# 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 (Gateway) for teaching from September 2016.

***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**  separate / combined | **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 (separate science only)** | 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 / 2 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)PAG4: Measuring the speed, frequency and wavelength of a wave | |
| 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 (separate science only)** | 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: P4 – Magnetism

## Total suggested teaching time – 13 hours

### P4.1 Magnets and Magnetic fields (5 / 5 hours)

|  |  |
| --- | --- |
| Links to KS3 Subject content  * magnetic poles, attraction and repulsion * magnetic fields by plotting compass, representation of field lines * Earth’s magnetism, compass and navigation | |
| Links to Mathematical Skills  * M1c * M5b | Links to Practical Activity Groups (PAGs)  * N/A |

# Overview of P4.1 Magnets and Magnetic fields

| Lesson | Statements | Teaching activities | Notes |
| --- | --- | --- | --- |
| 1 (1hr for separate and combined) | P4.1a describe the attraction and repulsion between unlike and like poles for permanent magnets  P4.1b describe the difference between permanent and induced magnets | **Starter:** How do magnets work?: James May’s Q and A  A short video in which James May explains magnetism.  [View full activity in P3.5 What are magnetic fields? – 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-gpbdg011-p35-what-are-magnetic-fields?activity=290147#290147)  **Main options:** Magnets and electromagnets: Magnetism, magnetic field, electromagnets  An interactive Java application in which a magnet and an electromagnet can be moved relative to a compass.  [View full activity in P3.5 What are magnetic fields? – 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-gpbdg011-p35-what-are-magnetic-fields?activity=290145#290145)  practical electromagnetic induction  <http://www.allaboutcircuits.com/textbook/experiments/chpt-2/electromagnetic-induction-experiment/>  **Plenary options:** Magnetism for kids  Provides a variety of resources and video links at all key stage levels covering all content. Shows the history of magnets.  [View full activity in 4.1 Magnets and magnetic fields – Online delivery guide](http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-physics-a-j249-from-2016/delivery-guide/topic-gpat004-p4-magnetism-and-magnetic-fields/delivery-guide-gpadg009-p41-magnets-and-magnetic-fields?activity=287717#287717) | Link to delivery guide  <http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-physics-a-j249-from-2016/delivery-guide/topic-gpat004-p4-magnetism-and-magnetic-fields/delivery-guide-gpadg009-p41-magnets-and-magnetic-fields> |
| 2 (1hr for separate and combined) | P4.1c describe the characteristics of the magnetic field of a magnet, showing how strength and direction change from one point to another | **Starter options:** Magnetic fields  A clip, which illustrates and explain the magnetic field.  [View full activity in 4.1 Magnets and magnetic fields – Online delivery guide](http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-physics-a-j249-from-2016/delivery-guide/topic-gpat004-p4-magnetism-and-magnetic-fields/delivery-guide-gpadg009-p41-magnets-and-magnetic-fields?activity=287720#287720)  Magnetic field lines, 3D  A video of a simple experiment with a suspension of iron filings to show magnetic field lines in three dimensions.  [View full activity in P3.5 What are magnetic fields? – Online delivery guide](https://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-gpbdg011-p35-what-are-magnetic-fields#290155)  **Main:** Investigating with magnets – pupils use magnets and compasses to plot field lines of one and two magnets, showing attraction and repulsion.  **Plenary:** [SAM](https://www.ocr.org.uk/Images/234625-unit-j249-01-physics-foundation-tier-paper-1-sample-assessment-material.pdf) J249-01 Question 17 | Link to [delivery guide](https://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-physics-a-j249-from-2016/delivery-guide/topic-gpat004-p4-magnetism-and-magnetic-fields/delivery-guide-gpadg009-p41-magnets-and-magnetic-fields)  Link to [SAM](https://www.ocr.org.uk/Images/234625-unit-j249-01-physics-foundation-tier-paper-1-sample-assessment-material.pdf) |
| 3 (1hr for separate and combined) | P4.1d explain how the behaviour of a magnetic (dipping) compass is related to evidence that the core of the Earth must be magnetic | **Starter:** Why earth’s magnetic shield matters  A short video about Earth’s magnetosphere.  [View full activity in P3.5 What are magnetic fields? – 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-gpbdg011-p35-what-are-magnetic-fields?activity=290149#290149)  **Main:** Compass  A step-by-step guide on how to make a compass.  <https://www.bbc.co.uk/bitesize/topics/zrvbkqt/articles/zfb6pbk>  **Plenary:** How does a compass work? Pupils discuss and write a paragraph to explain. | Link to [delivery guide](https://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-physics-a-j249-from-2016/delivery-guide/topic-gpat004-p4-magnetism-and-magnetic-fields/delivery-guide-gpadg009-p41-magnets-and-magnetic-fields) |
