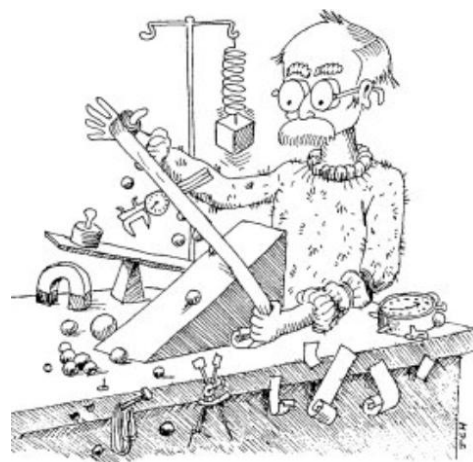


Physics Syllabus Required Experiments

Syllabus Section: Applications and Skills (left-hand side of syllabus format)

The physics syllabus contains a short list of prescribed experiments. These are generic rather than specific, so the details of implementation are up to the teacher. These prescribed investigations correspond to those experiments often regarded as good practice found in the Practical Schemes of Work over recent years from IB schools. These generic experiments are required and should appear on the 4/PSOW; questions relating to these may appear on the examination. The experimental investigations that appear on the right-hand side of the syllabus format under Aim 6 are not required but serve to help the teacher in producing a strong 4/PSOW. Here is a summary of the left-hand side Application and Skills prescribed experiments.

- 2.1—Determining the acceleration of free-fall experimentally
- 3.1—Applying the calorimetric techniques of specific heat capacity or specific latent heat experimentally
- 3.2—Investigating at least one gas law experimentally
- 4.2—Investigating the speed of sound experimentally
- 4.4—Determining refractive index experimentally
- 5.2—Investigating one or more of the factors that affect resistance experimentally
- 5.3—Determining internal resistance experimentally
- 7.1—Investigating half-life experimentally (or by simulation)
- 9.3—Investigating Young's double-slit experimentally
- 11.2—Investigating a diode bridge rectification circuit experimentally



Physics Syllabus Suggested Experiments

Syllabus Section: Aim 6 (right-hand side of syllabus format)

- 2.1—experiments, including use of data logging, could include (but are not limited to): determination of g , estimating speed using travel timetables, analysing projectile motion, and investigating motion through a fluid
- 2.2—experiments could include (but are not limited to): verification of Newton's second law; investigating forces in equilibrium; determination of the effects of friction
- 2.3—experiments could include (but are not limited to): relationship of kinetic and gravitational potential energy for a falling mass; power and efficiency of mechanical objects; comparison of different situations involving elastic potential energy
- 2.4—experiments could include (but are not limited to): analysis of collisions with respect to energy transfer; impulse investigations to determine velocity, force, time, or mass; determination of amount of transformed energy in inelastic collisions
- 3.1—experiments could include (but are not limited to): transfer of energy due to temperature difference; calorimetric investigations; energy involved in phase changes
- 3.2—experiments could include (but are not limited to): verification of gas laws; calculation of the Avogadro constant; virtual investigation of gas law parameters not possible within a school laboratory setting
- 4.1—experiments could include (but are not limited to): mass on a spring; simple pendulum; motion on a curved air track
- 4.2—experiments could include (but are not limited to): speed of waves in different media; detection of electromagnetic waves from various sources; use of echo methods (or similar) for determining wave speed, wavelength, distance, or medium elasticity and/or density
- 4.3—experiments could include (but are not limited to): observation of polarization under different conditions, including the use of microwaves; superposition of waves; representation of wave types using physical models (eg slinky demonstrations)
- 4.4—experiments could include (but are not limited to): determination of refractive index and application of

Snell's law; examination of diffraction patterns through apertures and around obstacles; investigation of the double-slit experiment; determining conditions under which total internal reflection may occur

4.5—experiments could include (but are not limited to): observation of standing wave patterns in physical objects (e.g. slinky springs); prediction of harmonic locations in an air tube in water; determining the frequency of tuning forks; observing or measuring vibrating violin/guitar strings

5.1—experiments could include (but are not limited to): demonstrations showing the effect of an electric field (e.g. using semolina); simulations involving the placement of one or more point charges and determining the resultant field

5.2—experiments could include (but are not limited to): use of a hot-wire ammeter as a historically important device; comparison of resistivity of a variety of conductors such as a wire at constant temperature, a filament lamp, or a graphite pencil; determination of thickness of a pencil mark on paper; investigation of ohmic and non-ohmic conductor characteristics; using a resistive wire wound and taped around the reservoir of a thermometer to relate wire resistance to current in the wire and temperature of wire

5.3—experiments could include (but are not limited to): investigation of simple electrolytic cells using various materials for the cathode, anode, and electrolyte; software-based investigations of electrical cell design; comparison of the life expectancy of various batteries.

6.1—experiments could include (but are not limited to): mass on a string; observation and quantification of loop-the-loop experiences; friction of a mass on a turntable

8.2—experiments could include (but are not limited to): simulations of energy exchange in the Earth surface-atmosphere system

AHL 9.1—experiments could include (but are not limited to): investigation of simple or torsional pendulums; measuring the vibrations of a tuning fork; further extensions of the experiments conducted in sub-topic 4.1. By using the force law, a student can, with iteration, determine the behaviour of an object under simple harmonic motion. The iterative approach (numerical solution), with given initial conditions, applies basic uniform acceleration equations in successive small time increments. At each increment, final values become the following initial conditions.

AHL 9.2—experiments can be combined with those from subtopics 4.4 and 9.3

AHL 9.3—experiments could include (but are not limited to): observing the use of diffraction gratings in spectroscopes; analysis of thin soap films; sound wave and microwave interference pattern analysis

AHL 9.5—experiments could include (but are not limited to): spectral data and images of receding galaxies are available from professional astronomical observatories for analysis

AHL 11.2—experiments could include (but are not limited to): construction of a basic ac generator; investigation of variation of input and output coils on a transformer; observing Wheatstone and Wien bridge circuits.

AHL 11.3—experiments could include (but are not limited to): investigating basic RC circuits; using a capacitor in a bridge circuit; examining other types of capacitors; verifying time constant

AHL 12.1—experiments could include (but are not limited to): the photoelectric effect can be investigated using LEDs

Option B.4—experiments could include (but are not limited to): observation of sand on a vibrating surface of varying frequencies; investigation of the effect of increasing damping on an oscillating system, such as a tuning fork; observing the use of a driving frequency on forced oscillations

Option C.1—experiments could include (but are not limited to): magnification determination using an optical bench; investigating real and virtual images formed by lenses; observing aberrations

Option D.2—software based analysis is available for students to participate in astrophysics research