# *PLANNING SUPPORT BOOKLET*

**J250**

**For first teaching in 2016**

This support material booklet is designed to accompany the

OCR GCSE (9–1) specification in Gateway Combined Science A – Physics

***DISCLAIMER***

This resource was designed using the most up to date information from the specification at the time it was published. Specifications are updated over time, which means there may be contradictions between the resource and the specification, therefore please use the information on the latest specification at all times.If you do notice a discrepancy please contact us on the following email address: resources.feedback@ocr.org.uk

# Introduction

This support material is designed to accompany the new OCR GCSE (9-1) specification for first teaching from September 2016 for:

* [Combined Science A (Gateway Science – J250)](http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-combined-science-a-j250-from-2016/)

We recognise that the number of hours available in timetable can vary considerably from school to school, and year to year. As such, these ***suggested*** teaching hours have been developed on the basis of the experience of the Science Subject Specialist team in delivering GCSE sciences in school. The hours are what we consider ideal for providing the best opportunity for high quality teaching and engagement of the learners in all aspects of learning science.

While Combined Science is a double award GCSE formed from the three separate science GCSEs, the DfE required subject content is greater than a strict two-thirds of the separate science qualifications, hence the suggested hours here are greater than a strict two-thirds of the separate science hours.

The ***suggested*** hours take into account all aspects of teaching, including pre- and post-assessment. As a linear course, we would recommend on-going revision of key concepts throughout the course to support learner’s learning. This can help to minimise the amount of re-teaching necessary at the end of the course, and allow for focused preparation for exams on higher level skills (e.g. making conceptual links between the topics) and exam technique.

Actual teaching hours will also depend on the amount of practical work done within each topic and the emphasis placed on development of practical skills in various areas, as well as use of contexts, case studies and other work to support depth of understanding and application of knowledge and understanding. It will also depend on the level of prior knowledge and understanding that learners bring to the course.

The table follows the order of the topics in the specification. It is not implied that centres teach the specification topics in the order shown. Centres are free to teach the specification in the order that suits them.

Should you wish to speak to a member of the Science Subject Team regarding teaching hours and scheme of work planning, we are available at scienceGCSE@ocr.org.uk or 01223 553998.

## Delivery guides

Delivery guides are individual teacher guides available from the qualification pages:

[http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-combined-science-a-j250-from-2016/#resources](http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-combined-science-a-j250-from-2016/%22%20%5Cl%20%22resources)

These Delivery guides provide further guidance and suggestions for teaching of individual topics, including links to a range of activities that may be used and guidance on resolving common misconceptions.

## Practical work

Specification Topic CS7 (Practical skills) is not included explicitly in the Planning Guidance table. The expectation is that the practical skills are developed throughout the course and in support of conceptual understanding.

Suggestions where the PAG activities can be included are given in the table below. This is by no means an exhaustive list of potential practical activities that can be used in teaching and learning of Physics.