| 4 (1hr for separate and combined) | P4.1e describe how to show that a current can create a magnetic effect and describe the directions of the magnetic field around a conducting wire  P4.1f recall that the strength of the field depends on the current and the distance from the conductor | **Starter options:** Richard Feynman on magnets  A ten-minute video of Richard Feynman being asked to explain magnetic attraction and repulsion.  [View full activity in P3.5 What are magnetic fields? – Online delivery guide](https://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-gpbdg011-p35-what-are-magnetic-fields?activity=290149/#290161)  Magnetic field around a wire  A simple interactive page in which the magnetic field around a current-carrying wire is shown.  [View full activity in P3.6 How do electric motors work? – Online delivery guide](https://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-gpbdg012-p36-how-do-electric-motors-work#290163)  **Main:** Magnetic fields due to current in wires  These are a collection of experiments designed for learners to do themselves to gain experience on magnetic fields and electromagnets.  [View full activity in 4.1 Magnets and magnetic fields – Online delivery guide](http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-physics-a-j249-from-2016/delivery-guide/topic-gpat004-p4-magnetism-and-magnetic-fields/delivery-guide-gpadg009-p41-magnets-and-magnetic-fields?activity=287724#287724)  **Plenary:** Give pupils mini white boards then get them to draw field lines for single magnets, magnets showing attraction and repulsion and a current carrying wire as a mini quiz. | Link to [delivery guide](https://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-physics-a-j249-from-2016/delivery-guide/topic-gpat004-p4-magnetism-and-magnetic-fields/delivery-guide-gpadg009-p41-magnets-and-magnetic-fields) |
| 5 (1hr for separate and combined) | P4.1g explain how solenoid arrangements can enhance the magnetic effect | **Starter:** Solenoid  A clear animation, which allows learners to amend voltage to see how a solenoid is affected and the magnetic field.  [View full activity in 4.1 Magnets and magnetic fields – Online delivery guide](http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-physics-a-j249-from-2016/delivery-guide/topic-gpat004-p4-magnetism-and-magnetic-fields/delivery-guide-gpadg009-p41-magnets-and-magnetic-fields?activity=287728#287728)  **Main:** Solenoid magnetic effect  The task allows learners to independently build up knowledge on solenoids. They should be able to draw its magnetic field and explain what affects its strength. The task is aimed at learners who are familiar with magnetic field around a straight wire but now need to look at a solenoid and its magnetic field.  [View full activity in 4.1 Magnets and magnetic fields – Online delivery guide](http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-physics-a-j249-from-2016/delivery-guide/topic-gpat004-p4-magnetism-and-magnetic-fields/delivery-guide-gpadg009-p41-magnets-and-magnetic-fields?activity=287726#287726)  **Plenary:** [SAM](https://www.ocr.org.uk/Images/234657-unit-j250-11-physics-higher-tier-paper-11-sample-assessment-material.pdf) J250-11 question 12 | Link to [delivery guide](https://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-physics-a-j249-from-2016/delivery-guide/topic-gpat004-p4-magnetism-and-magnetic-fields/delivery-guide-gpadg009-p41-magnets-and-magnetic-fields)  Link to [SAM](https://www.ocr.org.uk/Images/234657-unit-j250-11-physics-higher-tier-paper-11-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 |
| 1 | P4.1a, P4.1b | Bitesize [introduction to magnets](https://www.bbc.co.uk/bitesize/guides/zxxbkqt/revision/1) can be used as flipped learning. |
| 1 | P4.1a, P4.1b | [Question 11 on paper 3](https://ocr.org.uk/rpgphys3) of this Cambridge International resource could be used as a plenary or homework. |
| 1 | P4.1a, P4.1b | [Quiz](https://www.footprints-science.co.uk/index.php?quiz=Magnets) on magnets that could be used as plenary or homework. |
| 2 | P4.1c | A Bitesize [resource](https://www.bbc.co.uk/bitesize/guides/zxxbkqt/revision/2) that could be used as flipped learning for lesson 2 and the test as a homework. |
| 2 | P4.1c | [Short clip](https://ocr.org.uk/Images/587853-p4-cup-elevate-video-iron-filings-in-a-magnetic-field.mp4) of iron filings showing magnetic field from CUP Elevate. |
| 5 | P4.1g | [Video](https://ocr.org.uk/rpgphys8) from Cambridge International on electromagnets can be used as flipped learning. |

