# PLANNING SUPPORT BOOKLET

**J249**

**For first teaching in 2016**

This support material booklet is designed to accompany the OCR GCSE (9–1) specification in Physics A and Combined Science A (Gateway Science).

***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](mailto:resources.feedback@ocr.org.uk)

# Introduction

This support material is designed to accompany the OCR GCSE (9-1) specification in Physics A (Gateway) for teaching from September 2016.

The Planning Guidance table on the following pages sets out *suggested* teaching times for the topics within the specification. Note that we always recommend that individual centres plan their schemes of work according to their individual needs. Actual teaching times for topics will 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 suites them.

## Delivery guides

The column ‘Delivery guides’ refers to individual teacher guides available from the GCSE Physics A qualification page.

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 p9 (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 for where the PAG techniques can be are included throughout the table. This is by no means and exhaustive list of potential practical activities.

| **Topic** | **Teaching hours** | **Delivery Guides** | **PAG opportunities** | |
| --- | --- | --- | --- | --- |
| **Topic 1: Matter** | | | | |
| 1.1 The particle model | 3 / 3 hours | Matter – delivery guide | PAG1: Determine the densities of a variety of objects both solid and liquid | |
| 1.2 Changes of state | 5 / 5 hours | Matter – delivery guide | PAG5: Determine the specific heat capacity of a metal (Activity 1)  PAG5: Kettle design (Activity 2) | |
| 1.3 Pressure | 6 / 0 hours | Matter – delivery guide |  | |
| **Total for topic 1 = 14 / 8 hours** | | | | |
| **Topic 2: Forces** | | | | |
| 2.1 Motion | 5 / 5 hours | Forces and Motion – delivery guide | PAG3: Investigate acceleration of a trolley down a ramp (Activity 1)  PAG3: Investigating fluid flow (Activity 2) | |
| 2.2 Newton’s laws | 12 / 11 hours | Forces and Motion – delivery guide |  | |
| 2.3 Forces in action | 8 / 4 hours | Forces and Motion – delivery guide | PAG 2: Investigate the effect of forces on springs (Activity 1)  PAG 2: Investigating the effects of forces on the compression of a sample (Activity 2) | |
| **Total for topic 2 = 25 / 20 hours** | | | | |
| **Topic 3 Electricity** | | | | |
| 3.1 Static and Charge | 4 / 3 hours | Electricity – delivery guide |  | |
| 3.2 Simple circuits | 7 / 7 hours | Electricity – delivery guide | PAG6: Investigate the I-V characteristics of circuit elements (Activity 1)  PAG6: Mystery circuit elements (Activity 2)  PAG7: Investigate the brightness of bulbs in series and parallel | |
| **Total for topic 3 = 11 / 10 hours** | | | | |
| **Topic 4 Magnetism** | | | | |
| 4.1 Magnets and magnetic fields | 5 / 5 hours | Magnetism – delivery guide |  | |
| 4.2 Uses of magnetism | 8 / 3 hours | Magnetism – delivery guide |  | |
| **Total for topic 4 = 13 / 7 hours** | | | | |
| **Topic 5 Waves** | | | | |
| 5.1 Wave behaviour | 7 / 4 hours | Waves – delivery guide | PAG4: Measuring the speed, frequency and wavelength of a wave (Activity 1)  PAG4: Tsunami (Activity 2) | |
| 5.2 The electromagnetic spectrum | 4 / 4 hours | Waves – delivery guide |  | |
| 5.3 Wave interactions | 5 / 1 hours | Waves – delivery guide | PAG8: Investigate the reflection of light off a plane mirror and the refraction of light through prisms (Activity 1)  PAG8: Reflection within a material (Activity 2) | |
| **Total for topic 5 = 16 / 9 hours** | | | | |
| **Topic 6 Radioactivity** | | | | |
| 6.1 Radioactive emissions | 6 / 6 hours | Radioactivity – delivery guide |  | |
| 6.2 Uses and Hazards | 5 / 1 hours | Radioactivity –delivery guide |  | |
| **Total for topic 6 = 11 / 7 hours** | | | | |
| **Topic 7 Energy** | | | | |
| 7.1 Work done | 5 / 5 hours | Energy – delivery guide |  | |
| 7.2 Power and efficiency | 6 / 6 hours | Energy – delivery guide |  | |
| **Total for topic 7 = 11 / 11 hours** | | | | |
| **Topic 8 Global Challenges** | | | | |
| 8.1 Physics on the move | 5 / 4 hours | Global challenges – delivery guide |  | |
| 8.2 Powering Earth | 6 / 5 hours | Global challenges – delivery guide |  | |
| 8.3 The Earth and beyond | 8 / 0 hours | Global challenges – delivery guide |  | |
| **Total for topic 8 = 19 / 9 hours** | | | | |
| **Total teaching hours = 120 / 81 hours** | | | |

