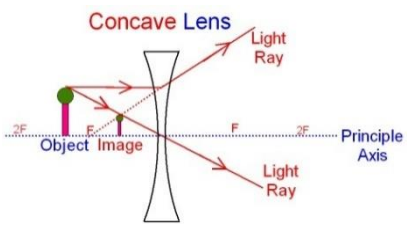
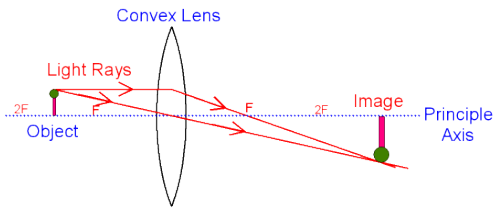
Physics: Waves, Sound/Light, Electromagnetic Waves, Magnetism, Mains Electricity and the National Grid

%	I can …	Prove it!
70%+	**6.7 Describe the method to measure the speed of sound in air and the speed of ripples on the water surface** **7.5 Link the properties of EM waves to their practical application (triple only)** **7.6 Apply knowledge of reflection, refraction, transmission and absorption to EM waves (triple only)** **7.10 Explain how radio a radio works using EM waves (triple only)** **8.16 Explain reflection, refraction, absorption and transmission of sound waves at a boundary. (triple only)** **8.5 Show how properties of a sound wave changes as it moves from one medium to another (refraction) (triple only)** **8.8 Describe what a convex and concave lens is and the image that would be produced by them drawing ray diagrams to illustrate this (triple only)** **8.9 Use the equation magnification = image height ÷ object height (triple only)** **5.7 Interpret diagrams of electromagnetic devices in order to explain how they work (triple only)** **1.1 Describe the motor effect and use this to explain how electric motors work (triple only)** **1.2 Explain and apply Fleming's left hand rule (triple only)** **1.3 Recall factors that affect the size of the force on a conductor (triple only)** **1.4 Use and rearrange the equation F = B I l (triple only)** **7.3 Describe the structure of a transformer (triple only)** **7.4 Use and rearrange the transformer equation (triple only)** **7.5 Apply this equation to describe the efficiency of transformers and the purpose of step up and step down transformers (triple only)** **7.6 Use the coil equation and relate this to power input and output (triple only)** **7.7 Apply these equations to explain the advantages of transmitting energy at a high potential difference.**	1. Write a method which would allow you to measure the speed of sound in air and the speed of ripples on the surface of water. List all of the equipment you would need and how you would take your measurements. Explain how to make your results accurate. 2. Complete a mind map to show the uses of each type of EM wave. You must explain why each one has this use e.g. *'Radio waves have low energy therefore are safe to use for radio transmission.'* Include in your mind map the key words: refraction, transmission, absorption 3. Draw a labelled diagram to show how a radio wave transmits signals. 4. For each of the following, write a paragraph explaining what is happening to the light rays. You may draw a diagram to help you: refraction, reflection, absorption, transmission. 5. Complete the table to compare specular reflection and diffuse reflection: 6. Draw a labelled diagram to show how sound waves behave when they move from one medium to another during refraction. 7. For each diagram, describe what is happening to the light rays and what will happen to the image: a. Concave lens  b. Convex lens  8. Use the formula **magnification = image height ÷ object height** to calculate the magnification of the convex and concave lenses in question 9. Write a flow chart to show the steps involved in making an electric bell sound. 10. Complete the following paragraph to explain the motor effect using these words: **flux, magnetic, force, length, conductor, current** When a current carrying _____ is placed in a _____ field it experiences a _____. This force is called the motor effect. The motor effect is caused by the field created by the current interacting with the magnetic field. The force can be increased by increasing the size of the _____, the _____ of the conductor or the _____ density. 11. Write a list of instructions to explain how to carry out Fleming's left hand rule. Include a description of what the direction of each of the following tell us: **thumb, first finger, second finger** 12. A 10cm length of wire with a 4A current passes through a magnetic field. What magnetic flux density needed to create a 2N force on the wire (show your working out)? What would be the current for the same wire if the force needed was 5N? 13. Draw a labelled diagram to show both a step-up and step-down transformer. 14. A step-down transformer is being used in a laptop computer. It uses the mains supply at 230V to produce an output p.d. of 12V. If there are 4600 turns on the largest coil, calculate the number of turns on the other coil showing all of your working out. 15. Explain why the transformer in question 14 reduces the voltage in the secondary coils using what you know about P=IV. 16. What kind of energy loss is reduced by reducing the current across a wire?

