

Secondary School Certificate Examination Syllabus

PHYSICS

Class X examination in 2011 and onwards

Topics Student Learning Outcomes

Part II (Class X)

10. Simple harmonic motion and Waves:

10.1 Simple harmonic motion:

- 10.1.1 State the conditions necessary for an object to oscillate with SHM
- 10.1.2 Explain SHM with simple pendulum, ball and bowl examples
- 10.1.3 Draw forces acting on a displaced pendulum
- 10.1.4 Solve problems by using the formula $T = 2\pi \sqrt{l/g}$ for simple pendulum
- 10.1.5 Explain that damping progressively reduces the amplitude of oscillation

10.2 Waves, their nature and type:

- 10.2.1 Describe wave motion as illustrated by vibrations in rope, slinky spring and by Experiments with water waves
- 10.2.2 Describe that waves are means of energy transfer without transfer of matter
- 10.2.3 Distinguish between mechanical and electromagnetic waves
- 10.2.4 Identify transverse and longitudinal waves in mechanical media, slinky and springs

10.3 Properties of waves:

- 10.3.1 Describe properties of waves such as reflection, refraction and diffraction with the Help of ripple tank

10.4 Characteristics of waves:

- 10.4.1 Define the terms speed (v), frequency (f), wavelength (λ), time period (T), Amplitude, crest, trough, cycle, wave front, compression and rarefaction
- 10.4.2 Derive equation $V=f\lambda$
- 10.4.3 Solve problems by applying the relation $f = 1/T$ and $V= f\lambda$.

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11. Sound:

11.1 Sound waves:

- 11.1.1 Explain how sound is produced by vibrating sources and that sound waves require a material medium for their propagation
- 11.1.2 Describe the longitudinal nature of sound waves (as a series of compressions and Rarefactions)

11.2 Speed of sound:

- 11.2.1 Describe an experiment for the determination of speed of sound

11.3 Characteristics of sound:

- 11.3.1 Define the terms pitch, loudness and quality of sound
- 11.3.2 Describe the effect of change in amplitude on loudness and the effect of change in Frequency on pitch of sound
- 11.3.3 Define intensity and state its SI unit
- 11.3.4 Describe what is meant by intensity level and give its unit
- 11.3.5 Describe the importance of acoustic protection;

11.4 Noise pollution:

- 11.4.1 Explain that noise is a nuisance;
- 11.4.2 Describe how reflection of sound may produce echo

11.5 Audible frequency range:

- 11.5.1 Describe audible frequency range
- 11.5.2 Describe the uses of ultrasound

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12. Geometrical optics:

12.1 Reflection of light:

- 12.1.1 Describe the terms used in reflection including normal, angle of incidence, and angle of reflection and state laws of reflection
- 12.2 Image location by spherical mirror equation
- 12.2.1 Solve problems of image location by spherical mirrors by using mirror formula
- 12.3 Refraction of light
- 12.3.1 Define the terminology 'angle of incidence and 'angle of refraction and State the laws of refractions
- 12.3.2 Describe and demonstrate the passage of light through parallel sided transparent Material
- 12.3.3 Solve problems by using different formulae
 - i. **$\sin \angle i / \sin \angle r$**
 - ii. **Speed of light in vacuum/speed of light in given medium**
 - iii. **Real depth / apparent depth**
- 12.3.4 Describe and demonstrate the passage of light through a glass prism

12.4 Total internal reflection:

12.4.1 State the conditions for total internal reflection

12.4.2 Describe the use of total internal reflection in light propagation e.g. optical fibers

12.4.3 Describe the relation between critical angle and refractive index

12.5 Image location by lens equation:

12.5.1 Describe and demonstrate how light is refracted through lenses

12.5.2 Solve problems of image location by lenses using lens formula

12.6 Magnifying power and resolving power :

12.6.2 Define the terms ‘resolving power’ and ‘magnifying power’

12.7 Compound microscope:

12.7.1 Draw a ray diagram of a simple microscope and determine its magnifying power

12.7.2 Draw a ray diagram of a compound microscope and determine its magnifying Power

12.8 Telescope:

12.8.1 Draw a ray diagram of a telescope and mention its magnifying power;

12.9 Defects in vision:

12.9.1 Draw ray diagrams to show the formation of images in the normal eye, a short-sighted eye and a long-sighted eye

12.9.2 Describe the correction of short-sight and long-sight.

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13. Electrostatics:

13.1 Electric charge:

13.1.1 Describe simple experiments to show the production and detection of electric Charge

13.1.2 Discuss the potential dangers of electrostatic charges e.g. fuelling of aircrafts and Tankers;

13.2 Electrostatic induction:

13.2.1 Describe experiments to show electrostatic charging by induction

13.2.2 State that there are positive and negative charges

13.3 Electroscopes:

13.3.1 Describe the construction and working principle of electroscopes

13.4 Coulomb's law:

13.4.1 State and explain Coulomb's law

13.4.2 Solve problems on electrostatic charges by using Coulomb's law

13.5 Electric field and its intensity

13.5.1 Define electric field and electric field intensity

13.5.2 Sketch the electric field lines for an isolated +ve and -ve point charges

13.6 Electrostatic potential:

13.6.1 Describe the concept of electrostatic potential

13.6.2 Define the unit ‘volt’

13.6.3 Describe potential difference as energy transfer per unit charge

13.7 Applications of electrostatics:

- 13.7.1 Describe a situation in which static electricity is dangerous and discuss the Precautions taken to ensure the safe discharge of static electricity
- 13.8 Capacitors and capacitance
- 13.8.1 Describe a capacitor as a charge storing device
- 13.8.2 Define capacitance and state its unit
- 13.8.3 Derive the formula for the effective capacitance of a number of capacitors Connected in series and in parallel
- 13.8.4 Apply the formula for the effective capacitance of a number of capacitors Connected in series and in parallel to solve related problems
- 13.9 **Different types of capacitors:**
- 13.9.1 Differentiate between fixed and variable capacitor.

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14. Current electricity:

14.1 Electric current:

- 14.1.1 Define electric current
- 14.1.2 Describe the concept of conventional current
- 14.2 Potential difference and e.m.f
- 14.2.1 Understand the potential difference across a circuit component and name its unit

14.3 Ohm's law:

- 14.3.1 Describe Ohm's law and explain its limitations
- 14.4.1 Define resistance and its unit (Ω)
- 14.4.2 Calculate the effective resistance of a number of resistances connected in series And also in parallel
- 14.4.3 Describe the factors affecting the resistances of a metallic conductor
- 14.4 Resistance (series and parallel combinations)
- 14.4.4 Distinguish between conductors and insulators

14.5 The I -V characteristics for ohmic and non ohmic conductors:

- 14.5.1 Sketch and interpret the **I -V** characteristics graph for a metallic conductor, a Filament lamp and a thermistor

14.6 Electrical power and joule's law:

- 14.6.1 Describe how energy is dissipated in a resistance and explain Joule's law
- 14.6.2 Apply the equation $E = I V t = I^2 R t = V^2 t / R$ to solve numerical problem
- 14.6.3 Calculate the cost of energy when given the cost per Kwh
- 14.6.4 Distinguish between D.C and A.C

14.7 Use of circuit components:

- 14.7.1 Identify circuit components such as switches, resistors, batteries etc

14.8 Measuring instruments (galvanometer, ammeter, voltmeter):

- 14.8.1 Describe the use of electrical measuring devices like galvanometer, ammeter and Voltmeter
- 14.8.2 Construct simple series (single path) and parallel circuits (multiple paths)
- 14.8.3 Predict the behaviour of light bulbs in series and parallel circuit such as for Celebration lights

14.9 **Alternating current (A.C):**

14.9.1 State the functions of the live, neutral and earth wires in the domestic main supply

14.9.2 Explain why domestic supplies are connected in parallel

14.10 **Safety measures:**

14.10.1 Describe hazards of electricity; (damage insulation, overheating of cables, damp Conditions)

14.10.2 Explain the use of safety measures in household electricity. (Fuse, circuit Breaker, earth wire)

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15. Electromagnetism:

15.1 **Magnetic effect of a steady current:**

15.1.1 Describe and demonstrate that an electric current in a conductor produces a Magnetic field around it

15.2 Force on a current carrying conductor in a magnetic field

15.2.1 Describe that a force acts on a current carrying conductor placed in a magnetic Field as long as the conductor is not parallel to the magnetic field

