

IGCSE Co-ordinated Sciences 0654

Unit 24: P18 Energy Resources & P19 Energy Distribution

Recommended Prior Knowledge

Students should have some knowledge of electrical circuitry and energy transfer.

Context

This Unit should be studied after students have covered the material in Topics P5, P6, P7 P8 and P12.

Outline

Methods of electricity generation and distribution are considered. The use of dynamos and transformers is explored.

AO	Learning outcomes	Suggested Teaching activities	Learning resources
A	Understand the meaning of the term <i>efficiency</i> when it is applied to energy transfer processes.	Topic P18 builds directly on P5 and P6. There are few, if any, opportunities for practical work in P18, but immense scope for student involvement through discussions.	<i>IGCSE Physics</i> by Tom Duncan & Heather Kennett Chapter 36. Ideas about energy efficiency: http://www.est.org.uk/myhome/
AB	Appreciate the necessity of finding an alternative to fossil fuels in the near future.	A variety of video or film material can be used to support work on using fossil fuels and nuclear power and prime energy sources. Renewable energy resources - such as hydroelectric power, solar power, etc. - are also the subject of many videos and films. However, many students may live in areas where renewable sources are being exploited. If this is so, then a visit to the appropriate power stations could be of great benefit, as well as building on students' local knowledge.	<i>IGCSE Physics</i> by Tom Duncan & Heather Kennett Chapter 36.
AB	Understand how energy may be released from the nuclei of atoms by both nuclear fission and nuclear fusion.		This site gives much interesting information about different types of power stations and includes a virtual tour of a power station.
AB	Appreciate some of the problems involved in the use of nuclear fission as an energy resource.	Students may use the website to make a virtual tour of a power station.	http://www.ergon.com.au/ Click on EnergyEd An excellent site.

AO	Learning outcomes	Suggested Teaching activities	Learning resources
AB	Understand that there are alternative (renewable) energy resources, but understand that no single renewable energy source is likely to act as a total replacement for present energy resources.	The very large savings which are possible by the more efficient use of current energy resources should be discussed. Students may use information from the website to prepare a written or oral presentation.	<i>IGCSE Physics</i> by Tom Duncan & Heather Kennett Chapter 36. This site provides a useful investigation into alternative energy: http://ericir.syr.edu/ Click on 'Lesson Plans', physical sciences, Solar Hot Box.
AB	Appreciate that greater efficiency in the use of energy can be as helpful as finding alternative sources.	A worthwhile introduction to this section is to consider the distribution of energy from a prime source such as coal. The coal could be burnt in a power station and the energy released distributed via electricity. Alternatively, the coal could be delivered to where it is needed and then burnt to release its energy. Both methods have an energy 'cost'; which is the less?	<i>IGCSE Physics</i> by Tom Duncan & Heather Kennett Chapter 36.
ABC	Understand that energy can be transferred from fuels to electricity by dynamos.	The distribution of energy using electricity could have a very high energy cost if it were not for the use of alternating current and transformers. The operation of transformers can be investigated practically.	<i>IGCSE Physics</i> by Tom Duncan & Heather Kennett Chapter 48. <i>IGCSE Study Guide for Physics</i> by Mike Folland Topic 4. <i>Teaching and Assessing Practical Skills in Science</i> by Dave Hayward.
ABC	Appreciate the problems involved in the electrical transmission of energy.	Students can use the websites to prepare a written or oral presentation on the transmission of electricity over long distances.	Electrical transmission of energy: http://www.energyquest.ca.gov http://www.answers.com
AB	Understand the importance of transformers in the electrical transmission of energy.	Students who are only following the core curriculum will not have covered electromagnetic induction in P14. They will need a simplified approach here if the rest of the work is to make sense: something on the lines of 'if electric current + magnetic field can produce motion of a wire, then perhaps motion of wire in a magnetic field can produce an electric current'. Only students aiming for higher grades should treat the transformer in any detail.	<i>IGCSE Physics</i> by Tom Duncan & Heather Kennett Chapter 49. <i>IGCSE Study Guide for Physics</i> by Mike Folland Topic 4. http://www.energyquest.ca.gov

AO	Learning outcomes	Suggested Teaching activities	Learning resources
AB	Be able to describe the work of a transformer in terms of the currents induced by changing magnetic fields.	Students aiming for higher grades should be given an explanation of how a transformer changes the voltage from input to output.	<i>IGCSE Physics</i> by Tom Duncan & Heather Kennett Chapter 49. <i>IGCSE Study Guide for Physics</i> by Mike Folland Topic 4.
AB	Be able to use the equation $V_p / V_s = N_p / N_s$	Students aiming for higher grades should carry out calculations from given data.	Interactive web link: http://micro.magnet.fsu.edu
AB	Appreciate the possible advantages of other methods of distributing energy, including the use of petrol for cars and the use of hydraulics.	Students can observe, locally or in photographs, a variety of hydraulically operated machinery. Students should appreciate the convenience of fuels such as petrol, which give easily portable energy sources.	<i>IGCSE Physics</i> by Tom Duncan & Heather Kennett Chapter 20.