# Edexcel : GCSE specification 2103

# Additional Science

First Certification Summer 2008

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Name : _____


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# Physics Unit P2

| Topic 9 — As Fast as You Can! | Page numbers in New Physics for You |
|---|---|
| **Learning outcomes**<br>Learning outcomes, words or statements in **bold** indicate that this content is designated for Highertier students only. | |
| **Students will be assessed on their ability to:** | |
| • explain that velocity is speed in a given direction and is a vector quantity P2 9.1 | 122 |
| • define acceleration in terms of a change in velocity (this can mean change in magnitude and/or direction) and the time taken for the change P2 9.2 | 122, 70 |
| • draw and interpret velocity time graphs and determine acceleration from the gradient of the graph P2 9.3 | 123-5 |
| • use the equation (P2 9.4):<br>average velocity = displacement / time<br>$v = s / t$ | 122, 126 |
| • use the equation (P2 9.5:<br>acceleration = change in velocity / time<br>$a = (v - u) / t$ | 122 |
| • explain that if the resultant force acting on a body is zero, it will remain at rest or continue to move at the same speed in the same direction P2 9.6 | 69, 87 |
| • explain that if the resultant force acting on a body is not zero, it will accelerate in the direction of the resultant force P2 9.7 | 86-7, 89 |
| • calculate a resultant force using a range of forces (limited to the resultant of forces acting along a line) including resistive forces P2 9.8 | 86-7, 89 |
| • use the equation (P2 9.9):<br>force = mass x acceleration<br>$F = m a$ | 130-1 |
| • explain that when two bodies interact, the forces they exert on each other are equal and opposite and that these are known as action and reaction forces P2 9.10 | 84-5 |
| • draw and interpret a free-body force diagram P2 9.11 | 87 |
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| • demonstrate an understanding of how data about forces can be collected to be incorporated into spreadsheet software and then used to model 'what if' situations P2 9.12 | - |
| • explain that falling objects are acted on by a downward force (weight) and an upward force (resistance) and that at the start of the fall the forces are unbalanced and the object accelerates P2 9.13 | 64, 89 |
| • **discuss, when an object falls through the atmosphere or other gas, resistance increasing with increasing speed and this may become equal in size to the weight of the falling object, which is when terminal velocity is reached** P2 9.14 | 89, 128 |
| • present an argument to explain how the stopping distance of a vehicle depends on the speed of travel P2 9.15 | 83 |
| • discuss the impact of factors such as driver's reaction time and the condition of the vehicle and road, on stopping distance P2 9.16 | 83 |
| • **calculate the momentum of an object using the equation:**<br>**momentum = mass x velocity** P2 9.17 | 136 |
| • **explain how vehicles and theme park rides are designed to absorb momentum in collisions to reduce injury to passengers** P2 9.18 | 136, 138 |
| • assess the effectiveness of safety technology when travelling, including safety belts/harnesses, crumple zones and airbags to prevent injury, when provided with appropriate data P2 9.19 | 138 |
| • interpret and translate between different ways of expressing the size of a risk P2 9.20 | 216 |
| • be aware of the factors that influence people's willingness to accept risks, including the degree of familiarity, whether it is imposed or voluntary. P2 9.21 | 216 |


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| Topic 10 — Roller Coasters and Relativity | Page numbers in New Physics for You |
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| **Learning outcomes**<br>Learning outcomes, words or statements in **bold** indicate that this content is designated for Higher-tier students only.<br><br>**Students will be assessed on their ability to:** | |
| • use the relationship (P2 10.1):<br>potential energy transferred =<br>*mass x acceleration of free-fall x change in height*<br>*PE = m x g x h* | 108 |
| • use the relationship (P2 10.2):<br>kinetic energy = ½ x mass x (velocity)$^2$<br>*KE = ½ m v$^2$* | 109 |
| • apply the equation to situations that use electric motors (P2 10.3):<br>electrical energy = voltage x current x time<br>*E = V x I x t* | 266 |
| • explain that work done is equal to energy transferred P2 10.4 | 99 |
| • use the equation (P2 10.5):<br>power = work done / time taken<br>*P = W / t* | 110-111 |
| • use the equation (P2 10.6):<br>work done =<br>force x distance moved in the direction of the force<br>*W = F x s* | 97 |
| • apply the principle of conservation of energy to examples involving gravitational potential energy, kinetic energy and other forms of energy P2 10.7 | 10-11, 98-101 |
| • describe how a roller coaster or other ride works, using concepts such as speed, acceleration, force and energy P2 10.8 | (99) |
| • **explain that an object moving in a circle at constant speed must be accelerating due to its direction changing** P2 10.9 | 70-1 |
| • **explain that there must be a resultant force acting on an object which is moving in a circle in order to bring about this acceleration** P2 10.10 | 70-1 |
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| • **apply the fact that a force is directed to the centre of the circle eg by drawing diagrams** P2 10.11 | 70-1 |
| • recognise that some theories, such as Einstein's theory of relativity, require creative imagination such as thought experiments, and do not emerge from experimental data automatically P2 10.12 | (153) |
| • discuss the fact that some scientists are often reluctant to accept new theories, such as Einstein's relativity, when they overturn long-established explanations P2 10.13 | 370 |
| • **explain that Einstein's theory of relativity is believed because it led to predictions which were tested successfully in different situations, such as atomic clocks and cosmic rays.** P2 10.14 | (373) |


