

Manipur Board Class 12 Physics Syllabus 2021-22

PHYSICS

THEORY

CLASS - XII

One Paper

Time : 3 Hours

70 Marks

Unit	Contents	Marks
I	Electrostatics	09
II	Current Electricity	07
III	Magnetic effect of current & Magnetism	09
IV	Electromagnetic Induction and Alternating current	08
V	Electromagnetic Waves	03
VI	Optics	15
VII	Dual Nature of Matter	05
VIII	Atoms and Nuclei	07
IX	Electronic Devices	07
Total		70

Unit I: Electrostatics

(Periods 25)

Electric Charges; Conservation of charge, Coulomb's law-force between two point charges, forces between multiple charges; superposition principle and continuous charge distribution.

Electric field, electric field due to a point charge, electric field lines; electric dipole, electric field due to a dipole; torque on a dipole in uniform electric field.

Electric flux, statement of Gauss's theorem and its applications to find field due to infinitely long straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell (field inside and outside).

Electric potential, potential difference, electric potential due to a point charge, a dipole and system of charges; equipotential surfaces, electrical potential energy of a system of two point charges and of electric dipole in an electrostatic field.

Conductors and insulators, free charges and bound charges inside a conductor. Dielectrics and electric polarisation, capacitors and capacitance, combination of capacitors in series and in parallel, capacitance of a parallel plate capacitor with and without dielectric medium between the plates, energy stored in a capacitor.

Unit II: Current Electricity

(Periods 22)

Electric current, flow of electric charges in a metallic conductor, drift velocity, mobility and their relation with electric current; Ohm's law, electrical resistance, V-I characteristics (linear and non-linear), electrical energy and power, electrical resistivity and conductivity.

Carbon resistors, colour code for carbon resistors; series and parallel combinations of resistors; temperature dependence of resistance.

Internal resistance of a cell, potential difference and emf of a cell, combination of cells in series and in parallel.

Kirchhoff's laws and simple applications. Wheatstone bridge, metre bridge.

Potentiometer - principle and its applications to measure potential difference and for comparing EMF of two cells; measurement of internal resistance of a cell.

Unit III: Magnetic Effects of Current and Magnetism

(Periods 25)

Concept of magnetic field, Oersted's experiment.

Biot - Savart law and its application to current carrying circular loop.

Ampere's circuital law and its applications to infinitely long straight wire, straight and toroidal solenoids (only qualitative treatment)

Force on a moving charge in uniform magnetic and electric fields, Cyclotron.

Force on a current-carrying conductor in a uniform magnetic field, force between two parallel current-carrying conductors-definition of ampere. Torque experienced by a current loop in uniform magnetic field; moving coil galvanometer-its current sensitivity and conversion to ammeter and voltmeter.

Current loop as a magnetic dipole and its magnetic dipole moment, magnetic dipole moment of a revolving electron. Magnetic field intensity due to a magnetic dipole (bar magnet) along its axis and perpendicular to its axis. Torque on a magnetic dipole (bar magnet) in a uniform magnetic field; bar magnet as an equivalent solenoid, magnetic field lines; earth's magnetic field and magnetic elements.

Para, dia and ferromagnetic substances, with examples. Electromagnets and factors affecting their strengths, permanent magnets.

Unit IV: Electromagnetic Induction and Alternating Currents

(Periods 20)

Electromagnetic induction; Faraday's law, induced EMF and current; Lenz's Law, Eddy currents, self and mutual induction.

Alternating currents, peak and RMS value of alternating current/voltage; reactance and impedance; LC oscillations (qualitative treatment only), LCR series circuit, resonance; power in AC circuits, power factor, wattless current.

AC generator and transformer.

Unit V: Electromagnetic waves

(Periods 4)

Basic idea of displacement current.

Electromagnetic waves and their characteristics (qualitative ideas only).

Transverse nature of electromagnetic waves.

Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, X-rays, gamma rays) including elementary facts about their uses.

Unit VI: Optics

(Periods 30)

Reflection of light, spherical mirrors, mirror formula, refraction of light, total internal reflection and its applications, optical fibres, refraction at spherical surfaces, lenses, thin lens formula, lens maker's formula, magnification, power of a lens, combination of thin lenses in contact, refraction of light through a prism.

Scattering of light-blue colour of sky and reddish appearance of the sun at sunrise and sunset.

Optical instruments: Microscopes, astronomical telescopes (reflecting and refracting) and their magnifying powers.

Wave optics: wave front and Huygens' principle, reflection and refraction of plane wave at a plane surface using wave fronts. Proof of laws of reflection and refraction using Huygens' principle. Interference, Young's double slit experiment and expression for fringe width, coherent sources and sustained interference of light. Diffraction due to a single slit, width of central maximum. Resolving-power of microscope and astronomical telescope. Polarisation, plane polarised light; Brewster's law, uses of plane polarised light and Polaroids.

Unit VII: Dual Nature of Matter and Radiation

(Periods 8)

Dual nature of radiation. Photoelectric effect, Hertz and Lenard's observations;

Einstein's photoelectric equation-particle nature of light.

