

Telecommunication Using Waves

31 slides, 7 Flash activities

This presentation is designed to teach:

- how radiowaves and microwaves are transmitted
- about amplitude, wavelength and frequency
- how to test the speed of sound using an experiment
- how to carry out calculations using $\text{wave speed} = \text{frequency} \times \text{wavelength}$
- how to investigate diffraction using a wave tank
- the differences in the level of diffraction occurring in radio and television communications
- about mobile phone communications.

Satellite orbits

Geostationary and polar orbits

Polar satellites have low orbits and pass over the poles. They are used for mapping and spying. The red light appears when the satellite is gathering intelligence.

For whom do you think the satellite is spying?

geostationary polar

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Telecommunication Using Cables

32 slides, 11 Flash activities

This presentation is designed to teach:

- how sound waves can be displayed on an oscilloscope
- about optical fibres
- about the sequence of events involved in the transmission of a signal along an optical fibre, from the signal being created by one computer, to it being decoded by another
- about total internal reflection in optical fibres, and how this also takes place in other materials.

Studying sound waves

Sound waves can be studied with this type of equipment.

A loudspeaker converts signals from the signal generator into sound waves.

A signal generator produces different types of signals.

An oscilloscope shows wave patterns and allows us to 'see' sound.

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Using Electricity – Useful Circuits

45 slides, 11 Flash activities

This presentation is designed to teach:

- what a series circuit is
- what a parallel circuit is
- that in a parallel circuit, voltage is the same in all parts of the circuit, but current is not
- the differences between a.c. and d.c. supplies, and their uses
- the different parts of a plug
- about safety, fuses, earth, double insulation, and circuit breakers.

What is a fuse?


A fuse is a safety device, which breaks the circuit, if the current is too high.

This protects the cable from overheating and catching fire.

A fuse contains a thin wire, which melts if the current is too high.

This breaks the circuit and so electricity is unable to flow through the appliance.

Fuses act as an early warning system, preventing appliances from being damaged by surges in electricity and warning owners of faults.



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Using Electricity – Current, Voltage, Resistance

46 slides, 14 Flash activities

This presentation is designed to teach:

- that current is the flow of electric charge, and that voltage is a measure of potential difference
- the different circuit symbols
- how to use the equation power = current × voltage in calculations
- what causes resistance
- how to carry out calculations using Ohm's Law
- how to use equations to calculate total resistance in series and parallel circuits
- the uses of resistance, such as for an electric light bulb.


Water model of a circuit

How can the flow of electric charge be modelled?

Stage 3

Height differences in this model represent changes in potential energy.

The pump moves the water to a higher level, increasing the water's potential energy.



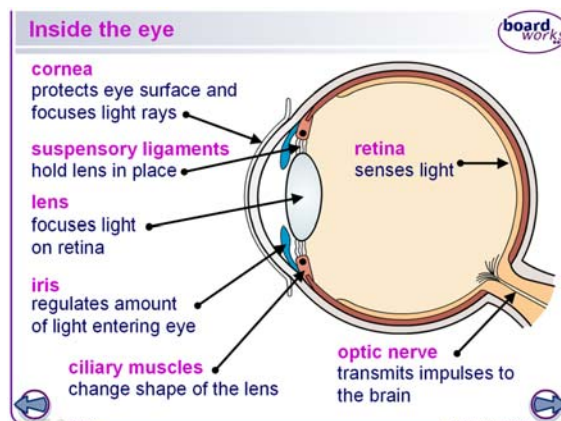
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Health Physics – Sight and Sound

40 slides, 16 Flash activities

This presentation is designed to teach:

- that different amounts of light pass through different materials
- the characteristics that make some materials more reflective than others
- how to carry out calculations investigating angles of incidence, reflection and refraction
- how lens focus light on the retina in the eye
- the range of frequencies that can be heard by people and animals, and how hearing loss can occur.