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| **Topic** | **Teaching hours**combined | **Delivery Guides** | **PAG opportunities** |
| --- | --- | --- | --- |
| **Topic 1: Matter** |
| 1.1 The particle model | 3 hours | Matter – delivery guide | PAG1: Determine the densities of a variety of objects both solid and liquid |
| 1.2 Changes of state | 6 hours | Matter – delivery guide | PAG5: Determine the specific heat capacity of a metal |
| **Total for topic 1 = 9 hours** |
| **Topic 2: Forces** |
| 2.1 Motion | 5 hours | Forces and Motion – delivery guide | PAG3: Investigate acceleration of a trolley down a ramp |
| 2.2 Newton’s laws | 11 hours | Forces and Motion – delivery guide |  |
| 2.3 Forces in action | 4 hours | Forces and Motion – delivery guide | PAG 2: Investigate the effect of forces on springs |
| **Total for topic 2 = 20 hours** |
| **Topic 3 Electricity and magnetism** |
| 3.1 Static and Charge | 3 hours | Electricity – delivery guide |  |
| 3.2 Simple circuits | 7 hours | Electricity – delivery guide | PAG6: Investigate the I-V characteristics of circuit elementsPAG7: Investigate the brightness of bulbs in series and parallel |
| 3.3 Magnets and magnetic fields | 7 hours | Magnetism – delivery guide |  |
| **Total for topic 3 = 17 hours** |
| **Topic 4 Waves and radioactivity** |
| 4.1 Wave behaviour | 4 hours | Waves – delivery guide | PAG4: Measuring the speed, frequency and wavelength of a wave |
| 4.2 The electromagnetic spectrum | 5 hours | Waves – delivery guide |  |
| 4.3 Radioactivity | 7 hours | Radioactivity – delivery guide |  |
| **Total for topic 4 = 16 hours** |
| **Topic 5 Energy** |
| 5.1 Work done | 5 hours | Energy – delivery guide |  |
| 5.2 Power and efficiency | 6 hours | Energy – delivery guide |  |
| **Total for topic 5 = 11 hours** |
| **Topic 6 Global Challenges** |
| 6.1 Physics on the move | 4 hours | Global challenges – delivery guide |  |
| 6.2 Powering Earth | 5 hours | Global challenges – delivery guide |  |
| **Total for topic 6 = 9 hours** |
| **Total teaching hours = 82 hours** |

Statements shown in bold type will only be tested in the Higher Tier papers. All other statements will be assessed in both Foundation and Higher Tier papers

# Outline Scheme of Work: P6 – Global challenges

## Total suggested teaching time –9 hours

### P6.1 Physics on the move (4 hours)

|  |
| --- |
| Links to KS3 Subject content* using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces
* moment as the turning effect of a force
* forces being needed to cause objects to stop or start moving, or to change their speed or direction of motion (qualitative only)
* change depending on direction of force and its size
 |
| Links to Mathematical Skills* M1a
* M1c
* M1d
* M2a
* M2b
* M2c
* M2h
* M3b
* M3c
 | Links to Practical Activity Groups (PAGs)* N/A
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# Overview of P6.1 Physics on the move