# Outline Scheme of Work: P4 – Magnetism

## Total suggested teaching time – 13 hours

### P4.2 Uses of magnetism (8 / 3 hours)

|  |  |
| --- | --- |
| Links to KS3 Subject content  * the magnetic effect of a current, electromagnets, D.C. motors (principles only) | |
| Links to Mathematical Skills  * M1a * M1b * M1c * M1d * M2a * M3a * M3b * M3c | Links to Mathematical Skills  * N/A |

# Overview of P4.2 Uses of magnetism

| Lesson | Statements | Teaching activities | Notes |
| --- | --- | --- | --- |
| 1 (1hr for separate and combined) | **P4.2a describe how a magnet and a current-carrying conductor exert a force on one another**  **P4.2b show that Fleming’s left-hand rule represents the relative orientations of the force, the conductor and the magnetic field** | **Starter options:** Physics misconceptions  A list of misconceptions or difficulties learners may have with electricity.  [View full activity in 4.2 Uses of magnetism – Online delivery guide](http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-physics-a-j249-from-2016/delivery-guide/topic-gpat004-p4-magnetism-and-magnetic-fields/delivery-guide-gpadg010-p42-uses-of-magnetism?activity=287758#287758)  Fleming’s left hand rule  A video clip, which explains Fleming’s left hand rule.  [View full activity in 4.2 Uses of magnetism – Online delivery guide](http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-physics-a-j249-from-2016/delivery-guide/topic-gpat004-p4-magnetism-and-magnetic-fields/delivery-guide-gpadg010-p42-uses-of-magnetism?activity=287756#287756)  **Main:** practical force on a current carrying conductor  <https://spark.iop.org/force-wire-carrying-current-magnetic-field>  **Plenary:** Pupils write a paragraph to explain force on a current carrying conductor in a magnetic field. | Link to [delivery guide](https://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-physics-a-j249-from-2016/delivery-guide/topic-gpat004-p4-magnetism-and-magnetic-fields/delivery-guide-gpadg009-p41-magnets-and-magnetic-fields) |
| 2 (1hr for separate and combined) | **P4.2c apply the equation that links the force on a conductor to the magnetic flux density, the current and the length of conductor to calculate the forces involved**  **PM4.2i apply: force on a conductor (at right angles to a magnetic field) carrying a current (N) = magnetic flux density (T) × current (A) × length (m)** | **Starter:** Right and left hand rules  A very basic page with graphics showing both the right hand rule and Fleming’s left hand rule.  [View full activity in P3.6 How do electric motors work? – Online delivery guide](https://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-gpbdg012-p36-how-do-electric-motors-work#290165)  **Main:** Pupils should be given the opportunity to practice using the equation, including rearranging and converting between units.  Pupils draw a labelled diagram or label a diagram given to them showing Fleming’s left hand rule and what each finger represents.  **Plenary:** [SAM](https://www.ocr.org.uk/Images/234629-unit-j249-03-physics-higher-tier-paper-3-sample-assessment-material.pdf) J249-03 Question 21 | Link to [delivery guide](https://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-physics-a-j249-from-2016/delivery-guide/topic-gpat004-p4-magnetism-and-magnetic-fields/delivery-guide-gpadg009-p41-magnets-and-magnetic-fields)  Link to [SAM](https://www.ocr.org.uk/Images/234629-unit-j249-03-physics-higher-tier-paper-3-sample-assessment-material.pdf) |
