Stewards Academy

# Science KS3:

# Year 8

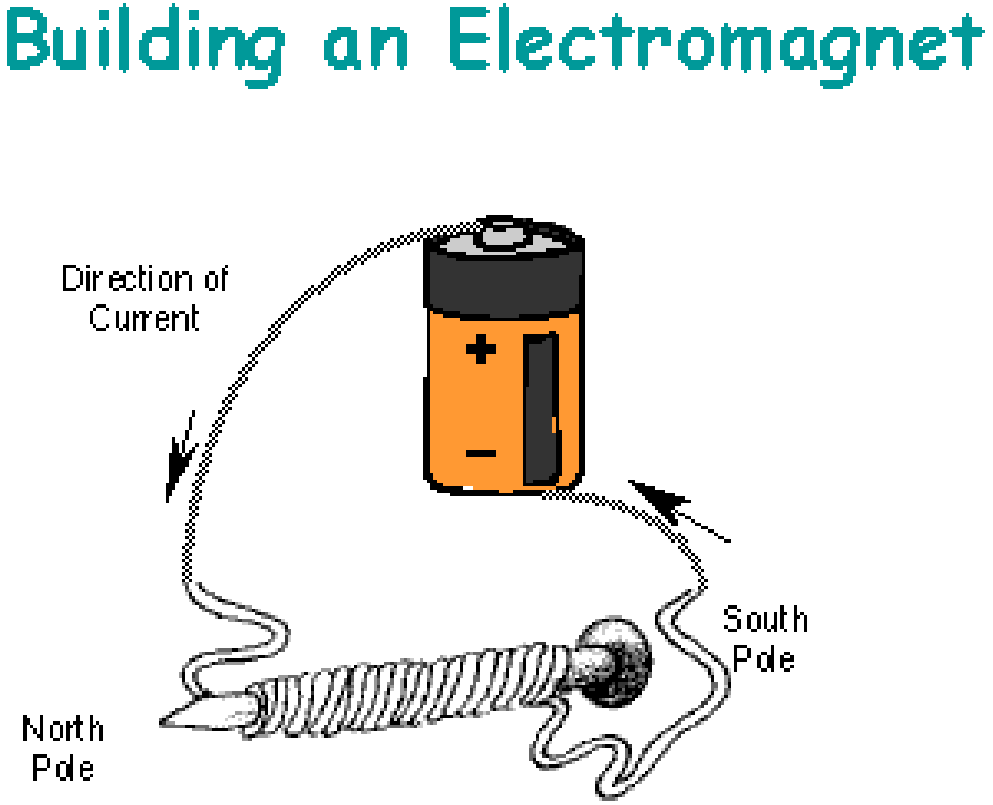
# Blended Learning Booklet

# Unit 6: Electromagnets

Name:

Form:

- *Aim to complete three lessons each week.*
- *Use the online text book to help you*
- https://www.kerboodle.com/app
- *Login using your user name ( 1st initial followed by surname all lower case eg Joe Blogs = jblogs)*
- *Password (initially the same as your user name) should be reset to stewards lower case*
- *Institution code is fu0*
- *Complete the work described in the four part lesson*
- Use the mark schemes provided to self assess your work and make corrections in blue pen.



# Big Picture – Year 8 Overview
# Science

Next Year

End of Year Assess-ment

End of Unit Test

Electromagnets and their uses

Magnets and magnetic fields

Electrostatic charge

Models of electrical circuits

Series and Parallel circuits

Voltage, resistance and current

UNIT 6

**Electromagnets**

**I will be able to** use models to explain how an electric circuits work. I will be able to identify different circuit components and make circuits designed to do different jobs. **I will be able to** explain how static charge accumulates on an object and ho this can cause lightening or r electric shocks. **I will be able to** explain how permanent and temporary magnets are made and how they are both surrounded by a magnetic field. **I will be able to** make an electromagnet, explain how to alter its strength and be able to describe several uses for electromagnets.

The rock cycle

The solar system

Global warming and climate change

The carbon cycle

Metal extraction and recycling

End of Unit Test

UNIT 5

**Earth**

**I will be able to** explain how everything we have has been created from materials from the Earth. **I will be able to** describe the Earth's structure, how rocks are formed and explain our Earths position in the Solar System and how this influences life on Earth. **I will be able to** explain how metals are extracted from rocks and are a finite resource that we should make sure we recycle so they don't run out. Finally, **I will be able to** state the composition of the atmosphere and the causes and effects of global warming

Rock types,

Structure of the Earth

End of Unit Test

Exo- and endo-thermic

Law of conservation of mass

Thermal decomposition

Combustion

Chemical reactions of metals

Metals and non-metals

Neutralisation

Acids and alkalis

UNIT 4

End of Unit Test

**Reactions**

**I will be able to** explain how useful chemical reactions can be in making medicines, fabrics and building materials. Specifically, **I will be able to** describe the reactions of acids and metals in detail. **I will be able to** explain exactly what happens to atoms in chemical reactions and how energy changes are observed during a chemical reaction.