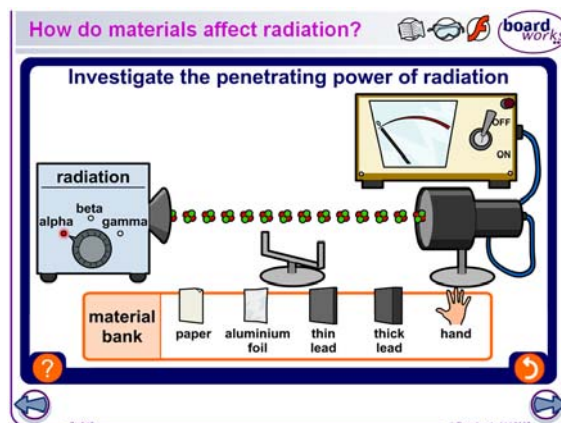


Health Physics – Nuclear Radiation

45 slides, 17 Flash activities

This presentation is designed to teach:

- about alpha, beta and gamma radiation
- how to test for radiation using a Geiger-Müller tube
- about half-life and radioactive decay, and how to carry out half-life calculations
- the dangers and uses of ionizing radiation, including X-rays
- precautions to take when using radiation, and how to calculate radiation exposure
- uses of radiation, including carbon dating, hospital X-rays and sterilizing equipment.

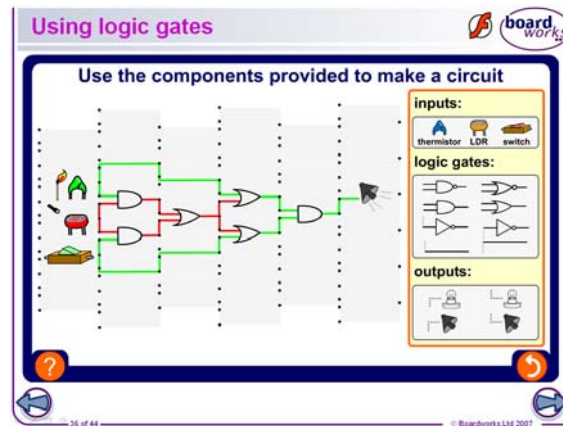


Electronics

42 slides, 10 Flash activities

This presentation is designed to teach:

- that an electronic system consists of an input, process and output
- examples of typical input, process and output devices
- common components in a circuit, and the symbols that are used to represent them
- how the current and voltage of a circuit are linked
- how 7-segment displays work
- how transistors can be used as switches
- what a logic gate is
- how clock signals are produced.



Transport – On the Move

43 slides, 17 Flash activities

This presentation is designed to teach:

- how to calculate speed using the equation $\text{distance} = \text{speed} \div \text{time}$
- how to use distance–time graphs
- what acceleration is and how to use the equation $\text{acceleration} = \text{change in speed} \div \text{time}$
- how to use speed–time graphs, both to find acceleration and distance travelled
- how to calculate stopping distance; the factors affecting thinking and braking distance.



Transport – Forces at Work

43 slides, 13 Flash activities

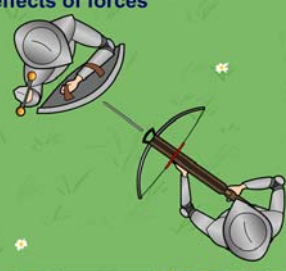
This presentation is designed to teach:

- what balanced, unbalanced and resultant forces are
- the causes and effects of friction
- Newton's First Law, and how this can be applied to the motion of a skydiver, including terminal velocity
- about momentum
- Newton's Second Law and the equation $\text{force} = \text{mass} \times \text{acceleration}$
- calculations using $\text{force} = \text{mass} \times \text{acceleration}$.

F Forces affecting objects

The effects of forces

Stage 2
When the bolt hits the knight's shield, the force that is applied causes the metal to crumple and change shape.