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| Topic 11 — Putting Radiation to Use | Page numbers in New Physics for You |
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| **Learning outcomes**<br>Learning outcomes, words or statements in **bold** indicate that this content is designated for Higher-tier students only.<br><br>**Students will be assessed on their ability to:** | |
| • describe how radioactivity is used in household fire (smoke) alarms and for treating food so it keeps longer P2 11.1 | page 347 |
| • explain that X-rays and gamma rays have similar properties, including their ionising abilities, but are emitted from different sources P2 11.2 | 208, 210 |
| • describe the uses of radioactivity in medical applications for both diagnosis and treatment for patients and also for sterilisation of equipment P2 11.3 | 346-7 |
| • describe the nature of each of the ionising radiations and compare their abilities to penetrate and to ionise P2 11.4 | 340-1, 208 |
| • describe the structure of an atom in terms of protons, neutrons and electrons and describe particular nuclei using symbols in the format : ${}^{m}X_{p}$ P2 11.5 | 342-3 |
| • **use the terms atomic (proton) number and mass (nucleon) number to explain the existence of isotopes** P2 11.6 | 343 |
| • **explain that alpha and beta particles and gamma rays are ionising radiations emitted from unstable nuclei in a random process** P2 11.7 | 340-1, 345 |
| • describe how the activity of a radioactive source decreases over a period of time P2 11.8 | 344 |
| • use the concept of half-life to carry out simple calculations including graphical representations P2 11.9 | 344, 352 |
| • demonstrate an understanding of how graphical representations of half-life can be made using suitable software, and compare this to traditional methods of creating graphical representation P2 11.10 | worksheet |
| • recognise that scientific conclusion, such as those from radioactive dating, often carry significant uncertainties P2 11.11 | (347, 352) |
| • discuss how scientific ideas, such as the risks associated with radioactive sources, develop over time P2 11.12 | 350, 377 |
| • **discuss the origin of the background radiation from Earth and space** P2 11.13 | 340, 350 |
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| • **explain what is meant by the background radiation which we all experience and describe how regional variations within the UK are caused in particular by radon gas** P2 11.14 | 340, 350 |
| • describe the dangers of ionising radiation in terms of tissue damage and possible mutations and relate this to the precautions taken while carrying out demonstrations at school P2 11.15 | 214, 346, 350 |
| • **explain that the Earth's atmosphere and magnetic field protects it from radiation from space.** P2 11.16 | - |

| Topic 12 — Power of the Atom | Page numbers in New Physics for You |
|---|---|
| **Learning outcomes**<br>Learning outcomes, words or statements in **bold** indicate that this content is designated for Higher-tier students only.<br><br>**Students will be assessed on their ability to:** | |
| • explore how scientists use theories to make predictions, including how Einstein suggested the possibility of releasing enormous amounts of energy trapped in an atom from his relation between mass and energy P2 12.1 | 348, 371, 376 |
| • explain the principle of a chain reaction P2 12.2 | 348 |
| • describe the fission of U-235 to produce two daughter nuclei and two neutrons P2 12.3 | 348 |
| • **describe a simple decay series starting from the daughter products of U-235** P2 12.4 | worksheet |
| • explain how a chain reaction can be used for both peaceful and destructive purposes P2 12.5 | 348-9 |
| • explain how the chain reaction is controlled in a nuclear reactor P2 12.6 | 348-9 |
| • discuss the benefits and drawbacks of nuclear power for generating electricity, including carbon dioxide emissions and safety issues P2 12.7 | 105-6, 349 |
| • describe the environmental and social impact of a nuclear power station on a locality P2 12.8 | - |
| • describe how thermal energy from the chain reaction is transferred to electrical energy in a nuclear power station P2 12.9 | 349, 104 |
| • explain that the products of nuclear fission are radioactive and discuss the longterm possibilities for storage/disposal of nuclear waste P2 12.10 | 350, worksheet |
| • **understand that nuclear fusion requires extremely high temperatures and densities, and relate this to the difficulty of making a practical form of power** P2 12.11 | 156 |
| • **describe how fusion differs from fission and recognise it as the energy source for stars** P2 12.12 | 156 |
| • appreciate that new scientific theories, such as 'cold fusion', are not accepted until they have been validated by the scientific community P2 12.13 | 370, 358 |
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| • explain common electrostatic phenomena in terms of the movement of electrons including shocks and earthing – examples include shocks from car doors, charges on synthetic fibres and lightning P2 12.14 | 245, 246 |
| • describe the forces that act between like charges (repulsive) and unlike charges (attractive) P2 12.15 | 241 |
| • explain that insulating and insulated materials can be charged by contact by the transfer of electrons P2 12.16 | 242 |
| • describe some of the potential dangers and uses of electrostatic charges, such as fuelling aircraft, fingerprinting and laser printing. P2 12.17 | 246 |


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