# How I secured distinction marks in Physics?

When I was studying in 10th standard, Physics was one of the subjects out of 8/9 subjects so like other subject I gave equal focus on Physics. I started my +2 with my 10th standard limited knowledge.

It was a challenge for me to secure good marks in +2 science subjects. In this article I will explain how I obtained distinction marks in Physics.

- ✓ Keep Physics syllabus for ready reference (Hand written 2/3 pages chapter wise listing preferred. In your text book you can list down chapter index also)
- ✓ Before attending physics class just go through chapter
- ✓ Refer questions long answer type, short answer type, objective type and numerical mentioned at the end of your text book
- ✓ Question bank is very useful, if you can refer your university 10 years questions bank this will give you fare idea as what type of questions normally asked in your examination. Now with the introduction of Common Syllabus you have to list out which topics are newly introduced and which topics excluded.
- ✓ Mark questions which are left unanswered
- ✓ Secret of success in +2 is extensive study
- ✓ Maintain a separate notes copy for physics
- ✓ I have seen Physics guide with extensive study material, vast listing of studying material you have to be very smart while reading such guide.
- ✓ If your college/school/tuition/coaching centre lectures are over now against each topics assign target date of complete revision.
- ✓ Physics is subject of understanding the basic concept so give importance of clearing the concepts. I found numerical problem solving approach is the best way to clear the concept.
- ✓ If your exams are not very close just entered in +2 science try to refer Reshnick and Haliday, HC Verma, NCERT books and your text book. You will find interesting how different people presented the same topics. This in turn will give you overall idea for these topics. Remember hard work has no substitute.

Frequently asked questions:

1. I want to get admission in engineering/medical entrance exam so I want to prepare myself for both my final year XII standard exam and entrance exam how should I prepare?

- Great idea, if you have decided to go for entrance exam you can manage both securing good marks in +2 as well as getting through entrance. You need to plan accordingly.

  Your board/university exam generally judge your performance whether you have understood the basic concepts of physics. Generally we answer long answer type questions, short answer type questions and objective type questions and simple application of physics concept through physics problem solving. Whereas

your entrance exam is based on objective type questions and physics problem solving. For engineering/medical often you have to walk extra mile beyond the scope of your university syllabus, exceptions and critical questions. Application of physics based on concepts. Now if you have solved many questions you will have fare idea of exceptional cases, where there is deviation how to derive your working physics formula for given numerical. But when we prepare for such entrance exam we are lost in vast scope of physics. Ask yourself can't you have a balanced study for both? I feel yes only writing papers in +2 board exams require some practice. Proper planning will fetch good results in both. Article on how to succeed engineering/medical entrance physics coming soon, just refer this article. Here will focus on +2 topics only.

2. Selective study or extensive study?

   Extensive study means go through each topics/sub topics which I prefer. But people often plan and become very serious of studying physics before examination they can't go through complete syllabus and often depends on Guess take huge risk by not reading some of the chapters at all. Unless you are studying all the topics you can't answer properly all questions in your exam.

   If you have planned well just revise whatever you have learnt in two years before exam. There are many students who read while going for exams in bus/auto they have not planned properly and not confident, this unnecessarily creates stress in your mind. Sometimes we have two exams in one day say physics paper I in morning session and paper II in afternoon session, I have seen people referring study material in Tiffin hours this is not a good practice, avoid this.

   Now let's see what are your Physics Chapter/Topics/Subtopics (this listing I have taken from latest syllabus based on common syllabus) and marks distribution. You can take remaining pages print and keep a copy for your ready reference.

## COURSE STRUCTURE

### Class XI (Theory)

One Paper | Three Hours | Max Marks: 70

| | Class XI | Weightage |
|---|---|---|
| Unit I | Physical World & Measurement | 03 |
| Unit II | Kinematics | 10 |
| Unit III | Laws of Motion | 10 |
| Unit IV | Work, Energy & Power | 06 |
| Unit V | Motion of System of particles & Rigid Body | 06 |
| Unit VI | Gravitation | 05 |
| Unit VII | Properties of Bulk Matter | 10 |
| Unit VIII | Thermodynamics | 05 |
| Unit XI | Behaviour of Perfect Gas & Kinetic Theory of gases | 05 |
| Unit X | Oscillations & Waves | 10 |
| | **Total** | **70** |

***Experiments***

1. Use of Vernier Callipers

(i) To measure diameter of a small spherical/cylindrical body.

(ii) To measure dimensions of a given regular body of known mass and hence find its density.

(iii) To measure internal diameter and depth of a given beaker/calorimeter and hence find its volume.