| 3 (1hr for separate and combined) | **P4.2d explain how the force exerted from a magnet and a current-carrying conductor is used to cause rotation in electric motors** | **Starter:** demo a simple electric motor. Use a kit if you have one available  **Main options:** It really spins around!: Simple models of electric motor  A set of simple motors that can be made with easily available materials.  [View full activity in P3.6 How do electric motors work? – Online delivery guide](https://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-gpbdg012-p36-how-do-electric-motors-work#290169)  the electric motor practical  <https://spark.iop.org/electric-motor>  **Plenary:** The electric motor  Provides clear explanation about an electric motor. It is also engaging with a simulation of how magnetic field and voltage are affected by turning the coil. Test can be used for homework.  [View full activity in 4.2 Uses of magnetism – Online delivery guide](http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-physics-a-j249-from-2016/delivery-guide/topic-gpat004-p4-magnetism-and-magnetic-fields/delivery-guide-gpadg010-p42-uses-of-magnetism?activity=287761#287761) | Link to [delivery guide](https://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-physics-a-j249-from-2016/delivery-guide/topic-gpat004-p4-magnetism-and-magnetic-fields/delivery-guide-gpadg009-p41-magnets-and-magnetic-fields) |
| 4 (1hr separate science only) | **P4.2e recall that a change in the magnetic field around a conductor can give rise to an induced potential difference across its ends, which could drive a current, generating a magnetic field that would oppose the original change** 🗹  **P4.2f explain how this effect is used in an alternator to generate a.c., and in a dynamo to generate d.c** 🗹 | **Starter:** Generator: Generator, magnetism, magnetic field  An interactive Java application featuring a virtual magnet, electromagnet, transformer and generator.  [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=290175#290175)  **Main:** Practical’s involving electricity  A series of demonstrations and practical’s which learners can attempt to grasp the key ideas of generators and transformers.  [View full activity in 4.2 Uses of magnetism – Online delivery guide](http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-physics-a-j249-from-2016/delivery-guide/topic-gpat004-p4-magnetism-and-magnetic-fields/delivery-guide-gpadg010-p42-uses-of-magnetism?activity=287765#287765)  Generation of alternating current  A presentation explaining AC generation.  [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=290183#290183)  **Plenary:** Potential difference- time graphs pupils explain the graphs for a.c. and d.c. | Link to [delivery guide](https://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-physics-a-j249-from-2016/delivery-guide/topic-gpat004-p4-magnetism-and-magnetic-fields/delivery-guide-gpadg009-p41-magnets-and-magnetic-fields) |
| 5 (1hr separate science only) | **P4.2g explain how the effect of an alternating current in one circuit, in inducing a current in transformers another, is used in transformers** 🗹 | **Starter:** How transformers work  A clear explanation of transformers in everyday appliances and how they are calculated.  [View full activity in 4.2 Uses of magnetism – Online delivery guide](http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-physics-a-j249-from-2016/delivery-guide/topic-gpat004-p4-magnetism-and-magnetic-fields/delivery-guide-gpadg010-p42-uses-of-magnetism?activity=287767#287767)  **Main:** practical transformers  <https://spark.iop.org/collections/transformers>  **Plenary:** Learners answer learning objective as a question. | Link to [delivery guide](https://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-physics-a-j249-from-2016/delivery-guide/topic-gpat004-p4-magnetism-and-magnetic-fields/delivery-guide-gpadg009-p41-magnets-and-magnetic-fields) |