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Transport – Movement Means Energy

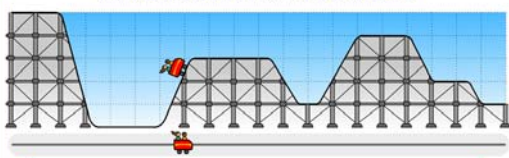
48 slides, 14 Flash activities

This presentation is designed to teach:

- what gravitational potential energy (GPE) is
- how to carry out calculations using the equation $\text{GPE} = \text{mass} \times \text{gravitational field strength} \times \text{height}$
- the Law of Conservation of Energy
- what kinetic energy is
- how to carry out calculations using the equation: $\text{work done} = \text{force} \times \text{distance moved}$
- that power is the rate at which work is done
- how to carry out calculations using the equation $\text{power} = \text{work done} \div \text{time taken}$.

Energy transfer of rollercoasters

What is the link between KE and GPE?



mass (kg)	500	GPE (J)	110,000
height (m)	22	KE (J)	141,000
velocity (m/s)	23.75		

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Energy Matters – Generating Electricity

43 slides, 12 Flash activities

This presentation is designed to teach:

- how energy resources can be divided between renewable and non-renewable types
- how to compare different energy resources in terms of reliability and how much energy is produced
- about a range of renewable energy resources including solar, hydroelectric, wind and tidal
- how electricity is produced from fossil fuels, nuclear power and hydroelectric power
- about different energy transfers within electricity generation.

What is a solar power station?

Solar power stations use the Sun's energy to heat water and make steam, which then drives a turbine to produce electricity.



Some solar power stations use a series of mirrors, called heliostats, to reflect light onto a boiler.

This solar power station in California consists of about 1800 heliostats, with an electrical output of 10 megawatts.

Would this sort of power station be effective in the UK?

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Energy Matters – Source to Consumer

43 slides, 18 Flash activities

This presentation is designed to teach:

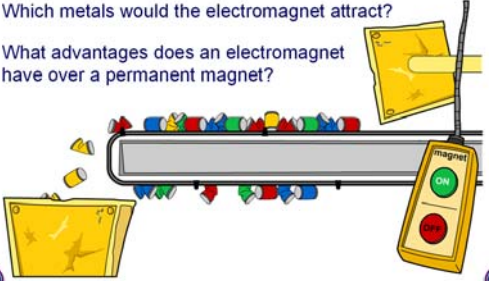
- about a.c. and d.c. electricity
- how transformers work and their applications
- how magnetism, current and force affect a wire, and how to use Fleming's Left Hand Rule
- about electricity generation and how to use Fleming's Right Hand Rule
- about a.c. electricity generation and how to increase it
- how a d.c. motor works
- using electromagnets.

Using electromagnets – recycling

A large electromagnet is used on a recycling plant conveyor belt to pick up and move metal cans.

Which metals would the electromagnet attract?

What advantages does an electromagnet have over a permanent magnet?



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Space Physics – Signals from Space

36 slides, 14 Flash activities

This presentation is designed to teach:

- about stars, planets and galaxies
- that distances in the universe can be measured in light years
- about splitting light using a prism, ordering coloured light according to the electromagnetic spectrum, and mixing different colours
- about the relationship between frequency and wavelength
- the different waves of the electromagnetic spectrum
- about using electromagnetic waves to gather information from space.



What happens when waves hit a surface?

When electromagnetic waves hit a surface, they can be **reflected**, **absorbed** or **transmitted**.

How the waves behave depends on their energy and the type of material.

For example, light waves are reflected by skin but X-rays pass straight through.

If electromagnetic waves are absorbed, some of their energy is absorbed by the material. This usually increases the temperature of the material.

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Space Physics – Space Travel

22 slides, 8 Flash activities


This presentation is designed to teach:

- about action-reaction pairs and Newton's Third Law
- what gravitational field strength is, and how it varies between different planets
- that the gravitational field strength experienced by a rocket weakens as it gets further from the Earth
- how gravitational fields can be modelled
- how to carry out calculations using $\text{weight} = \text{mass} \times \text{gravitational field strength}$.

Gravity during a rocket launch

Gravitational forces during a rocket launch

Stage 2
As the rocket moves further from the Earth, the gravitational force decreases, so the level of thrust from the boosters can also decrease.



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