| Lesson | Statements (bold = Higher tier) | Teaching activities | Notes |
| --- | --- | --- | --- |
| 1 (1hr) | P6.1a – recall typical speeds encountered in everyday experience for wind and sound, and for walking, running, cycling and other transportation systemsP6.1b – estimate the magnitudes of everyday accelerations | **Starter:** TEP Task 1 – speed<http://www.ocr.org.uk/Images/300837-global-challenges-part-1-topic-exploration-pack.docx>**Main:** cause of an accident task <https://www.tes.com/teaching-resource/stopping-distances-6396559>Pupils could experiment and work out their speed when walking and running and compare to speeds of vehicles and other animals.**Plenary:** GCSE Braking distances distance: Time and speed-time graphsA short video about braking distances at various speeds.[View full activity in P4.3 What is the connection between forces and motion? – Online delivery guide](http://www.ocr.org.uk/qualifications/gcse-twenty-first-century-science-suite-physics-b-j259-from-2016/delivery-guide/topic-gpbt04-p4-explaining-motion/delivery-guide-gpbdg016-p43-what-is-the-connection-between-forces-and-motion?activity=291108#291108) | Link to Topic exploration pack: Global challenges – Part 1<http://www.ocr.org.uk/Images/300837-global-challenges-part-1-topic-exploration-pack.docx> |
| 2 (1hr) | P6.1c – make calculations using ratios and proportional reasoning to convert units and to compute ratesP6.1d – explain methods of measuring human reaction times and recall typical results | **Starter:** TEP task 2 – Base Units<http://www.ocr.org.uk/Images/300837-global-challenges-part-1-topic-exploration-pack.docx>**Main:** TEP task 3 – reaction time practical<http://www.ocr.org.uk/Images/300837-global-challenges-part-1-topic-exploration-pack.docx>take previous experiment further by changing variables, could include caffeinated drinks, sensory deprivation (using blindfolds and waiting for sound cue), or distraction techniques.**Plenary:** [SAM](https://www.ocr.org.uk/Images/234643-unit-j250-06-physics-foundation-tier-paper-6-sample-assessment-material.pdf) question J250-06 Question 14 | Link to Topic exploration pack: Global challenges – [Part 1](https://www.ocr.org.uk/Images/300837-global-challenges-part-1-topic-exploration-pack.docx)Link to [SAM](https://www.ocr.org.uk/Images/234643-unit-j250-06-physics-foundation-tier-paper-6-sample-assessment-material.pdf) |
| 3 (1hr) | P6.1e – explain the factors which affect the distance required for road transport vehicles to come to rest in emergencies and the implications for safety | **Starter:** TEP Task 4 – stopping distances<http://www.ocr.org.uk/Images/300837-global-challenges-part-1-topic-exploration-pack.docx>**Main:** thinking/braking distances <https://www.tes.com/teaching-resource/stopping-distances-6396559>**Plenary:** [SAM](https://www.ocr.org.uk/Images/234630-unit-j249-04-physics-higher-tier-paper-4-sample-assessment-material.pdf) question J249-04 Question 25 | Link to Topic exploration pack: Global challenges – [Part 1](https://www.ocr.org.uk/Images/300837-global-challenges-part-1-topic-exploration-pack.docx)Link to [SAM](https://www.ocr.org.uk/Images/234630-unit-j249-04-physics-higher-tier-paper-4-sample-assessment-material.pdf) |
| 4 (1hr) | P6.1f – explain the dangers caused by large decelerations | **Starter:** Jeremy Clarkson on stopping distances<https://www.youtube.com/watch?v=KGkKDaYd3Mo>**Main:** TEP task 5 – Safety<http://www.ocr.org.uk/Images/300837-global-challenges-part-1-topic-exploration-pack.docx>Research task: in groups get pupils to research the dangers of large decelerations in cars and relate to the safety features in place in cars to reduce the impact of these. **Plenary:** [SAM](https://www.ocr.org.uk/Images/234626-unit-j249-02-physics-foundation-tier-paper-2-sample-assessment-material.pdf) question J249-02 Question 21 | Link to Topic exploration pack: Global challenges – [Part 1](https://www.ocr.org.uk/Images/300837-global-challenges-part-1-topic-exploration-pack.docx)Link to [SAM](https://www.ocr.org.uk/Images/234626-unit-j249-02-physics-foundation-tier-paper-2-sample-assessment-material.pdf) |

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| **Additional online learning opportunities*****As a response to the Covid-19 outbreak, additional online learning opportunities were identified for each topic in June 2020.*** |
| **Lesson** | **Statement** | **Teaching activities** |
| 1 | P6.1a, P6.1b | Pages 1 and 2 of the [BBC Bitesize](https://www.bbc.co.uk/bitesize/guides/zq4mfcw/revision/1) section can be used as flipped learning to introduce typical speeds and how to estimate accelerations. |
| 2 | P6.1c | Page 1 of this BBC [Bitesize section](https://www.bbc.co.uk/bitesize/guides/zq4mfcw/revision/1) and this [video](https://www.youtube.com/watch?v=8HjpgJBMMNo) can be used as flipped learning to explain how to convert units when calculating speeds.  |
| 3 | P6.1e, P6.1f | A great [animation](https://www.scootle.edu.au/ec/viewing/L51/L51/index.html) where students compare braking distances in different conditions. They need to write the results down and then choose different conditions to compare. Can be used as flipped learning. |
| 3 | P6.1e, P6.1f | Quick and fun [activity](https://www.justpark.com/creative/reaction-time-test/) to measure your reaction time! |

