develops skills in the use of multimeter and CRO to measure the current, voltage, resistances and capacitance, and frequency and study of wave forms.	9.16.Measuring Instruments – Cathode Ray oscillocope – Principle – Functional units – uses. Multimeter – construction and uses.	Gives the construction of CRO and explains its function. Explains the function of multimeter for voltage, current and resistance, and capacitance measurements.	Lists out the uses of CRO and Multimeter.	Explain how the multimeter is used for testing diodes and transistors. How the time base of the CRO is used to measure the frequency of audio frequency signals. How CRO is used to measure the frequency of audio frequency signal using X and Y plates.	1
Unit – 10 – Communication Systems					
Understands the basics of Radio communication with MW, SW and microwaves.	10.1.Modes of propagation ground wave – sky wave propagation.	Explains the propagation of ground wave and sky waves. Explains the structure of ionosphere and reflection of SW.	Lists the wavelength and frequencies of Radio waves used for MW and SW transmission.	Explain the formation and composition of ionosphere. Explain why SW are used for long distance communication. Define the terms skip distance and skip zone.	2
Appreciates the methods of modulation and demodulation of carrier waves for audio and video propagation.	10.2.Amplitude modulation, merits and demerits – applications – frequency modulation – advantages and applications – phase modulation.	Describes amplitude and phase modulation of carrier waves. Explains the frequency spectrum and band width of em waves used for audio and video signals and upper and lower side bands.	Lists out the merits and demerits of AM. Explians the advantages of FM for audio transmission.	Why Radio reception is clear during the night than during the day?	2
Appreciates the use of antennas TV transmission and reception of e-m-waves. Understands the characteristics and types of antennas for TV reception.	10.3.Antennas and Transmission lines – current and voltage distrbution – Directional pattern – Antenna parameters – Types of antenna – Design of Folded dipole.	Explains antenna parameters and describes the characteristics of different types of antennas.	Discusses the contructions of folded dipole antenna with a director and a reflector. Design a yogi antenna to receive TV signals in channel 4.	Explain the significance of antenna impedance and antenna gain. Describe the radiation pattern of dipole antenna.	2
Understands the	10.4.Radio	Explains the	Draws the	Discuss the role of	2

principles of radio transmission and reception.	transmission and reception – AM and FM – superheterodyne receiver.	basics of AM and FM. Explains the working of superheterodyne radio receiver.	block diagram of radio broadcasting and reception.	ionosphere in radio communication. What are the advantages of FM over AM? Explain the propagation of radiowaves of medium and short wavelengths. Why microwaves are used for TV transmission?	
Understands the scanning process in T.V.Transmission.	10.5. TV.Transmission and reception – scanning and synchroninsing – standards T.V.Antenna.	Explains the horizontal scanning vertical scanning and interlaced scanning.	Gives the frequencies of horizontal and vertical scanning frequencies.	Define the terms (1) Frame and (2) Field.	1
Identifies the camera signals, synchronizing pulses, blanking pulses, picture information and colour sub carrier signal in composite video signal.	10.6.Video signal analysis.	Explains the functions of the horizontal blanking pulses and vertical blanking pulses.	Explains the necessity, of introducing the synchronizing pulses during banking time.	1. Explain the role of synchronizing and blanking pulses in T.V.Transmission. 2. Explain the bandwidth necessary for audio and video transmission.	1
Learns the construction and working of a camera and a picture tube.	10.7. Videocon (camera tube) and picture tube.	Explains the working principles of TV.camera and a picture tube.	Differentiates a T.V. Camera and a picture tube.	Explain how a T.V. camera tube converts a picture into a video signal.	1
Understands the general principles of TV (Transmitter (Transmission) and receiver circuits.	10.8.Block diagram of a monochrome TV Transmitter and receiver circuits.	Explains the function of each unit present in the block diagram of monochrome TV transmitter and receiver.	Distinguishes the modulation methods used in Audio and video signals in T.V.Transmission.	How is TV transmission different from Radio broadcasting?	1
Recalls the theory of primary colours and their mixing.	10.9.Primary colours and their mixing.	Explains the principles of mixing the primary colours.	Lists out the primary colours and colour due to their combination and give the expressions for Y, I and Q signals in terms of primary colours.	What are the three primary colours.	1
Learns the construction of a camera and a picture tube.	10.10.Colour picture tube.	Explains the working principles of a camera and a picture tube.	Differentiates a camera and a picture tube.	How many filaments available in a colour picture tube?	1
Understands the general principles of T.V.Transmitter	10.11.Block diagrams of transmitter and receiver circuits (colour)	Explains the function of each unit present in the block diagram	Distinguish the modulation methods used in Audio and	Write a note an colour T.V.	1

