

PiXL Independence:

GCSE Physics – Student Booklet

KS4

Topic: Magnetism and electromagnetism

Contents:

- I. Level 1- Multiple Choice Quiz – 20 credits
- II. Level 2 - 5 questions, 5 sentences, 5 words – 10 credits each
- III. Level 3 - Science in The News – 100 credits
- IV. Level 4 - Scientific Poster – 100 credits
- V. Level 5 - Video summaries – 50 credits each

PiXL Independence – Level 1
Multiple Choice Questions
GCSE Physics – Magnetism and electromagnetism

INSTRUCTIONS

Score: /20

- Read the question carefully.
- Circle the correct letter.
- Answer all questions.

-
1. Which of the following metals is NOT magnetic?
 - a. Cobalt
 - b. Nickel
 - c. Iron
 - d. Copper

 2. The lines of force around a magnet are called a ...
 - a. magnetic field.
 - b. magnetic line.
 - c. magnetic space.
 - d. magnetic circuit.

 3. Which ONE of the statements about magnetising a material is FALSE?
 - a. An iron bar can be made into a magnet with a solenoid.
 - b. An unmagnetised material can be magnetised if stroked by a magnet.
 - c. When an unmagnetised material is magnetised, it will have two poles.
 - d. The poles of a magnet are reversed if it is heated.

 4. Which material is usually used to make permanent magnets instead of iron?
 - a. Brass
 - b. Steel
 - c. Copper
 - d. Aluminium

 5. Why is iron metal not used to make permanent magnets?
 - a. Iron loses its magnetism easily.
 - b. Iron is too expensive to work.
 - c. Iron is a finite resource.
 - d. Iron is too soft a metal.

 6. Choose the correct definition of a solenoid. A solenoid is a long coil of...
 - a. bare copper wire.
 - b. insulated wire.
 - c. wire made from a magnetic material.
 - d. insulating material.

7. How can a solenoid be made into an electromagnet?
 - a. Passing a current through the solenoid.
 - b. Inserting an iron bar in the solenoid.
 - c. Adding an aluminium core.
 - d. Pass a current through the coil and add an iron bar.

8. Which of the following is NOT a device which uses electromagnets?
 - a. A circuit breaker.
 - b. A security light.
 - c. An electric bell.
 - d. A relay.

9. Which of the following is NOT a way of increasing the strength of an electromagnet?
 - a. Using an iron core.
 - b. Increasing the number of coils.
 - c. Increasing the current.
 - d. Leaving the current switched on for a long time.

10. When a current-carrying wire in the presence of a magnetic field experiences a force, this is called the...
 - a. electric effect.
 - b. Fleming's effect.
 - c. motor effect.
 - d. magnetic effect.

11. When using Fleming's left hand rule, the second finger of the rule represents...
 - a. current.
 - b. voltage.
 - c. magnetic field.
 - d. movement.

12. Choose the correct equation for magnetic flux density.
 - a. $F = \frac{BI}{l}$
 - b. $F = BIl$
 - c. $F = Bel$
 - d. $F = \frac{Be}{l}$

13. Calculate the force on a conductor if the magnetic flux density is 0.05 T, the length of the conductor in the field is 50 mm and the current is 2 A.
 - a. 5 N
 - b. 1.25×10^{-3} N
 - c. 2 N
 - d. 5×10^{-3} N

14. The unit of magnetic flux density is the...
 - a. tesla.
 - b. farad.
 - c. sievert
 - d. pascal

15. A coil that spins in a uniform magnetic field is known as...
 - a. an electric current generator.
 - b. an induced current generator.
 - c. an alternating current generator.
 - d. a direct current generator.

16. Which of the following will NOT increase the current of a simple generator?
 - a. Using a magnet with a stronger magnetic field.
 - b. Using a coil with a bigger area.
 - c. Adding more turns of wire.
 - d. Using larger commutator rings.

17. The induced potential difference waveform of a simple generator can be displayed on...
 - a. an oscilloscope.
 - b. a voltmeter.
 - c. a potentiometer.
 - d. a galvanometer.

18. A dynamo is also known as...
 - a. an induced current generator.
 - b. an alternating current generator.
 - c. a direct current generator.
 - d. an electric current generator.

19. Two separate coils of insulated wire wound around the same iron core is known as...
 - a. an inducer.
 - b. a transformer.
 - c. a transistor.
 - d. a generator.

20. A transformer works with...
 - a. a.c. current only.
 - b. a.c. and d.c. current.
 - c. d. c. current only.
 - d. a. c. current and a static magnetic field.

PiXL Independence – Level 2

5 questions, 5 sentences, 5 words

GCSE Physics – Magnetism and electromagnetism

INSTRUCTIONS

- For each statement, use either the suggested website or your own text book to write a 5-point summary. In examinations, answers frequently require more than 1 key word for the mark, so aim to include a few key words.
- It is important to stick to 5 sentences. It is the process of selecting the most relevant information and summarizing it, that will help you remember it.
- Write concisely and do not elaborate unnecessarily, as it is harder to remember and revise facts from a big long paragraph.
- Finally, identify 5 key words that you may have difficulty remembering and include a brief definition. You might like to include a clip art style picture to help you remember it.

