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FOR MANIPUR CLASS 12 PREPARATION

# Manipur Board Class 12 Syllabus 2027 Physics

| EXAM | YEAR | TYPE | SUBJECT |
| --- | --- | --- | --- |
| Manipur Class 12 | 2027 | Syllabus | Physics |

# 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 and Radiation | 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 (without concept of earthing), 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 store in a capacitor (no derivation, formula only).

### 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.

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.

**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 solenoids (only qualitative treatment)

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

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; Current loop as a magnetic dipole and its magnetic dipole moment, moving coil galvanometer-its current sensitivity and conversion to ammeter and voltmeter.

Bar magnet, bar magnet as an equivalent solenoid (Qualitative treatment only), 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 (Qualitative treatment only), magnetic field lines.

Para, dia and ferromagnetic substances with examples. Magnetisation of materials, effect of temperature on magnetic properties.

**Unit IV: Electromagnetic Induction and Alternating Currents (Periods 20)**

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

Alternating currents, peak and RMS value of alternating current/voltage; reactance and impedance; LCR series circuit (Phasor-diagram solution only), resonance (without sharpness of 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, their transverse nature (qualitative ideas only).
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 optical fibers, 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.

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 only (no derivation final expression only), coherent sources and sustained interference of light. Diffraction due to a single slit, width of central maxima ( qualitative treatment only).

**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.

**Unit VIII: Atoms & Nuclei** **(Periods 18)**

Alpha-particle scattering experiment; Rutherford's model of atom; Bohr model and the expression for radius of $n^{th}$ possible orbit (without derivation), velocity and energy of electron in this orbit, hydrogen line spectra (Qualitative treatment only)

Composition and size of nucleus, nuclear force.

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), intrinsic and extrinsic semiconductors, p and n type, p-n junction.

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

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# PHYSICS

## PRACTICAL

## CLASS - XII

**Note : A.** Every student will perform at least 12 experiments (6 from each section). The activities mentioned here should only be for the purpose of demonstration. One project of five 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: | 5 Marks |
| Viva base on the project : | 2 Marks |
| Practical record of experiments : | 5 Marks |
| Viva on experiments : | 2 Marks |
| | **Total = 30 Marks** |

## Section-A

**EXPERIMENTS:**

**(Any 6 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 series combination of resistances using a meter bridge.
4. To verify the laws of parallel combination of resistances using a meter bridge.
5. To determine resistance of a galvanometer by half-deflection method and to find its figure of merit.
6. To convert a given galvanometer (of known resistance and figure of merit) into an ammeter and volmeter of desired range and to verify the same.
7. 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 6 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 I/u and I/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.

**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 Polariod.
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.** Physics Part-I
Textbook for Class-XII.
Published by : NCERT, New Delhi.

2. Physics Part-II
Textbook for Class-XII
Published by : 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. Saraswati Lab Manual Physics for Class-XII (NCF 2023 Aligned)
By : Dr. R.K. Gupta & Ms. Rashika Gupta
Published by : New Saraswati House (India) Pvt. Ltd., New Delhi - 110002

5. Comprehensive Practical Physics for Class XII (New Edition)
By : J.N. Jaiswal
Published by : Laxmi Publications (P) Ltd., New Delhi - 110 002.

6. A Textbook of Practical Physics for Class XII
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

| | | | | | |
|---|---|---|---|---|---|
| 1. | WEIGHTAGE TO OBJECTIVES: | | | | |
| | Objectives | | | Marks | Percentage |
| | Knowledge (K) | | | 10 | 15 |
| | Understanding (U) | | | 35 | 50 |
| | Application (A) | | | 21 | 30 |
| | Skill (S) | | | 4 | 5 |
| | | | Total: | 70 | 100 |
| 2. | WEIGHTAGE TO FORM OF QUESTIONS: | | | | |
| | Form of Questions | No. of Question | Time (in minutes) | Marks | Percentage |
| | Essay/Long Answer (E/LA) | 3 | 60 | 15 | 21 |
| | Short Answer (SA-I) | 6 | 37 | 18 | 26 |
| | Short Answer (SA-II) | 10 | 40 | 20 | 29 |
| | Very Short Answer (VSA) | 7 | 21 | 7 | 10 |
| | MCQ | 10 | 22 | 10 | 14 |
| | Total: | 36 | 180 | 70 | 100 |
| 3. | WEIGHTAGE TO CONTENT: | | | | |
| | UNIT/CONTENTS: | | | Marks | Percentage |
| | 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:<br>1. Internal option will be given in Essay Type Question.<br>2. Internal option will be given in three questions of SA-I including one case study based question. | | | | |
| 6. | DIFFICULTY LEVEL:<br>Difficult : 35% of the total marks<br>Average : 50% of the total marks<br>Easy : 15% of the total marks | | | | |

Abbreviation: K(Knowledge), U(Understanding), A(Application), Skill(S), E/LA(Essay /Long Answer Type), SA(Short Answer Type), VSA(Very Short Answer Type), MCQ(Multiple Choice Question)

**NOTE-** (i) Two questions out of 10 (ten) questions of MCQ will be assertion & reason type question.
(ii) Only one question of SA-I will be Case Study Based 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 | 1/0 | 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.= Reporting Skill, R.U.= Related Understandings.

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

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