15.3 **Turning effect on a current carrying coil in a magnetic field:**

15.3.1 State that a current carrying coil in a magnetic field experiences a torque with the Help of Fleming left hand rule

15.4 **D.C motor:**

15.4.1 Relate the turning effect on a coil to the action of a D.C. motor

15.5 **Electromagnetic induction :**

15.5.1 Describe an experiment to show that a changing magnetic field can induce e.m.f. in a circuit

15.5.2 Describe factors affecting the magnitude of an induced e.m.f.

15.5.3 Explain that the direction of an induced e.m.f opposes the change causing it and Relate this phenomenon to conservation of energy

15.6 **A.C generator:**

15.6.1 Describe a simple form of A.C generator

15.7 **Mutual induction:**

15.7.1 Describe mutual induction and state its units

15.8 **Transformer:**

15.8.1 Explain that a transformer works on the principle of mutual induction between two Coils

15.8.2 Describe the purpose of transformers in A.C circuits.

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16. Introductory electronics:

16.1 Thermionic emission:

16.1.1 Explain the process of Thermionic emission emitted from a filament

16.2 Electron gun and cathode rays:

16.2.1 Describe the simple construction and use of an electron gun as a source of electron Beam

16.3 Deflection of electron by electric field:

16.3.1 Describe the effect of electric field on an electron beam

16.4 Deflection of electron by magnetic field:

16.4.1 Describe the effect of magnetic field on an electron beam

16.5 Cathode rays oscilloscope (CRO):

16.5.1 Describe the basic principle of CRO and make a list of its uses

16.6 Introduction of electronics:

16.6.1 Differentiate between analogue and digital electronics

16.6.2 Describe how digital signals can carry more information

16.7 Analogue and digital electronics

16.7.1 State the basic operations of digital electronics

16.8 Logic gates:

16.8.1 Identify and draw the symbols for the logic gates; (**NOT, OR, AND, NOR and NAND**)

16.8.2 State the action of the logic gates in truth table form

16.8.3 Describe the simple uses of logic gates.

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17. Information and communication technology:

17.1 Components of ICT:

17.1.1 Describe the components of Information and Communication Technology (**ICT**)

17.2 Flow of information:

17.2.1 Explain briefly the transmission of

- Electric signals through wires
- Radio waves through air
- Light signals through optical fibers

17.3 Communication technology:

17.3.1 Describe function and use of fax machine, cell phone, photo phone and computer;

17.3.2 State the purpose of the use of e-mail and internet

17.4 Storing information:

17.4.1 Describe the use of information storage devices such as audio cassettes, video Cassettes, hard discs, floppy, compact discs and flash drive;

17.5 Handling information:

17.5.1 Identify the functions of word processing, data managing, monitoring and

Controlling

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18. Radioactivity:

18.1 Atom and atomic nucleus:

- 18.1.1 Describe Rutherford's nuclear model
- 18.1.2 Describe the composition of the nucleus in terms of protons and neutrons
- 18.1.3 Explain that number of protons in a nucleus distinguishes one element from the Other
- 18.1.4 Represent various nuclides by using the symbol of proton number Z, nucleon Number A and the nuclide notation X

18.2 Natural radioactivity:

- 18.2.1 Explain that some nuclei are unstable, give out radiation to get rid of excess Energy and are said to be radioactive
- 18.2.2 Describe that the three types of radiation are α , β & γ
- 18.2.3 State, for radioactive emissions
 - their nature
 - their relative ionizing effects
 - their relative penetrating abilities
- 18.2.4 Explain that an element may change into another element when radioactivity Occurs

18.3 Natural transmutations:

- 18.3.1 Represent changes in the composition of the nucleus by symbolic equations when Alpha or beta particles are emitted

18.4 Background radiation:

- 18.4.1 Describe that radioactive emissions occur randomly over space and time;
- 18.4.2 Show an awareness of the existence of background radiation and its sources

18.5 Half life:

- 18.5.1 Explain the meaning of half life of a radioactive material and calculate the half life And its graph

18.6 Radio isotopes:

- 18.6.1 Describe radio isotopes and their uses
- 18.6.2 Describe the process of carbon dating to estimate the age of ancient objects

18.7 Fission and fusion:

- 18.7.1 Describe briefly the processes of fission and fusion;

18.8 Hazards of radioactivity and safety measures

- 18.8.1 Describe hazards of radioactive materials

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