Modelling waves

Waves, energy and radiation

The eye and colour vision

Light waves

The ear and hearing

Sound waves

UNIT 3

End of Unit Test

**Waves**

**I will be able to** explain what sound is and how we are able to hear. I will be able to explain how sound can vary in loudness and pitch. **I will be able to** explain the difference between sound and light waves and how our eyes enable us to see. **I will be able to** explain different properties of waves and name some other types of wave.

DNA , genes and inheritance

Natural selection

Human lifecycle

Reproduction

Adaptation

Variation

UNIT 2

End of Unit Test

**Genes**

**I will be able to** describe all stages of the human lifecycle, including how humans reproduce and how our features are inherited from our parents through our DNA. That all organisms show variation and this can help them survive. **I will be able to** explain how organisms have evolved and understand that this occurs though inheritance and natural selection.

Critique claims and justify opinion

Evaluating scientific sources

Scientific communication

Analysisng and evaluating data

Identifying variables

UNIT 1

Year 8

**The Enquiry Process**

**I will be able to** explain why controlling variables is important, evaluate and interrogate investigations, be able to communicate scientific ideas appropriately. **I will be able to** critically evaluate scientific claims and weigh up the risks and benefits of new inventions/discoveries

# ZOOM IN...

# MY LEARNING JOURNEY:

## *Subject: Electromagnets: Year 8 Unit: 6*

**UP NEXT**
End of year
Catch-up & Booster

**CAREERS**
- Electrical engineer
- Recycling centre operator
- Power station operator.

In this unit students learn to understand what is happening in an electric circuit and how electricity and magnetism are connected.
This unit supports future learning in KS3 topics on non-contact forces and gravitational fields; how electricity is generated, paid for and its energy transferred. At KS4 this knowledge will provide the basis for students to be able to learn about how a force is generated by an electric current in a magnetic field and how this applies to motors. Also, about electromagnetic induction and how generators work. Plus, how electricity is generated in power stations and supplied to homes via the national grid.

**DEVELOPING COURAGE**

**C** That electricty is responsible with providing us with the standard of living we are used to.

**O** To set up and investicate electrical circuits

**U** Understanding how electricty and magnetism are linked

**R** in learning to use models to describe how an electric circuit works

**A** How using electricty responsibly in the home makes electricty bills more ecconomical

**G** Share our scientific knowledge

**E** Investigating how to make an electromagnet

**PREVIOUS LEARNING**

Pupils should have some experience of the following: That appliances such as kettles run on electricity. A bulb will only light if the circuit is complete. An open switch causes a bulb to go out and a closed switch causes a bulb to light. Conductors such as metals allow a current to pass, insulators do not. You need to work safely when constructing circuits. Bulbs/buzzers get brighter/louder if the number of cells (potential difference) increases. Circuit symbols are used in drawing electrical circuits.

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**WHAT WE KNOW/ REMEMBER**

- .....
- .....
- .....
- .....
- .....

**RECOMMENDED READING**

1. Charging About: The Story of Electricity (Science Works) by Jacqui Bailey,
2. A Beginner's Guide to Electricity and Magnetism by Gill Arbuthnott,
3. Nick and Tesla's High-Voltage Danger Lab: A Novel with Electromagnets, Burglar Alarms, and Other Gadgets by Bob Pflugfelder & Steve Hockensmith

**PERSONAL OBJECTIVES**

- .....
- .....
- .....
- .....
- .....
- .....
- .....
- .....
- .....
- .....

# Lesson 1: Book 1 – Potential difference (2.1.1)

## Connection

Have a look at the topic overview and the zoom in.

Populate what you know and your personal objectives.