🗹 This symbol indicates content that is found only in the physics separate science qualification.

# Outline Scheme of Work: P8 – Global challenges

## Total suggested teaching time – 19 / 9 hours

### P8.1 Physics on the move (5 / 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 |

# Overview of P8.1 Physics on the move

| Lesson | Statements | Teaching activities | Notes |
| --- | --- | --- | --- |
| 1 (1hr for separate and combined) | P8.1a – recall typical speeds encountered in everyday experience for wind and sound, and for walking, running, cycling and other transportation systems  P8.1b – 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 graphs  A 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  <https://www.ocr.org.uk/Images/300837-global-challenges-part-1-topic-exploration-pack.docx> |
| 2 (1hr for separate and combined) | P8.1c – make calculations using ratios and proportional reasoning to convert units and to compute rates  P8.1d – 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 for separate and combined) | P8.1e – explain the factors which affect the distance required for road transport vehicles to come to rest in emergencies and the implications for safety  P8.1f – estimate how the distances required for road vehicles to stop in an emergency, varies over a range of typical speeds | **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 for separate and combined) | P8.1g – 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) |
| 5 (1hr separate only) | P8.1h – estimate the forces involved in typical situations on a public road 🗹  P8.1i – estimate, for everyday road transport, the speed, accelerations and forces involved in large accelerations 🗹 | **Starter:** sheep dash reaction timer <http://www.bbc.co.uk/science/humanbody/sleep/sheep/reaction_version5.swf>  **Main:** designing a car – get pupils to design a vehicle with safety features to help in an accident  **Plenary:** [SAM](https://www.ocr.org.uk/Images/234658-unit-j250-12-physics-higher-tier-paper-12-sample-assessment-material.pdf) question J250-12 Question 15 | 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/234658-unit-j250-12-physics-higher-tier-paper-12-sample-assessment-material.pdf) question: |

|  |  |  |
| --- | --- | --- |
| 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 | P8.1a, P8.1b | 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 | P8.1c | Page 1 of this [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 | P8.1e, P8.1f | 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 | P8.1e, P8.1f | Quick and fun [activity](https://www.justpark.com/creative/reaction-time-test/) to measure your reaction time! |
| 5 | P8.1h, P8.1i | Students could use this Which? [article](https://www.which.co.uk/reviews/new-and-used-cars/article/car-safety-features-explained) to research safety features before doing the main activity in lesson 5. It also includes videos links and a quiz. |
| 5 | P8.1h, P8.1i | Top gear short [video](https://www.youtube.com/watch?v=L_OLeeNsnF0) showing crumple zones. |

# Outline Scheme of Work: P8 – Global challenges

## Total suggested teaching time – 19 / 9 hours

### P8.2 Powering Earth (6 / 5 hours)

|  |  |
| --- | --- |
| Links to KS3 Subject content  * Fuels and energy resources | |
| Links to Mathematical Skills  * M1c * M3b * M3c | Links to Practical Activity Groups (PAGs)  * N/A |

