WJEC : GCSE Specification 1310

GCSE Science

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Name : _____

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# Science # Physics 1 (P1)	**Page numbers in New Physics for You**
Energy, Radiation and the Universe	
1. GENERATION OF ELECTRICITY	
What things influence the types of power stations we build? **Who decides on whether to build wind farms?** **Candidates should:**	
(a) discuss the factors which are involved in the decisions about the types of power stations, including commissioning and decommissioning costs, types of energy sources, fuel costs and environmental factors as well as personal views which are not scientifically based. (w(iv)a,b)	pages 104-106
(b) be aware of the planning processes involved in the development of power stations based upon renewable resources, e.g. wind and wave farms. (w(iv)b)	13-15, 106
2. TRANSMISSION OF ELECTRICITY	
Why do we have pylons and overhead power lines? **Why is power transmitted at high voltage, but used at low voltage?** **Candidates should:**	
(a) understand the need for an electricity distribution system	303
(b) select and use the equation: power = voltage x current	266
(c) describe the National Grid, including the use of ICT for monitoring power use and responding to changing demand. (w(iv)a,b)	303
(d) use physics knowledge to explain why electricity is transmitted at high voltages but used at low voltages in the home. (w(iv)a,b)	303
(e) understand the need for transformers in the transmission of electrical energy from the power station to the home. (w(iv)b)	303

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3. HEATING AND THE HOME	
How much electrical energy do we use in the home? **How much does it cost?** **What sort of heating is most economic to use?** **Is it worth installing alternative energy sources?**	
(a) distinguish between power and energy and select and use the equation: energy transfer = power x time	110, 266
(b) collect information, either directly or using secondary sources on the power ratings of domestic electrical appliances and use it to investigate the cost of using them. (w(i)a)	267
(c) select and use the equations: Units used = power (kW) x time (h) cost = units used x cost per unit	267
(d) use data to compare the cost of different sources of domestic energy, including electricity, gas, oil and coal. (w(i)a,b)	267
(e) use data to explore the cost-effectiveness of introducing domestic solar and wind energy equipment, including fuel-cost savings and payback time. (w(i)a,b;(iv)b)	105-6
4. ENERGY, TEMPERATURE AND THE TRANSFER OF HEAT ENERGY	
How does heat flow from place to place? **How can we help heat flow or keep the heat in?** **Is it worth getting double glazing or insulating the loft?** **Candidates should:**	
(a) explore, experimentally and using secondary sources, using ICT where appropriate, how temperature differences lead to the transfer of thermal energy by conduction, convection and radiation. (w(i)a-c)	42-7
(b) use data from investigations to make comparisons of heat transfer.	
(c) know the factors which affect the rate of heat transfer, including the use of insulators in reducing conduction and the nature of the surface in radiative transfer. (w(i)c)	42-3, 46-7
(d) use their understanding of heat transfer to analyse the processes involved in domestic situations and to suggest how the heat transfer can be promoted or restricted [e.g. by the use of insulation].	42-51
(e) use data to compare the cost-effectiveness of different methods of reducing heat loss from the home, including loft insulation, cavity wall insulation, double-glazing and draught excluders and discuss the ethical issues surrounding controlling heat loss from the home. (w(i)a,b,d;(iv)a,b)	43

5. ENERGY EFFICIENCY	
How much of the energy we use is wasted? **Can we use less energy by doing things in different ways?** **Candidates should:**	
(a) understand qualitatively the idea of energy efficiency in terms of input energy, useful output energy and wasted energy.	102-3
(b) select and use the equation: efficiency = $\frac{\text{useful energy transfer}}{\text{total energy input}}$ X 100%	102-3
(c) plan and carry out investigations, experimentally or by using secondary sources, into the cost and efficiency of energy transfer in a variety of contexts, e.g. comparing an electric kettle with an electric cooker ring for boiling water.	264, worksheet
6. THE CHARACTERISTICS OF WAVES	
How can I measure waves? **Candidates should:**	
(a) characterise waves in terms of their wavelength, frequency, speed and amplitude.	167
(b) plan and carry out an investigation into waves e.g. investigating the factors which affect the speed of waves on water. (w(i)a)	167-8
(c) apply the equations wave speed = wavelength x frequency and speed = $\frac{\text{distance}}{\text{time}}$ to the motion of waves	167