Type	Similarities	differences
specular reflection		
diffuse reflection		

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%	I can …	Prove it!
60%	**6.5 Use and rearrange f = v λ** **7.3 Explain how EM waves are generated and absorbed** **7.4 Explain the hazardous effects of UV, X-rays and Gamma rays** **8.2 Describe reflection of waves at a boundary (triple only)** **8.3 Construct ray diagrams to show reflection (triple only)** **8.10 Explain how colour of objects is determined (triple only)** **8.11 Explain how colour filters work (triple only)** **5.6 Describe how to make an electromagnet and how to increase its strength** **1.5 Explain how loudspeakers and headphones work (triple only)** **1.6 Explain how potential difference/current can be induced in a circuit (the generator effect!) (triple only)** **1.7 Recall factors that can affect the size of this effect (triple only)** **1.8 Apply principals of the generator effect to: a dynamo, microphone, transformers (triple only)** **6.6 Explain how the power of a circuit is related to potential difference, current and energy**	1. Calculate the wave speed of a wave with a frequency of 100Hz and a wavelength of 2m. 2. Complete the table to show the hazards of EM waves. 3. Draw a ray diagram to show how light reflects off a smooth surface using these key terms: **reflected ray, incident ray, medium, normal, angle of incidence, angle of reflection, boundary.** 4. Explain why an apple looks green. 5. Explain why a green object appears black if viewed through a red filter. 6. Write a method for making an electromagnet. Include a labelled diagram. 7. Which three things can we do to make the electromagnet stronger? 8. Draw a flow chart to show, step-by-step, how a loudspeaker works using these words: **current, coil, magnetic field, cone, alternating, oscillate** 9. Draw a labelled diagram to show the generator effect. 10. What would happen to the p.d. or current if you did the following? • **Increased the size of the magnetic field** • **Increased the speed of the movement** • **Reversed the direction of the magnetic field** • **Reversed the direction of the movement** 11. Draw a flow chart to show, step-by-step, how a microphone works using these words: **sound waves, air pressure, oscillate, coil, frequency, amplitude, p.d.** 12. Give the equation which links power, current and potential difference and write a sentence explaining what this relationship means in a circuit?

Wave	Hazard	Explanation
radio waves		
microwaves		
infrared waves		
visible light		
ultraviolet light		
x-rays		
gamma rays		

Key Terms

Longitudinal Transverse Amplitude Frequency (f) Wavelength (λ) Period (T) Wave speed (v) Medium Normal Reflection Angle of incidence (θi) Angle of reflection (θr) Refraction Total Internal Reflection Critical Angle Refractive Index Frequency Range Electromagnetic Spectrum UV Gamma (γ) X-ray Diffraction Digital Analogue Pitch Specular Diffuse Concave Convex Electromagnet Generator effect Motor effect Fleming's Left Hand Rule Flux Density Potential Difference Resistance Current Charge Alternating Current Direct Current National Grid Transformer

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%	I can …	Prove it!
50%	**6.4 Use and rearrange T = 1/f** **8.1 Describe the properties of light and explain how light travels. (triple only)** **8.12 Define transparent and translucent (triple only)** **8.13 Explain what a sound wave is and how the ear detects them (triple only)** **8.17 Explain how waves can be used for detection and exploration of structures (ultrasound, seismic, echo sounding) (triple only)** **5.5 Explain how compasses work** **1.9 Draw and interpret graphs of potential difference generated in a coil against time (triple only)** **5.1 Describe the properties of mains electricity in the UK (A.C., Frequency and Voltage)** **5.2 Explain the difference between direct and alternating potential difference** **5.3 Describe the three core cables and the wires that they are made up of and the dangers of these** **7.2 Explain the role of step up and step down transformers in the national grid and use this to explain why it is an efficient system for transferring energy**	1. A fly flaps its wings back and forth 121 times each second. The period of the wing flapping is _____ sec. 2. Complete the following description of light using these words: **opaque, electromagnetic, transparent, translucent** Visible light is a type of _____ wave that can be seen by the human eye. It can be absorbed, _____ or transmitted. All objects either allow light through (_____), do now allow light through them (_____) or scatter light rays so objects cannot be seen clearly through them (_____). 3. Draw a labelled diagram of the human ear and write a paragraph explaining how sound waves are created by a violin and then travel to reach the ear drum. 4. Draw a mind map to describe and explain the uses of waves in the following: echo sounding, seismic wave detection, the structure of the Earth. 5. Complete the paragraph: A magnetic compass contains a small ___ _____. The compass _____ aligns with the _____ magnetic field. This means that the needle will always point to magnetic _____. words: North, bar magnet, Earth's, needle 6. Sketch a graph to show how the p.d. changes over time in a generator and explain how this shows alternating current. 7. List the following properties of mains electricity: AC or DC Frequency (Hz) Voltage (V) 8. Write a definition for the following: Alternating current/p.d.: Direct current/p.d.: 9. Complete the following table to describe the three main cables found in UK mains devices: 10. Write a paragraph to explain why we need to use step-up and step-down transformers.