# Overview of P8.2 Powering Earth (6 / 5 hours)

| Lesson | Statements | Teaching activities | Notes |
| --- | --- | --- | --- |
| 1 (1hr for separate and combined) | P8.2a – 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 generation  Here 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 1  Electricity generation  Here 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 for separate and combined) | P8.2b – explain patterns and trends in the use of energy resources | **Starter:** Non-renewable energy resources  Here 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 2  Patterns 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 for separate and combined) | P8.2c – 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 use  P8.2d – recall that step-up and step-down transformers are used to change the potential difference as power is transferred from power stations  P8.2e – explain how the national grid is an efficient way to transfer energy | **Starter:** National grid 1  A 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 powerlines  This 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 separate only) | P8.2f – link the potential differences and numbers of turns of a transformer to the power transfer involved; relate this to the advantages of power transmission at high voltages 🗹 | **Starter:** How transformers work  A short video explaining how transformers work.  [View full activity in P3.7 What is the process inside an electric generator – Online delivery guide](http://www.ocr.org.uk/qualifications/gcse-twenty-first-century-science-suite-physics-b-j259-from-2016/delivery-guide/topic-gpbt03-p3-electric-circuits/delivery-guide-gpbdg013-p37-what-is-the-process-inside-an-electric-generator?activity=290173#290173)  **Main:** TEP global challenges part 2 – task 5  <http://www.ocr.org.uk/Images/304429-global-challenges-part-2-topic-exploration-pack.docx>  practical transformers  <https://spark.iop.org/step-transformer>  **Plenary:** [SAMs](https://www.ocr.org.uk/Images/234630-unit-j249-04-physics-higher-tier-paper-4-sample-assessment-material.pdf) question J249-04 Q3 and Question 23  Pupils should be given the opportunity to practice using the equation, including rearranging and converting between units | 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/234630-unit-j249-04-physics-higher-tier-paper-4-sample-assessment-material.pdf) |
| 5 (1hr for separate and combined) | P8.2g – recall that the domestic supply in the UK is a.c. at 50Hz and about 230 volts  P8.2h – explain the difference between direct and alternating voltage | **Starter:** Power lines  A 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 3  A 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) |
| 6 (1hr for separate and combined) | P8.2i – recall the differences in function between the live, neutral and earth mains wires, and the potential differences between these wires  P8.2j – 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 6  Pupils 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 11  Electrical safety  A 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) |

|  |  |  |
| --- | --- | --- |
| 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 | P8.2b | 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 | P8.2c, P8.2d, P8.2e  P8.2f | 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. |

# Outline Scheme of Work: P8 – Global challenges

## Total suggested teaching time – 19 / 9 hours

### P8.3 Beyond Earth (8 / 0 hours)

|  |  |
| --- | --- |
| Links to KS3 Subject content  * gravity force, weight = mass × gravitational field strength (g), on Earth g = 10 N/kg, different on other planets and stars; gravity forces between Earth and Moon, and between Earth and Sun (qualitative only) * our Sun as a star, other stars in our galaxy, other galaxies * the seasons and the Earth’s tilt, day length at different times of year, in different hemispheres * the light year as a unit of astronomical distance | |
| Links to Mathematical Skills  * M5b | Links to Practical Activity Groups (PAGs)  * N/A |