2. Use of screw gauge

(i) To measure diameter of a given wire, (ii) To measure thickness of a given sheet
(iii) To measure volume of an irregular lamina

3. To determine radius of curvature of a given spherical surface by a spherometer.

4. To find the weight of a given body using parallelogram law of vectors.

5. Using a simple pendulum, plot L-T and L-T2 graphs. Hence find the effective length of Second's pendulum using appropriate graph.

6. To study the relationship between force of limiting friction and normal reaction and to find co-efficient of friction between a block and a horizontal surface.

7. To find the downward force, along an inclined plane, acting on a roller due to gravitational pull of the earth and study its relationship with the angle of inclination by plotting graph between force and sinθ

***Activities***

1. To make a paper scale of given least count, e.g. 0.2cm, 0.5cm.
2. To determine mass of a given body using a metre scale by principle of moments.
3. To plot a graph for a given set of data, with proper choice of scales and error bars.
4. To measure the force of limiting friction for rolling of a roller on a horizontal plane.
5. To study the variation in range of a jet of water with angle of projection.
6. To study the conservation of energy of a ball rolling down on inclined plane (using a Double inclined plane).
7. To study dissipation of energy of a simple pendulum by plotting a graph between square of amplitude and time.

**SECTION B**

***Experiments***

1. To determine Young's modulus of elasticity of the material of a given wire.

2. To find the force constant of a helical spring by plotting graph between load and extension.

3. To study the variation in volume with pressure for a sample of air at constant temperature by plotting graphs between P and V, and between P and I/V.

4. To determine the surface tension of water by capillary rise method.

5. To determine the coefficient of viscosity of a given viscous liquid by measuring terminal velocity of a given spherical body.

6. To study the relationship between the temperature of a hot body and time by plotting a cooling curve.

7. (i) To study the relation between frequency and length of a given wire under constant tension using sonometer.

(ii) To study the relation between the length of a given wire and tension for constant frequency using sonometer.

8. To find the speed of sound in air at room temperature using a resonance tube by two resonance positions.

9. To determine specific heat of a given (i) solid (ii) liquid, by method of mixtures.

**Activities**

1. To observe change of state and plot a cooling curve for molten wax.
2. To observe and explain the effect of heating on a bi-metallic strip.
3. To note the change in level of liquid in a container on heating and interpret the observations.
4. To study the effect of detergent on surface tension by observing capillary rise.
5. To study the factors affecting the rate of loss of heat of a liquid.
6. To study the effect of load on depression of a suitably clamped metre scale loaded (i) at its end (ii) in the middle.

**Class XII (Theory)**

| One Paper | Time: 3 Hours | 70 Marks |
|---|---|---|
| Unit I | Electrostatics | 08 |
| Unit II | Current Electricity | 07 |
| Unit III | Magnetic effect of current & Magnetism | 08 |
| Unit IV | Electromagnetic Induction and Alternating current | 08 |
| Unit V | Electromagnetic Waves | 03 |
| Unit VI | Optics | 14 |
| Unit VII | Dual Nature of Matter | 04 |
| Unit VIII | Atoms and Nuclei | 06 |
| Unit IX | Electronic Devices | 07 |
| Unit X | Communication Systems | 05 |
| | **Total** | **70** |

**Practicals**

Every student will perform 10 experiments (5 from each section) & 8 activities (4 from each section) during the academic year. Two demonstration experiments must be performed by the teacher with participation of students. The students will maintain a record of these demonstration experiments.

**SECTION A**

***Experiments***

1. To determine resistance per cm of a given wire by plotting a graph of potential difference versus current.

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

3. To verify the laws of combination (series/parallel) of resistances using a metre 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 the 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**

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 assemble 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***

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 lens by plotting graphs between u and v or between l/u and l/v.

3. To find the focal length of a convex mirror, using a convex lens.

4. To find the focal length of a concave lens, using a convex lens.

5. To determine angle of minimum deviation for a given prism by plotting a graph between angle of incidence and 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***

1. To study effect of intensity of light (by varying distance of the source) on an L.D.R.
2. To identify a diode, an LED, a transistor, and IC, a resistor and a capacitor from mixed collection of such items.
3. 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 I C) is in working order.
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 Polaroids.
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.

**B. Evaluation Scheme for Practical Examination:**

_ One experiment from any one section 8 Marks
_ Two activities (one from each section) (4+4) 8 Marks
_ Practical record (experiments & activities) 6 Marks
_ Record of demonstration experiments & Viva based on these experiments 3 Marks
_ Viva on experiments & activities 5 Marks

**Total 30 Marks**

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**XI – Physics Chapters**

**Unit I: Physical World and Measurement (periods 10)**

Physics - scope and excitement; nature of physical laws; Physics, technology and society.
Need for measurement: Units of measurement; systems of units; SI units, fundamental and derived units. Length, mass and time measurements; accuracy and precision of measuring instruments; errors in measurement; significant figures.
Dimensions of physical quantities, dimensional analysis and its applications.

