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Science

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Name : _____

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Physics Unit P1 a

Topic 9 — Producing and Measuring Electricity	Page numbers in New Physics for You
Learning outcomes Learning outcomes, words or statements in **bold** indicate that this content is designated for Higher-tier students only. **Students will be assessed on their ability to**:	
• distinguish between the two types of current (alternating and direct) P1 a 9.1	pages 248, 268, 299
• describe sources of direct current, including batteries and solar cells P1 a 9.2	248, 260, 14, 103, 115
• describe how to produce an electric current by rotating a magnet in a coil of wire, as in a dynamo P1 a 9.3	296-299
• describe the factors that affect the size and direction of an induced voltage P1 a 9.4	296, 300
• explain how changing the resistance in a circuit changes the current P1 a 9.5	253-6
• describe how the resistance of a light-dependent resistor (LDR) changes with light intensity and the resistance of a thermistor changes with a change of temperature P1 a 9.6	319
• recognise and explain applications depending on resistance change, such as controlling how long the shutter should be open on a digital camera P1 a 9.7	319
• explain that current is a rate of flow of negatively charged electrons and that it can be measured by an ammeter placed in series in a circuit P1 a 9.8	249, 250
• interpret a battery's stated capacity in terms of Amp-hours and use it to predict the number of hours it should last when supplying a given current P1 a 9.9	115
• use primary data to explain how current varies with voltage for fixed value resistors and filament lamps and how this can be investigated experimentally P1 a 9.10	253-6, 259
• use the relationship between the voltage, current and resistance: P1 a 9.11 $V = I \times R$	253
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• investigate practically or otherwise the voltage and current output, and advantages/disadvantages of battery technology (dry cell or rechargeable), including considerations of their cost/performance and impact on the environment P1 a 9.12	(252, 260)
• discuss the impact that the electric telephone and electricity has had on making the modern world P1 a 9.13	240, (289), 374-5
• **explore how a new technology, such as Maglev trains, develops as a result of scientific advances, such as the discovery of superconductivity** P1 a 9.14	(375)
• use data relating the size of electric circuits to the processing speed of computers and suggest future applications P1 a 9.15	(314)
• demonstrate an understanding of how ICT can be used to collect and display data from electric circuits for analysis, and compare this with traditional methods in terms of reliability and validity of data. P1 a 9.16	(worksheets)

Topic 10 — You're in Charge	Page numbers in New Physics for You
Learning outcomes Learning outcomes, words or statements in **bold** indicate that this content is designated for Higher-tier students only. **Students will be assessed on their ability to**:	
• evaluate whether renewable energies such as solar power and wind power can meet the UK's future electricity needs, and evaluate their economic, environmental and social impact P1 a 10.1	pages 14-15, 101-6
• **consider the benefits and drawbacks when deciding about implementing technology, such as a new national grid for distribution of electricity** P1 a 10.2	(303)
• **explore how scientific ideas change over time in context of the medical uses of electricity, real and imagined** P1 a 10.3	356-7, 375
• explain how a simple electric motor works P1 a 10.4	290-3
• explain the concept of electrical power as the rate of transfer of electrical energy P1 a 10.5	266-7
• use the equation to calculate electrical power: (P1 a 10.6) Power = Current x Voltage	266
• use the term 'efficiency' to be able to find efficiency from: (P1 a 10.7) useful output x 100% and recall this equation total input	102-4, 116
• **interpret data about the efficiency of solar cells and suggest why they are not yet in widespread use** P1 a 10.8	103, 105, 115
• use the equation to calculate the cost of electricity: cost = power x time x cost of 1 kWh where power is measured in kilowatts and time is measured in hours P1 a 10.9	267
• plan a way to test whether an energy efficiency measure, such as insulating a home, is cost effective P1 a 10.10	12, 43
• explain how the earth wire, together with a fuse, provides protection for the user P1 a 10.11	269
• **describe the advantages of a residual current circuit breaker (RCCB).** P1 a 10.12	269, 272