# Overview of P8.3 Beyond Earth (8 / 0 hours)

| Lesson | Statements | Teaching activities | Notes |
| --- | --- | --- | --- |
| 1 (1hr separate only) | P8.3a – explain the red-shift of light as seen from galaxies which are receding (qualitative only). The change with distance of each galaxy’s speed is evidence of an expanding universe | **Starter:** What is red-shift?  <https://www.youtube.com/watch?v=FhfnqboacV0>  **Main:** Show an expanding universe with a balloon  <http://www.astro.ucla.edu/~wright/balloon0.html>  red and blue shift class activity <https://www.stem.org.uk/resources/elibrary/resource/29947/redshift>  **Plenary:** [SAMs](https://www.ocr.org.uk/Images/234633-unit-j259-02-depth-in-physics-foundation-tier-sample-assessment-material.pdf) question J259-02 Question 3 | Link to Topic Exploration pack: Global challenges – [part 3](https://www.ocr.org.uk/Images/301917-global-challenges-part-3-topic-exploration-pack.docx)  Link to [SAM](https://www.ocr.org.uk/Images/234633-unit-j259-02-depth-in-physics-foundation-tier-sample-assessment-material.pdf) |
| 2 (1hr separate only) | P8.3b – explain how red shift and other evidence can be linked to the Big Bang model | **Starter:** Big band theory  <https://www.youtube.com/watch?v=DY03Xbcxis8>  **Main:** TEP Task 1 – Red shift and cosmic microwave background radiation <http://www.ocr.org.uk/Images/301917-global-challenges-part-3-topic-exploration-pack.docx>  TEP Activities <http://www.ocr.org.uk/Images/309129-space-and-the-big-bang-topic-exploration-pack.doc>  Big Bang worksheet and powerpoints <https://www.stem.org.uk/elibrary/resource/26991>  **Plenary:** SAM question j249-04 Question 19  <http://www.ocr.org.uk/Images/234630-unit-j249-04-physics-higher-tier-paper-4-sample-assessment-material.pdf> | Link to Topic Exploration pack: Global challenges – [part 3](https://www.ocr.org.uk/Images/301917-global-challenges-part-3-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) |
| 3 (1hr separate only) | P8.3c – recall that our Sun was formed from dust and gas drawn together by gravity and explain how this caused fusion reactions, leading to equilibrium between gravitational collapse and expansion due to the energy released during fusion | **Starter:** The lifecycle of a star  <https://www.youtube.com/watch?v=PM9CQDlQI0A>  **Main:** TEP Task 2 – Lifecycle of a star  <http://www.ocr.org.uk/Images/301917-global-challenges-part-3-topic-exploration-pack.docx>  I am a star class activity  <https://www.stem.org.uk/elibrary/resource/33688>  **Plenary:** [SAM](https://www.ocr.org.uk/Images/234636-unit-j259-04-depth-in-physics-higher-tier-sample-assessment-material.pdf) question J259-04 Question 7b | Link to Topic Exploration pack: Global challenges – [part 3](https://www.ocr.org.uk/Images/301917-global-challenges-part-3-topic-exploration-pack.docx) |
| 4 (1hr separate only) | P8.3e – recall the main features of our solar system, including the similarities and distinctions between the planets, their moons, and artificial satellites | **Starter:** TEP Task 3 – planets <http://www.ocr.org.uk/Images/301917-global-challenges-part-3-topic-exploration-pack.docx>  **Main:** TEP task 6 – planets similarities and differences  <http://www.ocr.org.uk/Images/301917-global-challenges-part-3-topic-exploration-pack.docx>  **Plenary:** [TEP](https://www.ocr.org.uk/Images/301917-global-challenges-part-3-topic-exploration-pack.docx) task 4 – creativity with the solar system  [SAMs](https://www.ocr.org.uk/Images/234636-unit-j259-04-depth-in-physics-higher-tier-sample-assessment-material.pdf) question J259-04 Question 5 | Link to Topic Exploration pack: Global challenges – [part 3](https://www.ocr.org.uk/Images/301917-global-challenges-part-3-topic-exploration-pack.docx) |
| 5 (1hr separate only) | P8.3f – explain for circular orbits, how the force of gravity can lead to changing velocity of a planet but unchanged speed (qualitative only)  P8.3g – explain how, for a stable orbit, the radius must change if this speed changes (qualitative only) | **Starter:** Introducing circular motion  <https://spark.iop.org/circular-motion>  **Main:** circular motion practical  <https://spark.iop.org/episode-224-describing-circular-motion>  orbits of Satellites and Moons  <https://spark.iop.org/orbits-satellites-and-moons>  **Plenary:** [TEP](https://www.ocr.org.uk/Images/301917-global-challenges-part-3-topic-exploration-pack.docx) task 7 – orbits  [SAM](https://www.ocr.org.uk/Images/234630-unit-j249-04-physics-higher-tier-paper-4-sample-assessment-material.pdf) question J249-04 Question 22 | Link to Topic Exploration pack: Global challenges – [part 3](https://www.ocr.org.uk/Images/301917-global-challenges-part-3-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) |