| 6 (1hr separate science only) | **P4.2h explain how the ratio of the potential differences across the two depends on the ratio of the numbers of turns in each** 🗹  **P4.2i apply the equations linking the potential differences and numbers of turns in the two coils of a transformer (M1c, M3b, M3c)** 🗹  **PM4.2ii apply: potential difference across primary coil (V) / potential difference across secondary coil (V) = number of turns in primary coil / number of turns in secondary coil** 🗹 | **Starter:** Principle of transformers  Clear explanation of a transformer with a simulation which allows learners to change the transformer into either a step up/step down transformer. The coils are clearly illustrated.  [View full activity in 4.2 Uses of magnetism – Online delivery guide](http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-physics-a-j249-from-2016/delivery-guide/topic-gpat004-p4-magnetism-and-magnetic-fields/delivery-guide-gpadg010-p42-uses-of-magnetism?activity=287763#287763)  **Main:** Pupils show be given the opportunity to practice using the equation, including rearranging and converting between units  **Plenary:** SAM J249-04 question 23  <http://www.ocr.org.uk/Images/234630-unit-j249-04-physics-higher-tier-paper-4-sample-assessment-material.pdf> | Link to [delivery guide](https://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-physics-a-j249-from-2016/delivery-guide/topic-gpat004-p4-magnetism-and-magnetic-fields/delivery-guide-gpadg009-p41-magnets-and-magnetic-fields)  Link to [SAM](https://www.ocr.org.uk/Images/234630-unit-j249-04-physics-higher-tier-paper-4-sample-assessment-material.pdf) |
| 7 (1hr separate science only) | **P4.2j explain the action of the microphone in converting the pressure variations in sound waves into variations in current in electrical circuits, and the reverse effect as used in loudspeakers and headphones** 🗹 | **Starter:** How do speakers work?  Clear explanation of how speakers work.  <https://www.youtube.com/watch?v=mD6P39t8obo>  **Main:** microphone demo  <https://spark.iop.org/sound-waves>  Guitar pickup  A simple demonstration of the principles by which electric guitar pickups 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=290181#290181)  **Plenary:** compare loudspeakers to microphones – get pupils to discuss how the two work, hopefully they will come up with the idea that microphones are loud speakers in reverse. | Link to [delivery guide](https://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-physics-a-j249-from-2016/delivery-guide/topic-gpat004-p4-magnetism-and-magnetic-fields/delivery-guide-gpadg009-p41-magnets-and-magnetic-fields) |
| 8 (1hr separate science only) | End of topic quiz | Pupils to complete the end of chapter quiz P4  After completion pupils to swap and mark quizzes.  Pupils use their quizzes to create a revision list from Chapter **4*.*** | [End of chapter quiz P4](https://interchange.ocr.org.uk/Downloads/Gateway-Physics-Quizzes.zip) 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 |
| 2 | P4.2c, PM4.2i | [Video](https://www.youtube.com/watch?v=jxFB_CWKj5M) to show how to use *F* = *BIL* - can be used as flipped learning. |
| 2/3 | P4.2c, PM4.2i | [Worksheet](https://www.tes.com/teaching-resource/p7-magnetism-force-on-a-current-carrying-wire-11666999) for homework on *F* = *BIL*. |
| 3 | P4.2d | CUP Elevate [resource](https://www.ocr.org.uk/Images/587854-p4-cup-elevate-resource-electric-motors.zip) that can be used as flipped learning to introduce electric motors. |
| 6 | P4.2h, P4.2i, PM4.2ii | Cambridge International [resource](https://ocr.org.uk/rpgphys3) - Electromagnetism paper 3 Q9 and Electromagnetism paper 4 Q8b. Can be used as homework. |
| 6 | P4.2h, P4.2i, PM4.2ii | Alternative [transformer calculations](http://www.darvill.clara.net/multichoice/transform.htm) for homework. |
| 7 | P4.2j | Short [animation](https://www.youtube.com/watch?v=LKuHuyaRiHg) explaining how loudspeakers work can be used as flip learning. |
| 7 | P4.2j | Bitesize [explanation](https://www.bbc.co.uk/bitesize/guides/z9f92nb/revision/5) of how loudspeakers work which can be used as flipped learning. |
| 7 | P4.2j | [Video](https://www.youtube.com/watch?v=47_fyzZEjxw) recapping how electric motors work and showing a practical explanation of how loudspeakers work which can be used as flipped learning. |



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