# Outline Scheme of Work: P6 – Global challenges

## Total suggested teaching time –9 hours

### P6.2 Powering Earth (5 hours)

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| --- |
| Links to KS3 Subject content* Fuels and energy resources
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| Links to Mathematical Skills* M1c
* M3b
* M3c
 | Links to Practical Activity Groups (PAGs)* N/A
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# Overview of P6.2 Powering Earth (5 hours)

| Lesson | Statements (bold = Higher tier) | Teaching activities | Notes |
| --- | --- | --- | --- |
| 1 (1hr) | P6.2a – describe the main energy sources available for use on Earth, compare the ways in which they are used and distinguish between renewable and non-renewable sources | **Starter:** Renewable electricity generationHere is a video detailing renewable electricity generation.[View full activity in P2.2 How can electricity be generated? – Online delivery guide](http://www.ocr.org.uk/qualifications/gcse-twenty-first-century-science-suite-physics-b-j259-from-2016/delivery-guide/topic-gpbt02-p2-sustainable-energy/delivery-guide-gpbdg006-p22-how-can-electricity-be-generated?activity=294347#294347)**Main:** TEP global challenges [part 2](https://www.ocr.org.uk/Images/304429-global-challenges-part-2-topic-exploration-pack.docx) – task 1Electricity generationHere is a practical that can help demonstrate to students how electricity is generated. <https://spark.iop.org/magnet-and-coil>**Plenary:** [SAMs](https://www.ocr.org.uk/Images/234626-unit-j249-02-physics-foundation-tier-paper-2-sample-assessment-material.pdf) question J249-02 Question 16 | Link to Topic Exploration pack: Global challenges – part 2<https://www.ocr.org.uk/Images/304429-global-challenges-part-2-topic-exploration-pack.docx>Link to [SAM](https://www.ocr.org.uk/Images/234626-unit-j249-02-physics-foundation-tier-paper-2-sample-assessment-material.pdf) |
| 2 (1hr) | P6.2b – explain patterns and trends in the use of energy resources | **Starter:** Non-renewable energy resourcesHere is a video that shows how electricity can be made from non-renewable sources.[View full activity in P2.2 How can electricity be generated? – Online delivery guide](http://www.ocr.org.uk/qualifications/gcse-twenty-first-century-science-suite-physics-b-j259-from-2016/delivery-guide/topic-gpbt02-p2-sustainable-energy/delivery-guide-gpbdg006-p22-how-can-electricity-be-generated?activity=294343#294343)**Main:** [TEP](https://www.ocr.org.uk/Images/304429-global-challenges-part-2-topic-exploration-pack.docx) global challenges part 2 – task 2Patterns and trends in energy use link Learners can use the links above to research the context of energy use over time, and how it has increased. Learners should be encouraged to explain what implications this energy use has for the future, given the use of non-renewable resources learnt from section P3.2.1. This can be done in the form of a written task or a discussion depending on time and learner ability.<https://www.bbc.co.uk/bitesize/guides/z3tjcwx/revision/3>**Plenary:** Energy debate and get pupils to evaluate the evidence and decide for themselves which type of energy resource we should be using and why. | Link to Topic Exploration pack: Global challenges – [part 2](https://www.ocr.org.uk/Images/304429-global-challenges-part-2-topic-exploration-pack.docx) |
| 3 (1hr) | P6.2c – recall that, in the national grid, electrical power is transferred at high voltages from power stations, and then transferred at lower voltages in each locality for domestic useP6.2d – recall that step-up and step-down transformers are used to change the potential difference as power is transferred from power stationsP6.2e – explain how the national grid is an efficient way to transfer energy | **Starter:** National grid 1A brief video that explains the national grid, and why the voltage is stepped up to higher voltages from power stations, and then transferred to lower voltages for domestic use.