Experimental study of photoelectric effect

Matter waves-wave nature of particles, de-Broglie relation. Davisson-Germer experiment (experimental details should be omitted; only conclusion should be explained).

Unit VIII: Atoms & Nuclei

(Periods 18)

Alpha-particle scattering experiment; Rutherford's model of atom; Bohr model, energy levels, hydrogen spectrum.

Composition and size of nucleus, Radioactivity, alpha, beta and gamma particles/rays and their properties; radioactive decay law, half life and mean life.

Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number; nuclear fission and fusion.

Unit IX: Electronic Devices

(Periods 18)

Energy bands in conductors, semiconductors and insulators (qualitative ideas only)

Semiconductor diode – I-V characteristics in forward and reverse bias, diode as a rectifier;

Special purpose of p-n junction diodes: LED, photodiode, solar cell and Zener diode and their characteristics, zener diode as a voltage regulator.



PHYSICS

PRACTICAL

CLASS - XII

Note : A. Every student will perform at least 15 experiments (7 from section A and 8 from section B). The activities mentioned here should only be for the purpose of demonstration. One project of three marks is to be carried out by the students.

The report of the project work should be submitted at the time of Practical Examination

B. Evaluation Scheme of Practical Examination :

Two experiments one from each of the two sections : 8+8=16 Marks

Theory	2+2=4
Observation/Data (procedure)	4=4=8
Conclusion	1+1=2
Accuracy of result	1+1=2

Total **16**

Record of one Investigatory project and 5 Marks

Viva base on the project :

Practical record of experiments : 5 Marks

Viva on experiments : 2+2=4 Marks

Total = 30 Marks

Section-A

EXPERIMENTS:

(Any 7 experiments out of the following to be performed by the students)

1. To find resistance of a given wire using meter bridge and hence determine the specific resistance of its material.
2. To determine resistance per cm of a given wire by plotting a graph of potential difference versus current.
3. To verify the laws of combination (series/parallel) of resistances using a meter bridge.
4. To compare the emf of two given primary cells using potentiometer.
5. To determine the internal resistance of given primary cell using potentiometer.
6. To determine resistance of a galvanometer by half-deflection method and to find its figure of merit.
7. To convert a given galvanometer (of known resistance and figure of merit) into an ammeter and voltmeter of desired range and to verify the same.
8. To find the frequency of the a.c. mains with a sonometer.

ACTIVITIES OF SECTION - A (FOR THE PURPOSE OF DEMONSTRATION ONLY)

1. To measure the resistance and impedance of an inductor with or without iron core.
2. To measure resistance, voltage (AC/DC), current (AC) and check continuity of a given circuit using multimeter.
3. To assemble a household circuit comprising three bulbs, three (on/off) switches, a fuse and a power source.
4. To measure the components of a given electrical circuit.
5. To study the variation in potential drop with length of a wire for a steady current
6. To draw the diagram of a given open circuit comprising at least a battery, resistor/ rheostat, key, ammeter and voltmeter. Mark the components that are not connected in proper order and correct the circuit and also the circuit diagram.

Section-B

EXPERIMENTS:

(Any 8 experiments out of the following to be performed by the students)

1. To find the value of v for different values of u in case of a concave mirror and to find the focal length.
2. To find the focal length of a convex mirror, using a convex lens.
3. To find the focal length of a convex lens by plotting graphs between u and v or between $1/u$ and $1/v$.
4. To find the focal length of a concave lens, using a convex lens.
5. To determine angle of minimum deviations for a given prisms by plotting a graph between the angle of incidence and the angle of deviation.
6. To determine refractive index of a glass slab using a travelling microscope.
7. To find refractive index of a liquid by using
(i) Concave mirror, (ii) Convex lens and plane mirror.
8. To draw the I-V characteristic curve of a p-n junction in forward bias and reverse bias.
9. To draw the characteristic curve of a Zener diode and to determine its reverse break down voltage.
10. To study the characteristics of a common - emitter npn or pnp transistor and to find out the values of current and voltage gains.

ACTIVITIES OF SECTION - B (FOR THE PURPOSE OF DEMONSTRATION ONLY)

1. To identify a diode, an LED a transistor, and IC, a resistor and a capacitor from mixed collection of such items.
2. Use of multimeter to (i) identify base of transistor, (ii) distinguish between npn and pnp type transistors, (iii) see the unidirectional flow of current in case of a diode and an LED, (iv) check whether a given electronic component (e.g. diode, transistor or IC) is in working order.
3. To study effect of intensity of light (by varying distance of the source) on an L.D.R.
4. To observe refraction and lateral deviation of a beam of light incident obliquely on a glass slab.
5. To observe polarization of light using two Polaroid.
6. To observe diffraction of light due to a thin slit.

7. To study the nature and size of the image formed by (i) convex lens (ii) concave mirror, on a screen by using a candle and a screen (for different distances of the candle from the lens/mirror).
8. To obtain a lens combination with the specified focal length by using two lenses from the given set of lenses.