## Activation

LI: Set up a circuit to measure potential difference and use a model to describe it

1. Make a note of the date, title and the LI
2. Key words – cell, battery, potential difference, voltmeter, volts
3. Read pages 28-29
4. https://www.youtube.com/watch?v=w82aSjLuD_8
5. Copy the diagram of the circuit on page 29
6. Answer Questions A, B

## Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

## Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

# Lesson1 Answers: Potential difference

Connection

N/A

Activation & Demonstration

| | |
|---|---|
| In-text questions | **A** voltmeter<br>**B** volt |
| Activity | **Are bigger batteries better?**<br>Plan should include how to measure the size of batteries, decision on diameter/weight/volume, use of voltmeter to measure the potential difference across the battery, collect a selection of different batteries, measure the 'size' and potential difference, record results in a table, plot the correct graph type. |
| Summary questions | **1** push, energy, voltmeter (3 marks)<br>**2a** The potential difference is bigger because the extra cell supplies more energy (2 marks)<br>**b** The buzzer would not work, the cells cancel out. (2 marks)<br>**3** Extended response question. (6 marks) Example answers:<br>The p.d. across the bulb is the same as the p.d. across the battery.<br>The p.d. across the battery shows the work done by the battery on the charges/electrons.<br>The p.d. across the bulb shows the work done by the charges in the component.<br>They are the same because the energy transferred by the battery is the same as the energy transferred to the component.<br>They are different because one shows the work done on the charges, and the other shows the work done by the charges. |

# Lesson 2: Book 1 – Resistance (2.1.2)

## Connection

1. What does the potential difference provide in a circuit?

2. What is the unit for measuring potential difference?

3. How is a voltmeter inserted into a circuit?

## Activation

LI: Set up a circuit to show what components with resistance do and use a model to describe it

1. Make a note of the date, title and the LI
2. Key words – resistance, ohms, electrical conductor, electrical insulator
3. Read pages 30-31
4. https://www.youtube.com/watch?v=FFHUoWFtab0
5. Copy the diagrams of the circuits on page 30 to show the effect of component with more or less resistance on the flow of current.
6. Copy the equation for calculating resistance.
7. Answer Questions A, B & C

## Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

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## Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

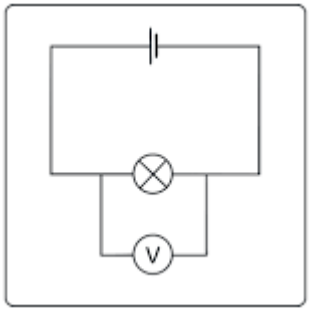
# Lesson 2 Answers: Resistance

## Connection

1. Potential difference is the push required to make the charges/electrons in the circuit flow.

2. Volts V

3. In parallel




## Activation & Demonstration

| | |
|---|---|
| In-text questions | **A** How easy or difficult it is for the charges to pass through a component in a circuit.<br>**B** ohms<br>**C** Use a pipe with a very small diameter. |
| Activity | **What's the resistance?**<br>$\text{resistance} = \frac{\text{p.d.}}{\text{current}} = \frac{12\text{V}}{0.6\text{A}} = 20\ \Omega$ |
| Summary questions | **1** potential difference, resistance, resistance, electrons, energy, conductors, insulators (7 marks)<br>**2a** You calculate the resistance by dividing the p.d. by the current. (1 mark)<br>**b**<br>$\text{resistance} = \frac{2\text{ V}}{0.4\text{ A}}$<br>= 5 Ω (1 mark)<br>$\text{resistance} = \frac{4\text{ V}}{0.8\text{ A}}$<br>$\text{resistance} = \frac{2\text{ V}}{0.4\text{ A}}$<br>**c** The wires are like pipes with a wide diameter. The water flows easily through them, like a large current in a circuit. The resistor is like a narrow pipe. It produces a lower rate of flow, just like the lower current. (4 marks)<br>**3** Extended response question (6 marks). Example answers:<br>Both conductors and insulators have resistance.<br>Conductors have many charges that can move readily. Conductors have low resistance.<br>Insulators do not contain many charges that are free to move. Insulators have high resistances.<br>Most conductors are metals that have electrons that are free to move.<br>Current in an insulator would be smaller than the current through a conductor (for the same potential difference). |

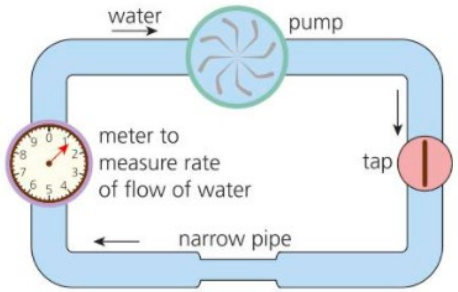
# Lesson 3: Book 1 – Series and Parallel circuits (2.1.3)

## Connection

1. What are the units for measuring resistance?

2. What is the equation for calculating resistance?

3. How does the diagram below model an electrical circuit?




## Activation

LI: Set up series and parallel circuits and measure the potential difference across components