Wire name	Colour	Use	Danger

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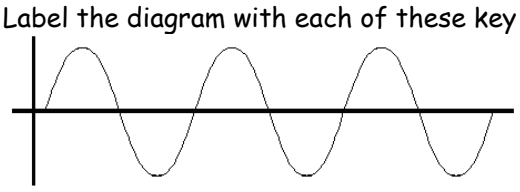
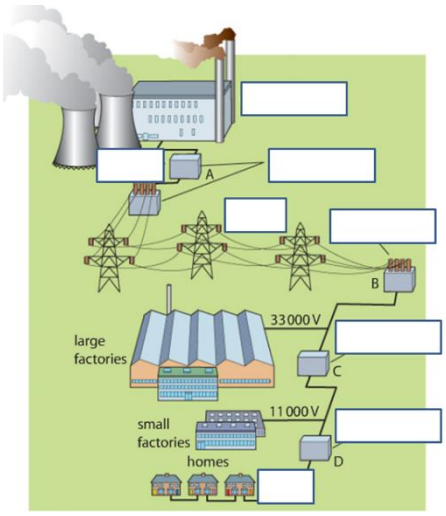
%	I can …	Prove it!
40%	**6.1 Describe what is meant by 'a wave'** **6.2 Describe the difference between longitudinal and transverse waves giving examples for both** **6.3 Describe amplitude, wavelength (λ), wave speed (v), frequency (f) and period of a wave (T)** **6.6 Identify amplitude and wavelength from diagrams of a wave** **7.2 Recall the order of electromagnetic waves and recall their frequency and wavelength and give examples of the uses of these** **Explain the difference between a permanent and induced magnet** **5.3 Describe the force between a magnet and a magnetic material** **5.4 Describe the direction and strength of a magnetic field around a magnet** **7.1 Describe the components of the national grid** **6.1 Use and rearrange the P=IV equation (electrical power)** **6.2 Use and rearrange the $P=I^2R$ equation (electrical power)** **6.3 Describe energy transfers in electrical appliances** **6.4 Use and rearrange E=Pt** **6.5 Use and rearrange E=QV**	1. Give the definition of a wave and list three examples of where we would find waves. 2. Which of these examples are transverse waves and which are longitudinal waves? a. light waves, radio waves, heat b. sound waves, earthquake waves 3. Give the definition of each of the following key words: a. wavelength = b. wave speed = c. frequency = d. period = 4. Label the diagram with each of these key words: amplitude, wavelength.  5. Draw a poster to show the electromagnetic spectrum. It must include the names of each type of wave, a use of each type of wave, a danger of each type of wave and their frequency. 6. Complete the sentences by filling in the missing words: Permanent magnets produce their own _____ _____ Induced magnets become a magnet when placed in a _____ _____. 11. Which of these is the only one which will repel a magnetic material? a. a magnet b. another magnetic material 12. Draw the magnetic field around the following magnet arrangements: a. North pole to North pole b. North pole to South pole c. South pole to South pole 13. Label the diagram of the national grid:  14. The heating element in a kettle produces an output power of 2300W when a p.d. of 230V is applied. Calculate the current flowing across the element showing your working out. 15. Work out the resistance of the same element using $P=I^2R$ 16. Complete the following paragraph to explain energy transfers in electrical appliances using these words: **high, low, powerful, potential difference, current** The power of a device depends on the _____ _____ across it and the _____ flowing through it. A device with a _____ potential difference or current will use more energy per second than one with a _____ potential difference our current, i.e. it will be more _____. 17. A 2.5V bulb has a current of 1.2A flowing through it. What is the power of the bulb and how much energy would it use in 10s? 18. A 2kW heater is on for one hour. How much energy does it use? Calculate this using E=Pt 19. A bulb transfers 30J of energy in 10 seconds. During this time a charge of 12C is transferred. What is the voltage of the bulb? Calculate this using E= QV
20%	**7.1 Describe what 'electromagnetic waves' are** **8.14 Recall the range of normal human hearing (triple only)** **5.1 Describe the polarity of magnets and list 4 magnetic materials**	1. Give a definition for an electromagnetic wave. 2. What is the hearing range of a human (Hz)? 3. Name the four magnetic materials.

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