Syllabus for Physics 4IA

Theory

	Topic		**Contents**
1	**Measurements and units**	Numbers and units	- Know how to work with units in particular S.I. units and their prefixes - Writing numbers in scientific notation and significant figures
		Measuring length and time	- Read Vernier and micrometer - Understand meaning zero error - Understand period movement and period
		Volume and density	- Define volume and density - Units of volume and density - Measuring volume and density for regular and irregular solids - Simple calculations using density - Compare masses with beam balance - Difference between beam balance and digital scales
2	**Forces and motion**	Speed, velocity and acceleration	- Measuring speed - Difference between speed and velocity - Define acceleration - Understand deceleration - Motion graphs: distance-time graph, speed-time graph - Meaning of slope (gradient) as rate of change of speed in time - Recognize difference between uniform and non-uniform movement from velocity- time graphs - Interpret area under speed-time line as distance travelled - Acceleration g of free fall (omit upward movement)
		Forces in balance	- Free body diagram: isolate object to identify forces acting on it - Measuring force - Different types of forces and arrow representation - Newton's first law of motion - Meaning of terminal velocity
		Force, mass and acceleration Friction and braking	- Newton's second law: notion of inertia, resulting force in one direction - Different effects of forces - Stopping distance - Friction: how can it be useful, how can it be reduced

		Force, weight and gravity Action and reaction	- Define difference between weight and mas - Changing weight, fixed mass - Newton's third law - Propulsion of rockets
3	**Forces and pressure**	Forces and turning effects Stretching and compressing Pressure	- Define moment of a force - Principle of moments - Condition of equilibrium: forces and moments - Centre of mass and stability - Hooke's law and meaning of spring constant - Plot force versus load and meaning of slope - Pressure between solids - Pressure in liquids (deriving formula for hydrostatic pressure optional) - Hydraulic systems - Pressure from the air - Atmospheric pressure - Measuring pressure using a manometer
4	**Work and energy**	Work and energy Transforming energy Calculating potential and kinetic energies Efficiency and power Energy for electricity and energy resources	- Define work and energy - Different forms of energy - Conservation of energy - Understand difference between work done and energy transformed - Sankey diagrams - Solve simple problems - Define efficiency - Link between efficiency and power Optional : personal research
5	**Thermal physics**	Temperature Expanding solids and liquids	- Understand notion of temperature - Understand difference between heat and thermal energy - Absolute zero and kelvin unit - Conversion kelvin and degree Celsius - Understand why solids and liquids expand when heated

		Thermal conduction Thermal convection Thermal radiation	- Effects and uses of thermal expansion - Volume change when water freezes and its effects - Factors affecting thermal conduction - Good and poor thermal conductors - Uses of insulating materials Examples of convection currents - Examples and uses of convection currents - Nature of thermal radiation - Examples of emitters, reflectors and absorbers - Greenhouse effect, solar panel and vacuum flask

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	**Measurements and units**	- Practice within the context of different labs
2	**Forces and motion**	- Find speed from distance / time measurements - Hooke's law for spring and elastic band - Frictional forces - Inertia
3	**Forces and pressure**	- Investigate factors influencing upthrust
4,5	**Work and energy**	- Renewable energies - Compare heat loss of different cups filled with hot drink (fair test notion)