1. Make a note of the date, title and the LI
2. Key words – series, parallel
3. Read pages 32-33
4. https://www.youtube.com/watch?v=m4jzgqZu-4s
5. Copy the diagrams at the bottom of page 32 showing how voltage is measured across components in a series circuit and also in a parallel circuit ( top of page 33).
   Answer Questions A, B

## Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

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## Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

# Lesson 3 Answers: Series and parallel circuits

Connection

1. Ohms

2. Resistance = voltage / current

3. Pump = battery (potential difference/voltage)
Water = flow of electrons (current)
Narrow pipe = a component (resistance)

Activation & Demonstration

| | |
|---|---|
| In-text questions | **A** The p.d. across each of the components in a series circuit adds up to the p.d. across the battery.<br>**B** 12V |
| Summary questions | **1** one, more than one, parallel, series (4 marks)<br>**2** As you add more bulbs in a series circuit, the brightness of the bulbs decreases and the p.d. across each bulb decreases (2 marks)<br>**3a** The p.d. across the first bulb is the same as the p.d. across the battery, which has not changed (1 mark).<br>**b** The resistance decreases (1 mark) adding another bulb increases the current (1 mark) the p.d. is the same (1 mark) so the resistance = $\frac{V}{I}$ is smaller (1 mark). |

# Lesson 4: Book 1 – Current (2.2.1)

## Connection

1. Draw 2 lamps in a series and a parallel circuit

2. How is the voltage split between 2 lamps in a series circuit ?

3. How is the voltage split between 2 lamps in a parallel circuit ?

## Activation

LI: Describe what happens to the current in series and parallel circuits and what happens when you change components

1. Make a note of the date, title and the LI
2. Key words – current, ammeter, motor
3. Read pages 34-35
4. https://www.youtube.com/watch?v=8Posj4WMo0o
5. Copy the diagrams at the bottom of the page 34 showing how current moves in a series circuit and also in a parallel circuit ( top of page 35).
6. Answer Questions A, B & C

## Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

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## Consolidation

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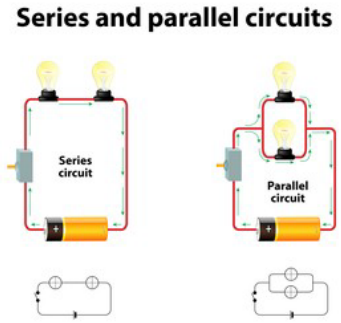
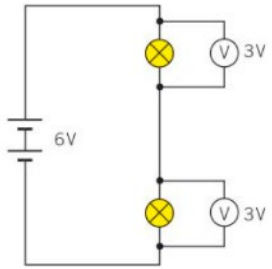
# Lesson 4 Answers: Current

## Connection

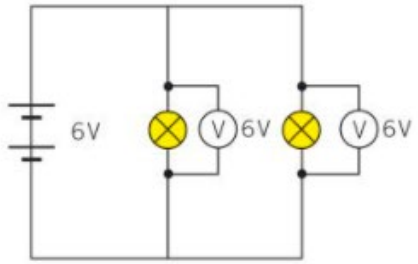
1.




2. Shared




3. Same




## Activation & Demonstration

| | |
|---|---|
| In-text questions | **A** charge flowing per second<br>**B** it decreases<br>**C** it increases |
| Activity | **Current issues**<br>0.2 ÷ 2 = 0.1 A If you double the number of the bulbs but keep the p.d. the same, the current will halve.<br>Confusing words<br>charge: the electron has a negative charge; there is a charge to go into a theme park<br>current: current is the amount of charge flowing per second; there can be a strong current in the river<br>cell; component that pushes change around a circuit; the smallest functional unit in an organism/American term for a mobile phone; a police or prison cell |
| Summary questions | **1** charge, second, electrons, ammeter, amps, A (6 marks)<br>**2a** Series circuit with battery of cells, motor, and switch. Students should annotate the switch, and explain how this can be switched on and off to control the circuit.(2 marks)<br>**b** The electrons move/a current flows. (1 marks)<br>**3** Extended response (6 marks). Example answers:<br>Start with a small series circuit with a switch, lamp, and cell. Show that the light comes on as soon as you press the switch. Make the leads longer, and show that this has no effect. Make a really big circuit, and show that the lamp comes on straight away. Use the rope model to show that the bulb comes on straight away if the charges are already in the wires. It does not matter how long the wire is, the bulb still comes on straight away. If the charges were in the battery, there would be a time delay. |

# Lesson 5: Book 1 – Charging up (2.2.2)

## Connection

1. What are the units for measuring current?

2. What is used to measure current

3. How does the current flow in a series circuit compared to a parallel circuit?

## Activation

LI: Describe the properties of an electric field and how charged objects interact.