| 6 (1hr separate only) | P8.3d – explain that all bodies emit radiation, and that the intensity and wavelength distribution of any emission depends on their temperatures  P8.3h – explain how the temperature of a body is related to the balance between incoming radiation absorbed and radiation emitted; illustrate this balance using everyday examples and the example of the factors which determine the temperature of the Earth | **Starter:** Video – how do greenhouse gases actually work? <https://www.youtube.com/watch?v=sTvqIijqvTg>  Display a picture of the sun and the earth and get pupils to give ideas of how the heat radiation gets from the sun to the earth.  **Main:** Colour and temperature of stars experiment  <https://www.stem.org.uk/elibrary/resource/29945>  An experimental model to understand temperature regulation.  [http://www.carboeurope.org/education/CS\_Materials/AnExperimental Model.pdf](http://www.carboeurope.org/education/CS_Materials/AnExperimental%20Model.pdf)  An open-ended experimental framework to enable learners to visualise what happens when different layers of reflection and absorption intermediate between a surface and a radiation source.  **Plenary:** An interactive resource which projects temperature change over time based on CO2 emissions. Have fun scaring learners by showing them that even keeping CO2­­­ emissions at current levels will continue to increase atmospheric temperature at an alarming rate. <http://scied.ucar.edu/simple-climate-model>  Or  A web based flash game in which you play the President Europe (!) and have to make various political and economic decisions affecting CO2 emissions.  <http://www.bbc.co.uk/sn/hottopics/climatechange/climate_challenge/> | Link to Topic Exploration pack: Global challenges – [part 3](https://www.ocr.org.uk/Images/301917-global-challenges-part-3-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) |
| 7 (1hr separate only) | P8.3i – explain, in qualitative terms, how the differences in velocity, absorption and reflection between different types of waves in solids and liquids can be used both for detection and for exploration of structures which are hidden from direct observation, notably in the Earth’s core and in deep water | **Starter:** Show images of ultrasound, earthquakes and sonar. Ask what these have in common?  **Main:** Split class in to small groups. Groups to choose to research one of the uses of these waves for either:  Ultrasound  Earthquake detection  SONAR  Pupils work in groups to research their chosen topic; they must create a presentation and fact sheet for the rest of the class.  **Plenary:** Pupil presentations, class take notes.  Pupils create a table giving the key information on each of the uses researched by the class. | Link to Topic Exploration pack: Global challenges – [part 3](https://www.ocr.org.uk/Images/301917-global-challenges-part-3-topic-exploration-pack.docx) |
| 8 |  | Pupils to complete the end of chapter quiz P8. After completion pupils to swap and mark quizzes.  Pupils use their quizzes to create a revision list from Chapter 8. | Link to Topic Exploration pack: Global challenges – [part 3](https://www.ocr.org.uk/Images/301917-global-challenges-part-3-topic-exploration-pack.docx)  [End of chapter quiz](https://interchange.ocr.org.uk/Downloads/Gateway-Physics-Quizzes.zip) P8 is available on OCR interchange |

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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 |
| 4 | P8.3e | Clear [video](https://www.youtube.com/watch?v=bYz48x5ikIs) on the solar system which can be used as flipped learning |
| 7 | P8.3i | Ultrasound, seismic and sonar activities suitable for home learning:  <https://www.stem.org.uk/elibrary/resource/31828>  <https://spark.iop.org/videos-age-14-16-ks4-support-remote-teaching-and-learning-light-sound-and-waves>  <https://www.tes.com/teaching-resource/ultrasound-lesson-6318455> |



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