GCSE
PHYSICS – UNIT P3
Example 2
4451

Scheme of Work

Introduction

This Outline Scheme of Work is one of a number of schemes prepared by practising teachers for the new AQA GCSE Sciences suite. It is hoped that other teachers will find them helpful as the basis for the fully detailed schemes prepared for teaching from September 2006. Each outline scheme covers one unit (B1, B2, B3, C1, C2, C3, P1, P2, P3) and for some units more than one outline scheme is available. This is because there are different, equally valid ways of approaching the teaching of the specifications and a single scheme would not show the range of possible approaches.

The AQA specifications are designed to be used with a wide range of resources, so this scheme does not assume the availability of any particular printed or electronic publications, or any special equipment. Teachers are enabled to use existing resources, including their own, together with resources specially purchased for the new specifications.

The outline scheme is arranged under the section headings of the relevant specification, for example, *13.1 How do forces have a turning effect?* The content in the section is further subdivided with a brief statement given of the coverage of each subdivision, together with activities that relate to that content and an indication of the number of hours it is suggested are needed to deliver that part of the content.

Opportunities to deliver 'How Science Works' and to use ICT are highlighted using the same icons as used in the specifications.

This identifies parts of the content which lend themselves to extended investigative work of the type needed to explore Sections 10.3–10.7 of the specifications. These sections are about obtaining valid and reliable scientific evidence.

This identifies parts of the content which lend themselves to activities which allow Sections 10.2 and 10.8–10.9 to be considered. These sections are about using scientific evidence, for example, how scientific evidence can contribute to decision making and how scientific evidence is limited.

This identifies where there are opportunities to use ICT sources and tools in teaching the specifications.

UNIT P3			
Total hours: 4	**13.1 How do forces have a turning effect?**		
Topic outline		**Teaching approach including possible experiments/investigation opportunities**	**Additional notes**
Moment = force × perp. distance	 	• See-saw investigations. • Try finding the mass of a metre rule that is hung off-centre and needs to be balanced by a hanging mass. Find alternative mass-distance combinations.	Good opportunity to talk about 10.5, equipment sensitivity and errors. ICT simulation
Total hours: 1	**13.2 What keeps bodies moving in a circle?**		
Topic outline		**Teaching approach including possible experiments/investigation opportunities**	**Additional notes**
Factors that affect centripetal force		• Whirl a rubber bung on string around. The string should pass down through a hand-held glass tube and be counter-balanced by large washers.	Note relationship between speed of rotation and number of washers needed to keep string in same place. (Details can be found in old Year 5 Nuffield Physics teachers' guides.) Carousel simulation showing vectored forces at: http://www.walter-fendt.de/ph14e/carousel.htm

Total hours: 3	13.3 What provides the centripetal force for planets and satellites?		
Topic outline		**Teaching approach including possible experiments/investigation opportunities**	**Additional notes**
Satellites		• Teacher demo – whirl a large bung around head. Get a student to note how many rotations the bung does in, say, 10 seconds. Repeat for a variety of orbit diameters.	Plot graph of radius vs time. See if they can extrapolate to polar and geostationary orbits. What are the sources of error?
Total hours: 6	**13.4 What do mirrors and lenses do to light?**		
Topic outline		**Teaching approach including possible experiments/investigation opportunities**	**Additional notes**
Reflection		• Reflect a ray of light off a vertical mirror and compare angle of incidence vs angle of reflection. Use an illuminated object in a ray box to pass rays through a convex lens onto on a screen of graph paper.	Note relative size of object and image to get magnification. Note how this increases as object distance approaches focal length. Simple applet showing reflection, refraction and TIR at: http://fysikk.hfk.vgs.no/Refleksj/flashLight.htm

Total hours: 3	13.5 What is sound?		
Topic outline		**Teaching approach including possible experiments/investigation opportunities**	**Additional notes**
CRO traces		• Demo signal generator traces on a CRO. Have a loudspeaker attached to link frequency with spacing of waves and loudness with height.	Try disconnecting the loudspeaker and get students to work out frequencies and relative loudness from the CRO traces. There is a very advanced simulation of a CRO at: http://www.talkingelectronics.com/
Pitch		• Rest a light stick against a rotating spoked bicycle wheel. Frequency taken from a mic/CRO can be plotted against rpm.	
Refraction of sound		• This can be demonstrated using a balloon 'lens' of carbon dioxide gas to focus sound from a very small loudspeaker onto a microphone connected to a CRO.	

Total hours: 2	13.6 What is ultrasound and how can it be used?		
Topic outline		**Teaching approach including possible experiments/investigation opportunities**	**Additional notes**
Ultrasound		• Commercial equipment might be needed to demonstrate this section.	Could discuss the ethics of commercial fishing using sonar; or the risk of foetal damage in pre-natal scans.

Total hours: 3	13.7 How can electricity be used to make things move?		
Topic outline		Teaching approach including possible experiments/investigation opportunities	Additional notes
		• Build model electric motors and investigate how changing the current or magnets alters the performance.	
Total hours: 3	**13.8 How do generators work?**		
Topic outline		Teaching approach including possible experiments/investigation opportunities	Additional notes
		• Provide students with pre-wound coils of wire, and magnets. Connect coil to centre-reading galvanometer. Insert magnets into and out of coils at different speeds. Look for a pattern.	Two repelling bar magnets strapped together form a stronger magnet. Also consider the very strong neodymium magnets (Risk assess).
Total hours: 2	**13.9 How do transformers work?**		
Topic outline		Teaching approach including possible experiments/investigation opportunities	Additional notes
Transformers		• See section 11.3 ideas.	

Total hours: 3	13.10 What is the life history of stars?		
Topic outline		**Teaching approach including possible experiments/investigation opportunities**	**Additional notes**
Life history of stars		• Practical work rather limited here.	To give them an idea of a billion, give them some graph paper to count the small squares, then work out how much paper you need for a million, then a billion small squares. Look at websites for star simulation. A one minute video of real footage of looking deeper and deeper into space is available at: http://www.astronomynotes.com/galaxy/s10.htm