1. Make a note of the date, title and the LI
2. Key words – electrostatic force, electrons, attract, repel, positively charged, negatively charged, electric field
3. Read pages 36-37
4. https://www.youtube.com/watch?v=yc2-363MIQs
5. Copy the diagrams at the bottom of the page 36 showing how a balloon gains an electrostatic charge
6. Answer Questions A, B & C

## Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

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## Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

# Lesson 5 Answers: Charging up

Connection

1. Amps

2. Ammeter

3. In series the current is the same anywhere in the circuit. In parallel the current splits along the different branches of the circuits. The amount of current that flows depends on the resistance of the components in the branch.

Activation & Demonstration

| | |
|---|---|
| In-text questions | **A** tiny (sub-atomic) particle with a negative charge<br>**B** Suitable diagrams showing the transfer of electrons from the rod to the cloth.<br>**C** If there is an electric field then a charged object experiences a force. |
| Summary questions | **1** positive, negative, electrons, repel, attract, decreases (6 marks)<br>**2a** Electrons are transferred between the balloon and the jumper. The balloon is charged, but the wall is neutral. The charge of the balloon repels like charges from the surface of the wall. (3 mark)<br>**b** The electrons on the charged object flow through the wire and not through you. (1 mark)<br>**3** Extended response question (6 marks). Example answers: Gravitational and electric fields produce forces. You cannot see or feel a gravitational or electric field. They produce non-contact forces. Gravitational fields are produced by masses. Electric fields are produced by charges. Gravitational fields produce forces that only attract. Electric fields produce forces that attract and repel. |

# Lesson 6: Book 2 – Magnets and magnetic field (2.3.1)

## Connection

1. Which charges attract and which repel?

2. What happens when you rub a balloon on your jumper?

3. Give an example of electrostatic charge

## Activation

LI: Describe how magnets interact and what magnetic filed diagrams tell you about the size and direction of a magnetic field

1. Make a note of the date, title and the LI
2. Key words – permanent magnet, magnetic poles, magnetic field, magnetic force
3. Read pages 36-37
4. https://www.youtube.com/watch?v=vgWiBYuPpjw
5. Copy the red and blue bullet points page 36
6. Copy the diagram top of page 37 with the plotting compasses showing the magnetic field around the magnet
7. Answer Questions A, B

## Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

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## Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

# Lesson 6: Answers Magnets and magnetic fields

Connection

1. Like charges repel eg ++ -- Opposite charges attract eg -+

2. The jumper and balloon start off neutral. Then electrons transfer from the jumper to the balloon leaving the jumper with a positive charge ad the balloon with a negative charge.

3. lightening, getting a shock off a car door handle

Activation & Demonstration

| | |
|---|---|
| In-text questions | **A** north and south **B** use a compass/iron filings |
| Activity | How strong? |
| Type of magnet | Distance between paperclip and magnet to get it to float (cm) |
| | |
| Summary questions | **1** north, south, repel, attract, compass, magnetic field (6 marks)<br>**2** A compass needle always points in a north–south direction.<br>The compass needle lines up in the Earth's magnetic field (which does not change). (2 marks)<br>**3** Example answers (6 marks):<br>Magnetic fields lines show the direction and strength of a magnetic field. Field lines go from a north pole to a south pole. They are closer near the poles of a magnet. Two attracting magnets will have lines from the north pole on one to the south pole on the other. The field lines behave like elastic bands. They try to straighten, so the magnets move together. For repelling magnets the lines are pushed apart. To straighten then, the magnets need to move further apart. Answers include a drawing of magnetic field lines around attracting and repelling magnets. |

# Lesson 7: Book 2 – Electromagnets (2.4.1)

## Connection

1. Which poles attract and which repel?

2. What does it mean when the lines showing a magnetic field are closer?

3. How does a compass work?

## Activation

LI: Make an electromagnet and explain how to change its strength

1. Make a note of the date, title and the LI
2. Key words – electromagnet, core, solenoid
3. Read pages 38-39
4. https://www.youtube.com/watch?v=cxELqN7wjS0
5. Copy the diagrams at the top of page 38 to show the difference the magnetic field round a coil of wire.
6. Answer Questions A, B

## Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

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## Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

