Objectives of Physics for third year secondary (GS + LS)

Mechanics

Energy (GS + LS)

- Define the macroscopic mechanical energy of a system.
- Explain the notion of internal energy of a system.
- Define the total energy of a system.
- Know the expression for the elastic potential energy of a spring.
- Explain the conservation and the non-conservation of the mechanical energy of a system.
- Apply the conservation of mechanical energy of a system.

Linear momentum (GS + LS)

- Define the linear momentum of a particle and of a system of particles.
- Know the relations between the linear momentum of a system of particles and that of its center of mass.
- Know the expression for Newton's 2nd law in terms of linear momentum.
- Define an isolated system.
- Apply the law of conservation of linear momentum.

Angular momentum (GS)

- Define the angular momentum of a system rotating about a fixed axis.
- Apply the relation between the angular momentum and angular velocity.
- State the theorem of angular momentum.
- State the law of conservation of angular momentum.
- Explain some applications using the conservation of angular momentum.

Mechanical oscillations (GS + LS)

- Define oscillatory phenomena and give examples of oscillators.
- Distinguish between damped and undamped oscillations.
- Establish the differential equation that governs simple harmonic motion by using the conservation of mechanical energy.
- Give examples of the driven mechanisms of a damped oscillator.

Forced oscillations – Resonance (GS + LS)

- Characterize forced oscillations.
- Know the conditions of resonance.
- Give practical examples of forced oscillations with and without resonance.

Relativity (GS)

- Distinguish between inertial and non-inertial frames.
- State Einstein's postulates of special relativity.
- Know the time dilation and length contraction are two consequences of the second postulate.
- Know the mass-energy equivalence.

Electricity

Electromagnetic induction (GS + LS)
- Know the phenomenon of electromagnetic induction.
- State and apply the laws of induction.
- Define the equivalent generator of a coil.
- Apply Ohm's law to a coil.
- Know the power distribution of a coil-magnet system.

Self-Induction (GS + LS)
- Define the phenomenon of self-induction.
- Define the inductance of a coil.
- Give the expression of self-induced electromotive force.
- Write the expression of the potential difference across a coil.
- Read the graphs of the growth and the decay of a current in an R-L series circuit (GS).
- Establish the differential equations of the growth and the decay of the current in an R-L series circuit and give their solutions (GS).
- Know the physical significance of the time constant (GS).
- Give the expression of the magnetic energy stored in a coil.

Alternating sinusoidal current (GS + LS)
- Define the alternating sinusoidal current.
- Apply Ohm's law to a resistor traversed by an alternating sinusoidal current.
- Study the response of an R-L series circuit traversed by an alternating sinusoidal current.
- Explain the phenomenon of charging and discharging a capacitor under a square signal and an alternating sinusoidal voltage, and establish the corresponding differential equations of this R-C series circuit.
- Establish the differential equation of an R-L-C series circuit traversed by an alternating sinusoidal current.
- Define average power and the power factor.

Transformers (GS + LS)

- Define and describe a transformer.
- Explain the functioning of a transformer.
- Give the expression of the efficiency of a transformer.
- Justify the usage of a transformer for transmission of electric energy.

Electromagnetic oscillations (GS)

- Analyze the energy exchanges in an R-L-C series circuit.
- Define the charging and discharging phases of a capacitor in an R-L-C series circuit.
- Give the expression of the natural period of an ideal L-C circuit.
- Analyze an R-L-C series circuit under forced oscillations.
- Give the condition of the electric current resonance.

Aspects of Light

Wave aspect of light – Diffraction (GS + LS)

- Know Huygens' principle.
- Interpret the diffraction phenomenon of light.
- Read the graph of light intensity in a diffraction pattern.
- Know the characteristics of light waves.

Interference of light (GS + LS)

- Know the phenomenon of interference of light.
- Know the conditions of obtaining interference fringes.
- Interpret the formation of interference fringes.
- Give the expressions of the path difference and the inter-fringe distance.

Corpuscular aspect of light (GS +LS)

- Define the photoelectric effect.
- State Planck-Einstein's hypothesis.
- Interpret the photoelectric effect by the Planck-Einstein's hypothesis.
- Know the magnetic spectra of a bar magnet and of a U-shape magnet.

Atom and Nucleus

The atom (GS + LS)

- Know the historical development of the model of the atom.
- Know that the atom has discrete energy levels.
- Draw the energy level diagram of the hydrogen atom.
- Differentiate between emission and absorption spectra.

Atomic Nucleus (GS + LS)

- Represent the nucleus by its atomic number Z and its mass number A.
- Define the atomic mass unit u.
- Define the isotope of an element.
- Explain the concept of binding energy.
- Explain the stability of the nucleus.

Radioactivity (GS + LS)

- Explain the radioactive disintegration.
- Characterize the α, β and γ emissions.
- Define the activity of a radioactive element.
- Define the period of a radionuclide.
- State the law of radioactive decay.
- Know the principle of artificial radioactivity.
- Know the existence of some natural radioactive series.

Nuclear Reactions (GS + LS)

- Know the principle of nuclear fission.
- Explain the chain reaction.
- Know the principle of nuclear fusion.
- Apply the conservation of energy in a nuclear reaction.
- Identify the nuclear waste.