A2 Unit G484: The Newtonian World

Assessed with a 1 hour 15 minute, 60 mark paper where all questions are answered.

Module 1: Newton's laws and momentum

The ideas developed by Newton underpin work in a number of the units and modules at A2. The second law in particular has impact on several topics including the behaviour of gases in the module on thermal physics.

This module provides the opportunity to discuss the use of models to explain the elaborate physical world around us. It is also important to remember that a fundamental law such as Newton's second law is valid as long as a single experiment does not contradict it. For objects travelling at relatively slow speeds, its success is truly phenomenal, but strange things start to happen when objects travel at speeds close to the speed of light.

There are many opportunities for you to carry out experimental work and analyse data using ICT or data-logging techniques.

- 4.1.1 Newton's laws of motion
- 4.1.2 Collisions

Module 2: Circular motion and oscillations

There are many examples of objects travelling at constant speed in circles, eg planets, artificial satellites, charged particles in a magnetic field, etc. The physics in all these cases can be described using the ideas developed by Newton. We can use the models created by Newton to understand and predict the motion of artificial satellites around the Earth and the planets in our own solar system.

The atoms in a solid and the piston of a car both show oscillatory motion. In this module, we develop the physics behind oscillatory motion and illustrate its beneficial and detrimental effects. This module provides ample opportunities to show how theories are developed. Newton's thought experiment on the cannon ball fired at right angles to the Earth's gravitational field can be used to show how scientific ideas and models can be developed to describe the motion of satellites in geostationary orbits.

- 4.2.1 Circular motion
- 4.2.2 Gravitational Fields
- 4.2.3 Simple harmonic oscillations

Module 3: Thermal Physics

In physics, the terms ‘internal energy’ and ‘temperature’ have very precise meanings. The amount of internal energy within an object is the total random kinetic and potential energy of all the atoms within the object whereas temperature is used to determine in which direction energy will flow when two objects are close to one another. The flow of energy from one object at a higher temperature to another object at a lower temperature is called heating.

This module uses the ideas of Newtonian mechanics to explain how gas atoms exert pressure on container walls. It provides an opportunity to discuss how scientific models in the form of Newtonian mechanics can be developed to explain the behaviour of gases.

- 4.3.1 Solid, liquid and gas
- 4.3.2 Temperature
- 4.3.3 Thermal properties of materials
- 4.3.4 Ideal gases