# Lesson 7 Answers: Magnets and magnetic fields

## Connection

1. Like poles repel
   eg NN SS
   Opposite poles attract eg NS

2. Closer lines indicate the magnetic field is stronger

3. A compass is a mini magnet that lines itself up with the earths magnetic field.

## Activation & Demonstration

| | |
|---|---|
| In-text questions | **A** magnetic<br>**B** type of core, number of turns, current |
| Summary questions | **1** current, magnetic field, coil, current, decreases (5 marks)<br>**2** Diagram showing a wire wound around the nail.<br>The ends of the wires are attached to the battery using the leads and crocodile clips. (2 marks)<br>**3** Example answers (6 marks):<br>There is a magnetic field around a wire carrying a current. The field is stronger if there are more loops of wire. This is because the fields add together. A bigger current produces a stronger magnetic field. The magnetic material inside the coil becomes magnetised when you put it in a magnetic field. This increases the strength of the electromagnet. |

# Lesson 8: Book 2 – Using electromagnets (2.4.2)

## Connection

1. What is an electromagnet?

2. What factors can be used to make an electromagnet stronger?

3. What is the difference between using iron or steel in an electromagnet?

## Activation

LI: Describe why and how electromagnets are useful

1. Make a note of the date, title and the LI
2. Key words – electric bell, circuit breaker, loud speaker
3. Read pages 40-41
4. https://www.youtube.com/watch?v=qMB5nQmB82M
5. Copy the diagram of a bell at the top of page 40 – label with the bullet points to explain how an electric bell works
6. Answer Questions A, B & C

## Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

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## Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

# Lesson 8 Answers: Electromagnets

## Connection

1. A magnet that can be turned on and off by turning an electric current on and off

2.
-More coils/tuns of wire
-Increase the current flowing
-Use a metal/steel core

3. An iron core makes a temporary magnet. A steel core makes a permanent magnet.

## Activation & Demonstration

| | |
|---|---|
| In-text questions | **A** It becomes an electromagnet/produces a magnetic field.<br>**B** The circuit is complete again, and a current flows.<br>**C** Because you can make them strong enough to lift a car/because you can turn them on and off. |
| Summary questions | **1** electromagnet, ring, fuse, reset, permanent, repel and attract (6 marks)<br>**2** Similarity: both contain a solenoid/when a current flows the solenoid becomes magnetic/the electromagnet breaks the circuit<br>Difference: the circuit in a bell continually makes and breaks/the circuit in the circuit breaker has to be reset each time (2 marks)<br>**3** Example answers (6 marks):<br>Electromagnet is on the two walls.<br>A magnetic material is on the doors.<br>When a current flows in the electromagnet there is a magnetic field around it.<br>The magnetic material on the doors is attracted to it.<br>The doors stay open while a current flows.<br>When the fire alarm sounds, the current to the electromagnet is cut.<br>There is no longer a magnetic field around the electromagnet.<br>The magnetic material on the doors is no longer attracted to it.<br>The doors close. |

# Lesson 9 & 10: Book 1 & 2 – Revision

## Connection

1. Why are electromagnets more useful than permanent magnets?

2. Give 3x uses of an electromagnet

3. Explain how an electric bell works.

## Activation

LI: Practice some Big Idea questions about Electromagnets

1. Make a note of the date, title and the LI
2. Read page 39 for Book 1 questions and page 43 for Book 2 questions
3. Use the previous pages of the book and your notes to help you answer the questions

## Demonstration

Work with others on your table to answer as many of the questions as you can.

In 45 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

## Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

# Lesson 9: Answers Magnets and magnetic fields Activation & Demonstration

Connection

1. The magnet can be turned off and on

2.
Electric bell
Circuit breaker
Loud speaker

3. Press the bell to complete the circuit. The electromagnet is on and attracts the iron armature which then breaks the circuit again. The electromagnet turns off the armature is no longer attracted and the spring causes the armature to spring back. The process repeats for as long as the bell is pressed