and receiver circuits.		of colour TV Transmitter and receiver.	video signals in T.V. Transmission.		
Understands the construction and function of radar system.	10.12.Radar – principles – components of Radar – Radar range equation – factors influencing maximum range – applications.	Explains the block diagram of a radar systems. Obtains the radar range equation.	Lists out five factors that influence the maximum range of a radar.	What are the applications of the radar in communication systems? What is the need for a duplexer in a radar system.	1
Recognises the merits of digital communication. Understands the basics of Fax, modem. Appreciates the communication with wire, cable, optical fibre and satellite.	10.13.Digital communication data transmission and reception – principles of fax, modem, satellite communication – wire, cable and optical communication.	Explains the basics of analog and digital communication. Describes the use of fax and modem in communication. Discusses the characteristics and applications of wire, cable, optical and satellite communication.	Collects details of Indian communication satellites. Observes the use of fax and modem in communication. Compares the band width, reliability and applications of optical and satellite communication.	1. Lists the advantages of digital communication. 2. Explain the working of a fax and a modem. 3. Explain the principles and advantages of (i) optical communication and (ii) Satellite communication.	2

STANDARD XII

PHYSICS - EXPERIMENTS

Practicals should be done by choosing four experiments from each group.

GROUP A

1. To find the focal length of a convex lens by u-v method, conjugate foci method and plot a graph between u and v.
2. To find the focal length of a concave lens using a convex lens. (1) in contact method and (2) out of contact method
3. To determine the R.I. of the material of the given prism using i - d curve.
4. To determine the refractive index of a prism by finding angle of prism and angle of minimum deviation using a spectrometer.
5. To determine wavelength (?) of a monochromatic source using by a plane diffraction grating and spectrometer.
6. To determine wavelengths (?) of a composite light using a diffraction grating and a spectrometer.
7. To determine wavelength of monochromatic sodium and LED (3 colours R, G, Y) using Newton' s ring experiment.
8. To study the diffraction of light due to a thin slit between sharp edges of razor blade.

GROUP B

1. To find resistance of a given wire using a metre bridge and hence determine the specific resistance of its material.

2. To compare the emf' s of two primary cells using the potentiometer.

3. To calibrate a low range voltmeter using the potentiometer.

4. To determine the value of the horizontal component of the magnetic induction of the earth' s magnetic field, using the tangent galvanometer.

5. To determine the magnetic field at a point on the axis of a circular coil.

6. To compare the magnetic moments of the given two bar magnets in Tan A position by (i) Equal distance method and (ii) Null deflection method

7. To compare the magnetic moments of the given two bar magnets in Tan B position by

   (i) Equal distance method and (ii) Null deflection method

8. To find the frequency of the alternating current (a.c) mains using a sonometer wire.

GROUP C

1. (a) To draw a characteristics curve of a p-n junction diode in forward bias and to determine its static resistance.

   (b) To draw the characteristics curve of a Zener diode and to determine its reverse break down voltage.

2. To study the characteristics of a common emitter NPN transistor and to find out its input impedance, current and voltage gain and output admittance.

3. To construct a RC coupled (common emitter) amplifier and to study its frequency response.

4. To construct a Colpitt's oscillator - hence determine the self inductance of the coil of wire.

5. Construct a basic amplifier (OP amp) using IC 741 (inverting, non inverting, summing, difference - Voltage follower).

6. Study of basic gates using discrete components. OR, AND and NOT Gates.

7. Study of basic logic gates using integrated circuits. NOT, AND, NAND, OR, NOR gates.

8. To construct a regulated power supply with bridge rectifier and Zener diode. Study of current and voltage regulation characteristics.