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7. THE ELECTRO-MAGNETIC SPECTRUM	
What sorts of electromagnetic waves are there? **How do we use these waves and how are they dangerous?** **Is it better to use optical fibres or satellites for communication?** **How dangerous are mobile phone masts?**	
Candidates should: (a) distinguish between the different regions of the electromagnetic spectrum [radio waves, microwaves, infra red, visible light, ultra violet, X rays and gamma rays] in terms of their wavelength and frequency (with an awareness of how these wave properties are related) and appreciate that they all travel at the same speed in a vacuum.	208-9
(b) Investigate, using secondary sources (e.g. an internet search), and know the uses of microwaves, infrared and visible radiation in energy transfer, and the hazards associated with the high-energy ionizing radiations, ultra-violet, X-rays and gamma rays.	210-214
(c) investigate experimentally the conditions under which total internal reflection occurs within parallel-sided glass blocks and explain, **in terms of total internal reflection,** how optical fibres enable long distance communication (w(i)c)	187, 189, 192, 314
(d) Compare the use of microwaves and infra-red radiation in long distance communication, including a consideration of geosynchronous satellites, mobile phone technology and intercontinental optical fibre links. (w(iv)a,b)	211, 213, 216-7, 154-5, 314
(e) Investigate and make a report on or take part in a discussion on claimed health risks associated with mobile phone and Tetra communications and understand the planning requirements for the communication masts. (w(iv)a-c)	216-7
8. THE SOLAR SYSTEM	
What objects are in the Solar System and how do they move? **How did the Solar System form?**	
Candidates should: (a) know the theory of the origin of the Solar System in terms of the gravitational collapse of a cloud of gas (largely hydrogen and helium) and dust. (w(iv)c)	152
(b) describe the main features of the Solar System, including the Sun, the rocky and gas planets, moons, asteroids and comets, relating these features to the origin of the Solar System.	150-2
(c) interpret data on the orbits of planets and other bodies in the Solar System.	151, 162
(d) understand the effect of gravity on the orbital motion of planets, comets, moons and artificial satellites **and use a model of radiation pressure to account for cometary tails**. (w(i)c)	152-3
(e) know how new discoveries of solar system objects are made by the use of ICT to detect movement.	(151)

9. STARS	
What are stars made of and how do we know? **Where do the elements come from that make us up?** **How do stars form, get their energy and what will happen to them in the end?** **Candidates should:** (a) know that, in the 19th and early 20th centuries, the source of the Sun's energy became a problem as Geologists discovered that the Earth was millions of years old, and the model of the Sun's being powered by Chemical energy could not account for its shining for more than a few thousand years. (w(i)d;(iv)c) (b) know that studies of the light from stars, including our Sun, show that they are composed mainly of hydrogen and helium and that their energy is supplied by the fusion of hydrogen into helium, which is able to supply energy at the current rate for about 10 000 million years. (w(i)b,c) (c) appreciate the role of previous generations of stars in the existence of elements heavier than helium in the Solar System and that the fraction of heavier elements in the universe is gradually increasing as a result of the processes in stars. (w(i)c) (d) model the stability of stars in terms of the balance between gravitational force and gas/radiation pressure and describe the stages in the evolution of low and high mass stars. (w(i)c)	156 156-7 156-7
10. THE UNIVERSE	
How do we know that the universe is expanding? **How can we find out how old the universe is?** **Candidates should:** (a) know how studies of the electromagnetic radiation from distant galaxies lead to a model of an expanding universe **and that the further they are away, the bigger their speed**. (b) know that Red Shift measurements provide evidence that the universe started with a hot Big Bang which, according to current measurements, occurred 12-15 thousand million years ago.	158 158, 373

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