| | |
|---|---|
| Lesson 6 Revision questions | **1a** B (1 mark)<br>**b** Circuit A: connect a lead from the bulb to the battery. Circuit C: turn one of the cells around. (2 marks)<br>**2a** repel (1 mark) **b** attract (1 mark) **c** field, force (2 marks)<br>**3a** The quantity that tells you how much a component reduces the current flowing through it (1 mark)<br>**b** An insulator has a high resistance (1 mark), a conductor has a low resistance (1 mark)<br>**4a** Credit suitable parallel circuits with two cells on one branch, with a bulb and a switch on each of the two other branches. (2 marks)<br>**b** parallel (1 mark) **c** A, B, A, and B (3 marks) **d** Attach an ammeter between the bulbs and the switches. (2 marks)<br>**5a** The push of the battery/energy transferred in a component. (1 mark)<br>**b** The potential difference that the lamp is designed to work at. (1 mark)<br>**c** resistance $= \frac{\text{p.d.}}{\text{current}} = \frac{3\text{V}}{0.4\text{A}} = 20\ \Omega$ (2 marks)<br>**d** The current increases (1 mark) and the bulb is brighter (1 mark).<br>**6a** Reading on the ammeter is halved, because there is twice the resistance (2 marks).<br>**b** The voltmeter reading is halved, there is less energy transferred to the lamp because the current is less. (2 marks)<br>**7** This is an extended response question. Students should be marked on the use of good English, organization of information, spelling and grammar, and correct use of specialist scientific terms. The best answers will explain in detail how the rod becomes charged and is able to attract the small pieces of paper (maximum of 6 marks).<br>Examples of correct scientific points:<br>Both the rod and cloth contain atoms.<br>Atoms contain electrons, protons, and neutrons.<br>Electrons are negatively charged.<br>Protons are positively charged.<br>When you rub the rod, electrons move from the cloth to the rod (or vice versa).<br>The rod becomes negatively charged/cloth becomes positively charged (or vice versa, as above)<br>The rod repels the electrons on the top of the pieces of paper.<br>The top of the pieces of paper become positively charged.<br>The paper is attracted to the rod.<br>**8** It incorporates high resistance (1 mark) that reduces the current to a safer level (1 mark). |

# Lesson 10: Answers Magnets and magnetic fields

Activation & Demonstration

| | |
|---|---|
| Lesson 10 Revision questions | **1a** A coil of wire. (1 mark)<br>**b** A coil of wire carrying a current, usually wrapped around a core of iron. (1 mark)<br>**c** A magnet that does not lose its magnetism. (1 mark)<br>**d** A region where a magnetic material or magnet experiences a force. (1 mark)<br>**2a** Diagram of the magnetic field around a bar magnet like that on page 37 of the Student Book. (1 mark for shape, 1 mark for arrows on field lines from north to south)<br>**b** A: attract B: repel (2 marks)<br>**c** You can turn an electromagnet on and off but you cannot turn a permanent magnet on and off. (1 mark)<br>**3a** Diagram of the magnetic field around the Earth like that on page 37 of the Student Book. (1 mark for shape, 1 mark for arrows on field lines from south geographic pole to north geographic pole.)<br>**b i** There are arrows on the field lines. (1 mark)<br>**ii** The field lines are close together. (1 mark)<br>**4** use a larger current, wind more turns on the coil, use a steel core (4 marks)<br>**5a** coil of wire, magnet (2 marks)<br>**b i** they both contain a wire carrying a current. (1 mark)<br>**ii** they are both make and break circuits. (1 mark)<br>**6a** The surgeon should use an electromagnet, so they can turn the magnet on and off. (2 marks)<br>**b** If the splinter is not made of a magnetic material it will not be attracted to the magnet. (2 marks)<br>**7a** Diagram of the field around two repelling magnets.<br>Correct arrows on lines. (2 marks)<br>**b** The force on a magnetic material due to one of the magnets is balanced by the force due to the other magnet. (1 mark)<br>**c** If one magnet was stronger than the other the neutral point would be further from it, because the magnetic field strength decreases with distance. This means you would need to be further from it to produce a force equal to that of the weaker magnet. (2 marks)<br>**d** More field lines around one of the magnets.<br>Neutral point nearer weaker magnet (2 marks)<br>**8a** The Earth behaves as if there is a bar magnet at the centre of it.<br>A compass always points in the same direction, which enables you to navigate. (2 marks)<br>**b** The magnet would not roll directly down the slope.<br>The magnetic field of the Earth would exert a force on it. (2 marks) |

# Lesson 11: Revision

## Connection

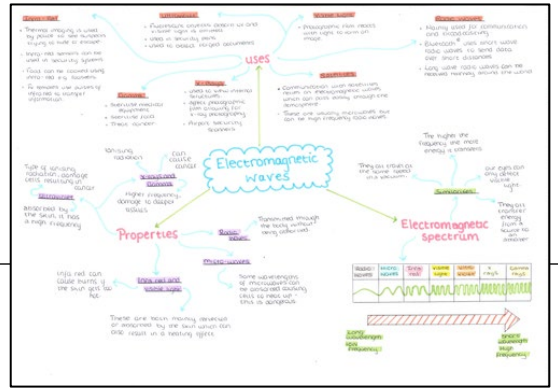
N/A

## Activation

LI: Complete a piece of revision work

1. Make a summary sheet OR
2. Make flash cards OR
3. Complete the revision questions from book 1 (page 197) and 2 (page 161)

