Syllabus checklist

MODULE 1 Kinematics

PH11-8

How is the motion of an object moving in a straight line described and predicted?

- [ ] describe uniform straight-line (rectilinear) motion and uniformly accelerated motion through:...
- [ ] conduct a practical investigation to gather data to facilitate the analysis of instantaneous and average velocity through:...
- [ ] calculate the relative velocity of two objects moving along the same line using vector analysis
- [ ] conduct practical investigations, selecting from a range of technologies, to record and analyse the motion of objects in a variety of situations in one dimension in order to measure or calculate:...
- [ ] use mathematical modelling and graphs, selected from a range of technologies, to analyse and derive relationships between time, distance, displacement, speed, velocity and acceleration in rectilinear motion, including:...

How is the motion of an object that changes its direction of movement on a plane described?

- [ ] analyse vectors in one and two dimensions to:...
- [ ] represent the distance and displacement of objects moving on a horizontal plane using:...
- [ ] describe and analyse algebraically, graphically and with vector diagrams, the ways in which the motion of objects changes, including:...
- [ ] describe and analyse, using vector analysis, the relative positions and motions of one object relative to another object on a plane (ACSPH061)
- [ ] analyse the relative motion of objects in two dimensions in a variety of situations, for example:...

MODULE 2 Dynamics

PH11-9

How are forces produced between objects and what effects do forces produce?

- [ ] explore the concept of net force and equilibrium in one-dimensional and simple two-dimensional contexts using: (ACSPH050)
- [ ] solve problems or make quantitative predictions about resultant and component forces by applying the following relationships:...
- [ ] conduct a practical investigation to explain and predict the motion of objects on inclined planes (ACSPH098)

How can the motion of objects be explained and analysed?

- [ ] apply Newton's first two laws of motion to a variety of everyday situations, including both static and dynamic examples, and include the role played by friction $\vec{f}_{friction}=\mu\vec{F}_N$ (ACSPH063)
- [ ] investigate, describe and analyse the acceleration of a single object subjected to a constant net force and relate the motion of the object to Newton's Second Law of Motion through the use of: (ACSPH062, ACSPH063)
- [ ] apply the special case of conservation of mechanical energy to the quantitative analysis of motion involving:...
- [ ] conduct investigations over a range of mechanical processes to analyse qualitatively and quantitatively the concept of average power $P=\Delta E/\Delta t$, $P=F_{\parallel}v=Fv\cos\theta$ including but not limited to:...

How is the motion of objects in a simple system dependent on the interaction between the objects?

- [ ] conduct an investigation to describe and analyse one-dimensional (collinear) and two-dimensional interactions of objects in simple closed systems (ACSPH064)
- [ ] analyse quantitatively and predict, using the law of conservation of momentum $\sum m\vec{v}_{before}=\sum m\vec{v}_{after}$ and, where appropriate, conservation of kinetic energy $\sum 1/2mv_{before}^2=\sum 1/2mv_{after}^2$, the results of interactions in elastic collisions (ACSPH066)
- [ ] investigate the relationship and analyse information obtained from graphical representations of force as a function of time
- [ ] evaluate the effects of forces involved in collisions and other interactions, and analyse quantitatively the interactions using the concept of impulse $\Delta\vec{p}=\vec{F}_{net}\Delta t$
- [ ] analyse and compare the momentum and kinetic energy of elastic and inelastic collisions (ACSPH066)

Syllabus checklist

MODULE 3 Waves and Thermodynamics

PH11-10

What are the properties of all waves and wave motion?

- [ ] conduct a practical investigation involving the creation of mechanical waves in a variety of situations in order to explain:...
- [ ] conduct practical investigations to explain and analyse the differences between:...
- [ ] construct and/or interpret graphs of displacement as a function of time and as a function of position of transverse and longitudinal waves, and relate the features of those graphs to the following wave characteristics:...
- [ ] solve problems and/or make predictions by modelling and applying the following relationships to a variety of situations:...

How do waves behave?

- [ ] explain the behaviour of waves in a variety of situations by investigating the phenomena of:...
- [ ] conduct an investigation to distinguish between progressive and standing waves (ACSPH072)
- [ ] conduct an investigation to explore resonance in mechanical systems and the relationships between:...

What evidence suggests that sound is a mechanical wave?