[View full activity in P2.2 How can electricity be generated? – Online delivery guide](http://www.ocr.org.uk/qualifications/gcse-twenty-first-century-science-suite-physics-b-j259-from-2016/delivery-guide/topic-gpbt02-p2-sustainable-energy/delivery-guide-gpbdg006-p22-how-can-electricity-be-generated?activity=294349#294349)**Main:** TEP global challenges part 2 – task 4<http://www.ocr.org.uk/Images/304429-global-challenges-part-2-topic-exploration-pack.docx>dc powerlinesThis practical demonstration is a model D.C power line, which can be used to explain the importance of raising the voltage when transmitting electricity over a distance.<https://spark.iop.org/model-dc-power-line>**Plenary:** TEP global challenges part 2 – task 3<http://www.ocr.org.uk/Images/304429-global-challenges-part-2-topic-exploration-pack.docx> | Link to Topic Exploration pack: Global challenges – [part 2](https://www.ocr.org.uk/Images/304429-global-challenges-part-2-topic-exploration-pack.docx) |
| 4 (1hr) | P6.2f – recall that the domestic supply in the UK is a.c. at 50Hz and about 230 voltsP6.2g – explain the difference between direct and alternating voltage | **Starter:** Power linesA video explaining how power lines are used.[View full activity in P2.2 How can electricity be generated? – Online delivery guide](http://www.ocr.org.uk/qualifications/gcse-twenty-first-century-science-suite-physics-b-j259-from-2016/delivery-guide/topic-gpbt02-p2-sustainable-energy/delivery-guide-gpbdg006-p22-how-can-electricity-be-generated?activity=294351#294351)**Main:** National grid 3A booklet that includes information on the national grid, and also has questions to test recall.<https://www.yumpu.com/en/document/view/46913805/gcse-p1-142-the-national-gridpdf-st-ambrose-college>**Plenary:** SAM question J259-01 Question 7<http://www.ocr.org.uk/Images/234632-unit-j259-01-breadth-in-physics-foundation-tier-sample-assessment-material.pdf> | Link to Topic Exploration pack: Global challenges – [part 2](https://www.ocr.org.uk/Images/304429-global-challenges-part-2-topic-exploration-pack.docx) |
| 5 (1hr) | P6.2h – recall the differences in function between the live, neutral and earth mains wires, and the potential differences between these wiresP6.2i – explain that a live wire may be dangerous even when a switch in a mains circuit is open, and explain the dangers of providing any connection between the live wire and earth | **Starter:** Live wire demonstration<https://www.youtube.com/watch?v=2Xoyb9M5-EA>**Main:** TEP global challenges [part 2](https://www.ocr.org.uk/Images/304429-global-challenges-part-2-topic-exploration-pack.docx) – task 6Pupils to draw labelled diagrams of the inside of a plug and explain each safety feature.**Plenary:** [SAMs](https://www.ocr.org.uk/Images/234658-unit-j250-12-physics-higher-tier-paper-12-sample-assessment-material.pdf) question J250-12 Question 11Electrical safetyA brief series of online questions about electrical safety.[View full activity in P2.2 How can electricity be generated? – Online delivery guide](http://www.ocr.org.uk/qualifications/gcse-twenty-first-century-science-suite-physics-b-j259-from-2016/delivery-guide/topic-gpbt02-p2-sustainable-energy/delivery-guide-gpbdg006-p22-how-can-electricity-be-generated?activity=294361#294361) | Link to Topic Exploration pack: Global challenges – [part 2](https://www.ocr.org.uk/Images/304429-global-challenges-part-2-topic-exploration-pack.docx)Link to [SAM](https://www.ocr.org.uk/Images/234658-unit-j250-12-physics-higher-tier-paper-12-sample-assessment-material.pdf) |

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| **Additional online learning opportunities*****As a response to the Covid-19 outbreak, additional online learning opportunities were identified for each topic in June 2020.*** |
| **Lesson** | **Statement** | **Teaching activities** |
| 2 | P6.2b | Government [article](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/820843/Energy_Consumption_in_the_UK__ECUK__MASTER_COPY.pdf) and [electricity data](https://www.gov.uk/government/collections/electricity-statistics#historical-time-series-data) for comparing energy use as homework or flipped learning.  |
| 3/4 | P6.2c, P6.2d, P6.2e | Quick [quiz](https://www.footprints-science.co.uk/index.php?quiz=Transformers&module=68) that can be used for homework on transformers and national grid. |

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