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Physics Unit P1 b

Topic 11 — Now You See it, Now You Don't	Page numbers in New Physics for You
Learning outcomes Learning outcomes, words or statements in **bold** indicate that this content is designated for Higher-tier students only.	
Students will be assessed on their ability to:	
• discuss the evidence that microwave radiation from mobile phones or masts poses health risks, and how this has been reported in the media P1 b 11.1	216-7
• discuss the characteristics of ultraviolet light in terms of amplitude, frequency and wavelength and relate them to the dangers of over-exposure P1 b 11.2	208, 210, 212, 214
• describe the detrimental effects of excessive exposure to the following waves **and explain this in terms of increasing frequency**:	
○ microwaves: internal heating of body tissue	209, 213-4
○ infrared: skin burns	209, 231-4
○ X-rays and gamma-rays: mutation or destruction of cells in the body P1 b 11.3	208, 210, 214
• use primary or secondary data to describe how differences in density of materials will cause waves to be reflected/refracted P1 b 11.4	184-5, 187-9
• explain how scanning by reflection can be used for the following applications:	
○ ultrasound: scanning a foetus during pregnancy	229
○ optical: iris recognition	356
○ discuss the advantages/disadvantages of such technology P1 b 11.5	229, 356
• explain how scanning by absorption enables:	
○ X-rays to see bone fractures	208, 210, 312
○ microwaves to monitor rain	211
○ ultraviolet light to detect forged bank notes by fluorescence P1 b 11.6	212
• explain how scanning by emission enables the use of infrared sensors to monitor temperature P1 b 11.7	211, 213
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• **discuss the benefits and drawbacks to society of a technology that is based on the properties of waves** P1 b 11.8	207-219
• describe the advantages of sending information in the form of a digital signal compared with analogue P1 b 11.9	218-9
• discuss how the production of digital signals has created a range of music technologies, including synthesised instruments and altered the way we listen to and distribute music P1 b 11.10	219, 233
• describe how the property of total internal reflection of light waves allows optical fibres to transfer large amounts of information over long distances P1 b 11.11	187-9, 192, 219, 314
• describe the similarities and differences between longitudinal and transverse waves, giving examples of each type, including sound waves, ultrasound, seismic waves and electromagnetic waves P1 b 11.12	166, 171, 225-9, 146-7
• **suggest reasons why scientists find it difficult to predict earthquakes and tsunami waves, given appropriate data** P1 b 11.13	(146-7, 373)
• explain the terms:	
○ amplitude	167
○ frequency	167
○ wavelength	167
○ speed of a wave P1 b 11.14	167
• use the relationship: speed = frequency x wavelength (P1 b 11.15)	167, 209, 225
• use the equation: speed = distance / time to calculate the distance to a reflecting surface if the time for the reflected wave to return is known P1 b 11.16	122, 227, 228
• **use data about seismic waves passing through the Earth to draw conclusions about the types of materials that are found in the planet's interior** P1 b 11.17	147
• describe how similarities and differences of waves can be represented in the electromagnetic spectrum P1 b 11.18	208-9
• recall that electromagnetic waves all travel at the same speed in a vacuum. P1 b 11.19	209

Topic 12 — Space and its Mysteries	Page numbers in New Physics for You
Learning outcomes Learning outcomes, words or statements in **bold** indicate that this content is designated for Higher-tier students only. **Students will be assessed on their ability to:**	
• describe conditions in interplanetary space in terms of atmosphere, temperature and weightlessness due to lack of gravity P1 b 12.1	160
• **describe how these conditions can be partly allowed for in spacecraft, including supply of air, heating/cooling, artificial gravity, exercise machines, etc** P1 b 12.2	161
• explain the difference between mass and weight P1 b 12.3	9, 67-8, 131
• use the equation (P1 b 12.4): weight = mass x acceleration of free-fall $W = m g$	131
• explain how a spacecraft might be powered in terms of action and reaction P1 b 12.5	84-5, 160
• describe how force = mass x acceleration, can be used to predict how an object behaves P1 b 12.6	130-1
• **discuss the possible social and economic benefits of knowledge about the universe and the technological advances which might accrue from its exploration** P1 b 12.7	(154-5)
• describe ways of discovering information about the universe other than humans travelling there, including soil experiments on landers (Viking/NASA Spirit and Opportunity rovers) and Search for Extraterrestrial Intelligence (SETI) P1 b 12.8	159, 161
• discuss how scientists are devising ways to overcome the problems of long space flights, including the deterioration of bones and heart, and the dangers of radiation P1 b 12.9	160-1
• explain the role of gravity both on Earth and in astronomy, **including the idea of black holes** P1 b 12.10	65, 150, 152-3, 157
• use the unit of gravitational field strength – Newton per kilogram (N/kg) P1 b 12.11	67, 131
• describe stellar evolution from the nebula stage for small stars like our Sun and for more massive stars P1 b 12.12	152, 157
• discuss the risks of a global catastrophe such as a comet hitting the Earth, taking account the consequences, the chance of it occurring and any uncertainties P1 b 12.13	worksheet
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• describe how the orbit of a comet differs from that of a planet or an asteroid P1 b 12.14	152
• use data sources to compare the relative sizes of and distances between Earth, our Moon, the planets, the Sun, galaxies and the universe P1 b 12.15	151, 159
• show an understanding of how data-logging and remote sensing can provide information about the universe without us travelling there P1 b 12.16	161
• describe the solar system as part of the Milky Way galaxy and discuss how this is related to other galaxies and the universe P1 b 12.17	150-1, 157-8
• **discuss and develop an argument for and against the idea that intelligent life exists elsewhere in the galaxy, using scientific evidence, and propose ways to find such life** P1 b 12.18	159
• be able to recognise that there are scientific questions which remain unanswered, such as the existence of extraterrestrial life and the **nature of 'dark matter' that makes up much of the universe's mass** P1 b 12.19	6, 158, 359
• describe the origin, current state and fate of the universe using the main theories (Big Bang, oscillating and steady state); **and explain the supporting evidence for these theories, including microwaves and red shift** P1 b 12.20	158, 373
• **describe how the existence of life on a planet is determined by the position of the planet in its solar system and the position of its star in its life-cycle.** P1 b 12.21	150, 157