- [ ] conduct a practical investigation to relate the pitch and loudness of a sound to its wave characteristics
- [ ] model the behaviour of sound in air as a longitudinal wave
- [ ] relate the displacement of air molecules to variations in pressure (ACSPH070)
- [ ] investigate quantitatively the relationship between distance and intensity of sound
- [ ] conduct investigations to analyse the reflection, diffraction, resonance and superposition of sound waves (ACSPH071)
- [ ] investigate and model the behaviour of standing waves on strings and/or in pipes to relate quantitatively the fundamental and harmonic frequencies of the waves that are produced to the physical characteristics (eg length, mass, tension, wave velocity) of the medium (ACSPH072)
- [ ] analyse qualitatively and quantitatively the relationships of the wave nature of sound to explain:...

What properties can be demonstrated when using the ray model of light?

- [ ] conduct a practical investigation to analyse the formation of images in mirrors and lenses via reflection and refraction using the ray model of light (ACSPH075)
- [ ] conduct investigations to examine qualitatively and quantitatively the refraction and total internal reflection of light (ACSPH075, ACSPH076)
- [ ] predict quantitatively, using Snell's Law, the refraction and total internal reflection of light in a variety of situations
- [ ] conduct a practical investigation to demonstrate and explain the phenomenon of the dispersion of light
- [ ] conduct an investigation to demonstrate the relationship between inverse square law, the intensity of light and the transfer of energy (ACSPH077)
- [ ] solve problems or make quantitative predictions in a variety of situations by applying the following relationships to:...

How are temperature, thermal energy and particle motion related?

- [ ] explain the relationship between the temperature of an object and the kinetic energy of the particles within it (ACSPH018)
- [ ] explain the concept of thermal equilibrium (ACSPH022)
- [ ] analyse the relationship between the change in temperature of an object and its specific heat capacity through the equation $Q=mc\Delta T$ (ACSPH020)
- [ ] investigate energy transfer by the process of:...
- [ ] conduct an investigation to analyse qualitatively and quantitatively the latent heat involved in a change of state
- [ ] model and predict quantitatively energy transfer from hot objects by the process of thermal conductivity
- [ ] apply the following relationships to solve problems and make quantitative predictions in a variety of situations:...

MODULE 4 Electricity and Magnetism

PH11-11

How do charged objects interact with other charged objects and with neutral objects?

- [ ] conduct investigations to describe and analyse qualitatively and quantitatively:...
- [ ] apply the electric field model to account for and quantitatively analyse interactions between charged objects using:...
- [ ] analyse the effects of a moving charge in an electric field, in order to relate potential energy, work and equipotential lines, by applying: (ACSPH105)

How do the processes of the transfer and the transformation of energy occur in electric circuits?

- [ ] investigate the flow of electric current in metals and apply models to represent current, including:...
- [ ] investigate quantitatively the current–voltage relationships in ohmic and non-ohmic resistors to explore the usefulness and limitations of Ohm's Law using:...
- [ ] investigate quantitatively and analyse the rate of conversion of electrical energy in components of electric circuits, including the production of heat and light, by applying $P=VI$ and $E=Pt$ and variations that involve Ohm's Law (ACSPH042)
- [ ] investigate qualitatively and quantitatively series and parallel circuits to relate the flow of current through the individual components, the potential differences across those components and the rate of energy conversion by the components to the laws of conservation of charge and energy, by deriving the following relationships: (ACSPH038, ACSPH039, ACSPH044)
- [ ] investigate quantitatively the application of the law of conservation of energy to the heating effects of electric currents, including the application of $P=VI$ and variations of this involving Ohm's Law (ACSPH043)

How do magnetised and magnetic objects interact?

- [ ] investigate and describe qualitatively the force produced between magnetised and magnetic materials in the context of ferromagnetic materials (ACSPH079)
- [ ] use magnetic field lines to model qualitatively the direction and strength of magnetic fields produced by magnets, current-carrying wires and solenoids and relate these fields to their effect on magnetic materials that are placed within them (ACSPH083)
- [ ] conduct investigations into and describe quantitatively the magnetic fields produced by wires and solenoids, including: (ACSPH106, ACSPH107)
- [ ] investigate and explain the process by which ferromagnetic materials become magnetised (ACSPH083)
- [ ] apply models to represent qualitatively and describe quantitatively the features of magnetic fields