mind map



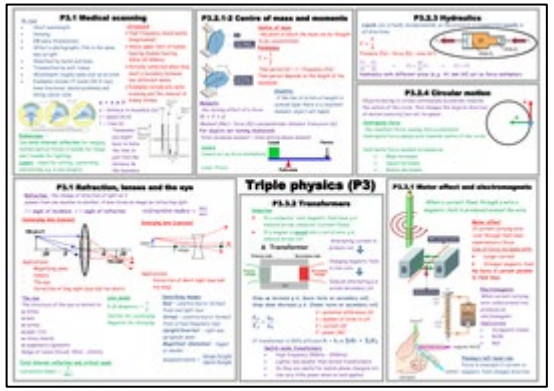

## Demonstration

Use your revision work to quiz the person sat next to you OR work in a group to quiz each other.

flash cards

## Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher




Summary sheet

| Attainment Band | Electricity & Electromagnets<br>Knowledge and Understanding |
|---|---|
| Yellow/Yellow + | • Explain how electrical conductors work, using models; explain the strengths and weaknesses of different models and analogies that describe how current works<br>• Compare the strengths and weaknesses of different models<br>• Derive a mathematical relationship between voltage and current, and make predictions from it<br>• Use models and analogies to explain how different factors affect resistance<br>• Compare the strengths and weaknesses of different models<br>• Explain why components behave differently in series and parallel circuits<br>• Make predictions about current and voltage in different circuit arrangements; explain how the domestic ring main works<br>• Explain the advantages of using either series or parallel circuits<br>• Describe early ideas about magnetism<br>• Explain how historical ideas about magnetism were developed<br>• Explain how scientific methods can be used to develop ideas further<br>• Use the domain theory to explain how materials become magnetised and demagnetised; evaluate experimental designs and make improvements<br>• Draw and explain conclusions about magnets using the domain theory; use data to evaluate different methods of making magnets and testing magnetic strength<br>• Evaluate the concept of magnetic field and force lines<br>• Explain evidence for how the Earth's magnetic field works<br>• Analyse data and draw conclusions; use models and analogies to explain the factors affecting the strengths of electromagnets<br>• Explain the advantages and disadvantages of using electromagnets |
| Blue | • Describe what current is, using models and analogies<br>• Relate current and voltage to different models<br>• Describe the relationship between voltage, current and resistance; present results using appropriate graphs<br>• Investigate factors affecting resistance<br>• Relate the current, voltage and resistance to the rope model<br>• Draw and interpret circuit diagrams for series and parallel circuits; predict the brightness of bulbs in these circuits<br>• Use models to explain what is happening to the current and voltage in series and parallel circuits; calculate the current and the voltage in series and parallel circuits<br>• Describe different uses of series and parallel circuits<br>• Explain how historical ideas about magnetism were developed<br>• Describe different methods of making permanent magnets; design an investigation to compare different methods of making magnets<br>• Interpret data using graphs; compare methods of making permanent magnets<br>• Explain the presence of a magnetic field and indicate how it varies with regard to field lines, direction and strength<br>• Describe the geodynamo theory<br>• Collect accurate, reliable evidence; describe the factors that affect the strength of electromagnets<br>• Compare and contrast the use of magnets and electromagnets in different applications |

Stewards Academy
Science Department
ASSESSMENT FEEDBACK
Year 8 – 6

| | |
|---|---|
| Green | • Recognise and use symbols to represent components in a circuit; investigate electrical conductors and insulators.<br>• Recognise the units of voltage; use different models to describe voltage.<br>• Describe the term 'resistance' and recognise the units; collect reliable data from circuits.<br>• Describe resistance and its effect in a circuit.<br>• Use different models to describe voltage, current and resistance.<br>• Recognise circuits as being series or parallel and identify the features of each.<br>• Make measurements of current and voltage in series circuits and parallel circuits.<br>• Identify if a circuit is arranged in series or parallel or both.<br>• Describe early ideas about magnetism.<br>• Describe the differences between permanent and temporary magnets; describe how to test the strength of a magnet.<br>• Follow a procedure to collect reliable, accurate and valid data.<br>• Record and display ideas about magnetic fields.<br>• Describe some effects of the Earth's magnetic field.<br>• Plan to investigate the strength of electromagnets; describe what an electromagnet is.<br>• Describe different applications of magnets and electromagnets. |
| White | • Some of the above elements have been achieved. |