**Unit II: Kinematics (Periods 30)**

Frame of reference. Motion in a straight line: Position-time graph, speed and velocity.
Uniform and non-uniform motion, average speed and instantaneous velocity.
Uniformly accelerated motion, velocity-time, position-time graphs, relations for uniformly accelerated motion (graphical treatment).
Elementary concepts of differentiation and integration for describing motion.
Scalar and vector quantities: Position and displacement vectors, general vectors and notation, equality of vectors, multiplication of vectors by a real number; addition and subtraction of vectors. Relative velocity.
Unit vector; Resolution of a vector in a plane - rectangular components. Motion in a plane. Cases of uniform velocity and uniform acceleration-projectile motion. Uniform circular motion.

**Unit III: Laws of Motion (Periods 16)**

Intuitive concept of force. Inertia, Newton's first law of motion; momentum and Newton's second law of motion; impulse; Newton's third law of motion. Law of conservation of linear momentum and its applications.

Equilibrium of concurrent forces. Static and kinetic friction, laws of friction, rolling friction. Dynamics of uniform circular motion: Centripetal force, examples of circular motion (vehicle on level circular road, vehicle on banked road).

**Unit IV: Work, Energy and Power (Periods 16)**

Scalar product of vectors. Work done by a constant force and a variable force; kinetic energy, work-energy theorem, power.
Notion of potential energy, potential energy of a spring, conservative forces: conservation of mechanical energy (kinetic and potential energies); non-conservative forces: elastic and inelastic collisions in one and two dimensions.

**Unit V: Motion of System of Particles and Rigid Body (Periods 18)**

Centre of mass of a two-particle system, momentum conversation and centre of mass motion. Centre of mass of a rigid body; centre of mass of uniform rod.
Vector product of vectors; moment of a force, torque, angular momentum, conservation of angular momentum with some examples.
Equilibrium of rigid bodies, rigid body rotation and equations of rotational motion, comparison of linear and rotational motions; moment of inertia, radius of gyration.
Values of moments of inertia for simple geometrical objects (no derivation). Statement of parallel and perpendicular axes theorems and their applications.

**Unit VI: Gravitation (Periods 14)**

Keplar's laws of planetary motion. The universal law of gravitation.
Acceleration due to gravity and its variation with altitude and depth.
Gravitational potential energy; gravitational potential. Escape velocity. Orbital velocity of a satellite. Geo-stationary satellites.

**Unit VII: Properties of Bulk Matter (Periods 28)**

Elastic behaviour, Stress-strain relationship, Hooke's law, Young's modulus, bulk modulus,shear, modulus of rigidity.

Pressure due to a fluid column; Pascal's law and its applications (hydraulic lift and hydraulic brakes). Effect of gravity on fluid pressure.

Viscosity, Stokes' law, terminal velocity, Reynold's number, streamline and turbulent flow. Bernoulli's theorem and its applications.

Class XII – Theory

**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. Van de Graaff generator.

**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 law and its applications to infinitely long straight wire, straight and toroidal solenoids. 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 ferro - magnetic 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 inductance. Need for displacement current.
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, wattless current. AC generator and transformer.

**Unit V: Electromagnetic waves (Periods 4)**

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, lensmaker's formula. Magnification, power of a lens, combination of thin lenses in contact. Refraction and dispersion of light through a prism.
Scattering of light - blue colour of the sky and reddish appearance of the sun at sunrise and sunset.

Optical instruments: Human eye, image formation and accommodation, correction of eye defects (myopia, hypermetropia, presbyopia and astigmatism) using lenses. Microscopes and 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 microscopes and astronomical telescopes. 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.
Matter waves-wave nature of particles, de Broglie relation. Davisson-Germer experiment.

**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, atomic masses, isotopes, isobars; isotones. Radioactivityalpha, beta and gamma particles/rays and their properties; radioactive decay law.
Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number; nuclear fission, nuclear reactor, nuclear fusion.

**Unit IX: Electronic Devices (Periods 18)**

Semiconductors; semiconductor diode – I-V characteristics in forward and reverse bias, diode as a rectifier; I-V characteristics of LED, photodiode, solar cell, and Zener diode; Zener diode as a voltage regulator. Junction transistor, transistor action, characteristics of a transistor; transistor as an amplifier (common emitter configuration) and oscillator. Logic gates (OR, AND, NOT,NAND and NOR). Transistor as a switch.

**Unit X: Communication Systems (Periods 10)**

Elements of a communication system (block diagram only); bandwidth of signals (speech, TV and digital data); bandwidth of transmission medium. Propagation of electromagnetic waves in the atmosphere, sky and space wave propagation. Need for modulation. Production and detection of an amplitude-modulated wave.

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Continued ... Part-II