Syllabus for Physics 3IA

Theory

	Topic		Contents
1	**Waves, sounds and vibrations**	Transverse and longitudinal waves	- Understand difference between Transverse and longitudinal waves With examples of each - Meaning of wavelength, amplitude, frequency - Wave equation
		Wave effects	- Reflection, refraction, diffraction and examples of each - Change of diffraction effect with change in gap size
		Sound waves	- Production of sound waves due to vibrations with examples - Properties of sound waves - Why sound waves need a material to travel through - Displaying sound waves on an oscilloscope
		Speed of sound and echoes	- Measuring the speed of sound in air - Understand how reflection causes echoes
		Characteristics of sound waves	- Range of audible frequencies for different species - Link between frequency and pitch - Link between amplitude and loudness
		Ultrasound	- Uses of ultrasound
2	**Rays and waves**	Light rays and waves	- Features of light waves -
		Reflection in plane mirrors	- Angle of incidence and reflection, formation of image
		Refraction	- Define refraction - Demonstrate refraction - Angle of refraction - Define refractive index in terms of speed - Dispersion when light passes through a prism - Total internal reflection and examples - Meaning of critical angle
		Lenses	- Compare converging (convex) and diverging (concave) lenses - Understand meaning of principal focus and focal length - Draw diagrams to show how and where a convex lens forms a real image and a virtual image

			- Convex lens as a magnifying glass
		The human eye	- Role of different parts of the human eye - Correcting defects in vision
		Electromagnetic waves	- Main features of electromagnetic waves and uses
3	**Electricity**	Electric charge	- Negative and positive charges - Attraction and repulsion of charges - Conductors and insulators
		Current in a simple circuit	- Current as a flow of charge - Link between charge, current and time - Conventional current direction - Short circuit using simulation (Phet)
		Potential difference (PD)	- Understand that one volt across a cell means one joule of energy given to each coulomb of charge - Cells in series - Rule linking PDs around a circuit
		Resistance	- Understand how changes in PD or resistance affect the current in a circuit - Equation linking resistance, PD and current - Interpret current-voltage graphs - Examples of resistance components
		Series and parallel circuits	- Bulbs and switches in series and in parallel - Basic circuit rules: rule of voltage in series circuits, rule of currents in parallel circuit
		Electrical power	- Define power - Understand power rating of electrical appliances - Link between power, voltage and current
		Mains electricity	- Apply simple calculations to everyday appliances - Safety precautions and hazards - Usefulness of fuse and power breaker

		Electrical energy calculations	- Link between power, electrical energy and time - Understand the notion of kilowatt-hour
4	**Magnets**	Magnets	- Magnetic poles - Attraction and repulsion - Magnetic and non-magnetic materials
		Magnetic fields	- Magnetic field pattern - Analogy bar magnet and earth's magnetic field
5	**Radioactivity** **(if time allows)**	Inside atoms	- Revision from chemistry
		Nuclear radiation	- Understand ionizing property of nuclear radiation - Meaning of radioactive decay - Properties of alpha and beta radiation
		Radioactive decay	- Background radiation - Define activity and half-life - Background - Identify half-life on activity-time graph
		Using radioactivity	- Radioactive substances as tracers, in radiotherapy, in industry

General skills:
1. Use of command terms
2. Summarise key points in a text
3. Use of tables
4. Writing a method
5. Charts and graphs (see chemistry and physics)
   - Present information as bar charts or scatter graphs
   - Understanding direct and inverse proportion
   - Identify relationships using scatter graphs (direct proportion and linear relationship; significance of intercept)
   - Analyse and describe trends of a graph

6. Modelling in science: how to use models in science and testing them
7. Produce and present a presentation
8. Calculating with simple formulae : $y = a$ times x, reciprocals, ratios, percentages, powers of ten
9. Measuring angles
10. Understand accuracy and precision

11. Understand random and systematic errors
12. Rounding numbers
13. Know the S.I. units and their multiples of the physical quantities introduced in the different chapters.
14. Make approximations and estimates
15. Understand notion of fair testing

Practical Work Suggestions

The practical activities are an integral part of the course.

	Topic	Contents
1	**Sound waves**	- Producing sounds with different sources and identify vibrating parts
2	**Rays and waves**	- Light passing through a parallel-sided block of glass, a prism - Factors influencing shadow size
3	**Electricity**	- Simple circuit measurements, use of ammeter and voltmeter - Simulation (Phet) to build circuits and verify rules of current and voltage, to understand short circuit
4	**Magnets**	- Plot fields of magnets