SUGGESTED INVESTIGATORY PROJECTS FOR CLASS XII

1. To investigate whether the energy of a simple pendulum is conserved.
2. To determine the radius of gyration about the centre of mass of a meter scale used as a bar pendulum.
3. To investigate changes in the velocity of a body under the action of a constant force and determine its acceleration.
4. To compare effectiveness of different materials as insulators of heat.
5. To study various factors on which the internal resistance/emf of a cell depends.
6. To construct a time-switch and study dependence of its time constant on various factors.
7. To study infra-red radiation emitted by different sources using photo-transistor.
8. To compare effectiveness of different materials as absorbers of sound.
9. To design an automatic traffic signal system using suitable combinations of logic-gates.
10. To study luminosity of various electric lamps of different powers and make.
11. To compare the Young's modulus of elasticity of different specimens of rubber and also draw their elastic hysteresis curve.
12. To study the refractive indices of the materials of transparent substances of different densities.
13. To determine the wavelength of laser beam by diffraction.
14. Any other innovative works related to the syllabus.

PRESCRIBED TEXTBOOKS:

1. A Textbook of Physics Part- I for Class XII.
Published by : The Council of Higher Secondary Education, Manipur with copy right from the NCERT, New Delhi.
2. A Textbook of Physics Part- II for Class XII.
Published by : The Council of Higher Secondary Education, Manipur with copy right from the NCERT, New Delhi.

REFERENCE BOOKS:

1. Fundamental Physics
By: Dr. Gomber and K.L. Gogia
Published by : Pradeep Publications,
Jalandhar - 144008
2. New Millennium Physics for Class XI & XII
By: S.K. Sharma
Published by: S. Dinesh Sales Corporation, Jalandhar.
3. Modern's abc Physics
By: Satish K. Gupta
Published by: Modern Publishers, Jalandhar
4. A Textbook of Practical Physics for Class XI
By: O. Kuber Singh
Published by: Writers Book Store, Paona Bazar, Imphal

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DESIGN OF QUESTION PAPER

Subject : **PHYSICS**
 Paper : Theory
 Class : XII
 Full Mark : 70
 Time : 3 Hours

WEIGHTAGE TO OBJECTIVES:					
		Marks	Percentage		
1.	Objectives	14	20		
	Knowledge (K)	32	46		
	Understanding (U)	21	30		
	Application (A)	3	4		
	Skill (S)	Total:	70	100	
WEIGHTAGE TO FORM OF QUESTIONS:					
Form of Questions		No. of Question	Time (in minutes)	Marks	Percentage
2.	Essay/Long Answer (E/LA)	3	60	15	21
	Short Answer (SA-I)	7	42	21	30
	Short Answer (SA-II)	10	40	20	29
	Very Short Answer (VSA)	10	30	10	14
	MCQ	4	8	4	6
	Total:		34	180	70
WEIGHTAGE TO CONTENT:					
UNIT/CONTENTS:			Marks	Percentage	
3.	I	Electrostatics	09	12	
	II	Current Electricity	07	10	
	III	Magnetic effect of current & Magnetism	09	12	
	IV	Electromagnetic Induction and Alternating current	08	11	
	V	Electromagnetic Waves	03	5	
	VI	Optics	15	23	
	VII	Dual Nature of Matter	05	7	
	VIII	Atoms and Nuclei	07	10	
	IX	Electronic Devices	07	10	
Total:			70	100	
4.	SCHEME OF SECTIONS: Nil				
5.	SCHEME OF OPTIONS: Internal option may be given in E/LA Type of Questions only.				
6.	DIFFICULTY LEVEL:				
		Difficulty	: 30%		
		Average	: 50%		
		Easy	: 20%		

Abbreviation: K(Knowledge), U(Understanding), C(Comprehension), Expression(Exp), Skill(S), E(Essay Type), SA(Short Answer Type), VSA(Very Short Answer Type), MCQ(Multiple Choice Question)

DESIGN OF QUESTION PAPER

Subject : PHYSICS

Paper : Practical

Class : XII

Full Marks : 30

Time : 3 Hours

Sl. No.	Forms of exercise	Nature of Exercise	Skill/Objective to be tested					Marks Allotted	Estimated Time in Minute
			O.S.	M.S.	D.S.	R.S.	R.U.		
1.	Short	Theory (Principle/ working formula) illustration diagrams	0	0	$\frac{1}{0}$	$\frac{3}{4}$	0	4	40
2.	Short	Setting of instruments and using it.	0	2	0	0	2	4	20
3.	Major Experiment	Experimental procedure, tabulation, etc.	2	2	0	0	0	4	100
4.	Short	Reading of measurement	2	0	0	2	0	4	20
5.	Short	Viva-Voce	0	0	0	0	4	4	X
6.	Sessional Record	Practical Note Book	1	1	1	1	1	5	–
7.	Sessional Record	Project Report	1	1	1	1	1	5	
Total			6	6	3/2	7/8	8	30	180

O.S.= Observational Skill, M.S.=Manipulative Skill, D.S. = Drawing Skill, R.S.= Report-
ing Skill, R.U.= Related Understandings.

* No fixed time is allotted for viva-voce. It is to be conducted during the course of the experi-
ment.

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