Example:

QUESTION:	Summarise magnets and magnetic fields.			
Sources:	Website – 1. http://www.bbc.co.uk/education/guides/zxxbkqt/revision 2. http://www.gcsescience.com/pme1.htm			
	1. Magnets have a north and a south pole, opposite poles attract, same poles repel. 2. Magnetic materials are cobalt, iron and nickel. 3. There is a magnetic field surrounding the magnet, this can be seen using iron filings and a plastic sheet. 4. An unmagnetised magnetic material can be made magnetic by placing it within a magnetic field. This is called induced magnetism. 5. Steel is used instead of iron to make permanent magnets as iron loses its magnetism easily. Steel is an alloy containing iron.			
Poles – north and south	Cobalt, iron, nickel	Magnetic field – north to south iron filings	Induced magnetism	Steel is an alloy containing iron.

QUESTION 1:	What is an electromagnet and how can you alter its strength?
Sources:	Website – 1. http://www.bbc.co.uk/education/guides/zmm39j6/revision 2. https://www.brainpop.com/technology/energytechnology/electromagnets/

--	--	--	--	--

--	--	--	--	--

QUESTION 2:	What is the motor effect and how does it link to Fleming' s left hand rule?
Sources:	Website – 1. http://www.bbc.co.uk/education/guides/zmm39j6/revision/4 2. http://www.s-cool.co.uk/a-level/physics/forces-in-magnetic-fields/revise-it/the-motor-effect-and-flemings-left-hand-rule

--	--	--	--	--

--	--	--	--	--

QUESTION 3:	What is an a.c. generator and how does it work?
Sources:	Website – 1. https://www.youtube.com/watch?v=H8KubamfH4U 2. https://www.miniphysics.com/a-c-generator.html

--	--	--	--	--

--	--	--	--	--

QUESTION 4:	How does a loudspeaker work?
Sources:	Website – <ol style="list-style-type: none">1. http://www.physics.org/article-questions.asp?id=542. http://www.gcsescience.com/pme14.htm

--	--	--	--	--

--	--	--	--	--

QUESTION 5:	What is a transformer? Include the transformer equation showing a worked example question.
Sources:	Website – 1. http://www.gcscience.com/pme23.htm 2. http://www.passmyexams.co.uk/GCSE/physics/transformers.html

--	--	--	--	--

--	--	--	--	--

PiXL Independence – Level 3

Science in the News

GCSE Physics – Magnetism and electromagnetism

Fake news

Sensationalised news stories have been around for some time, but with the mass growth of social media, the problem seems to have grown in recent years. At the very least, the US Presidential election has certainly highlighted the impact that misleading information can have. www.tiny.cc/fakenews2

At home, the Brexit vote also suffered from the circulation of misleading news stories www.tiny.cc/fakenews3

Therefore, the ability to identify real information, track it back to the source article and make your own judgement is a very important skill. This activity will help you develop that skill.

How dangerous are solar flares?

News article: <http://chicagotonight.wttw.com/2017/09/19/fermilab-scientist-warns-solar-flares-could-devastate-infrastructure>

News article: <http://www.telegraph.co.uk/news/2017/09/09/solar-flare-energy-billion-hydrogen-bombs-lights-british-skies/>

Discussion article: <https://www.space.com/38115-sun-monster-solar-flares-seven-days.html>

Real article: <https://hesperia.gsfc.nasa.gov/sftheory/spaceweather.htm>

Task 1:

You need to produce a 1 page essay on what a solar flare is and the risks associated with solar flares.

Essay section	Activity
Introduction	Summarise the recent events that have caused concern regarding solar flares.
Describe	Describe what solar flares are and how they are formed.
Explore	Explore how solar flares could impact the Earth.
Evaluate	Evaluate how the Earth is protected from solar flares. Are there any other precautions or advice that would be suitable if there was a large solar flare?

What are the risks when having an MRI scan?

News article: <https://www.nytimes.com/2017/06/23/well/live/do-mri-scans-cause-any-harm.html>

NHS article: <http://www.nhs.uk/conditions/mri-scan/Pages/Introduction.aspx>

Discussion article: <http://www.alphr.com/science/1006929/mri-fmri-ct-cat-scan-how-it-works>

Real article: <https://www.radiologyinfo.org/en/info.cfm?pg=bodymr>

Task 2:

You need to produce a 1 page essay on the risks and benefits of an MRI scan and how it works to create an image.

Essay section	Activity
Introduction	What is an MRI scan and who might be likely to have one?
Describe	Describe how an MRI scan creates an image inside the body.
Explore	Explore how some patients may be more at risk than others when having an MRI scan.
Evaluate	Evaluate the advantages and disadvantages of having an MRI scan.

PiXL Independence – Level 4

Scientific Posters

GCSE Physics – Magnetism and electromagnetism

INSTRUCTIONS

Scientific Posters

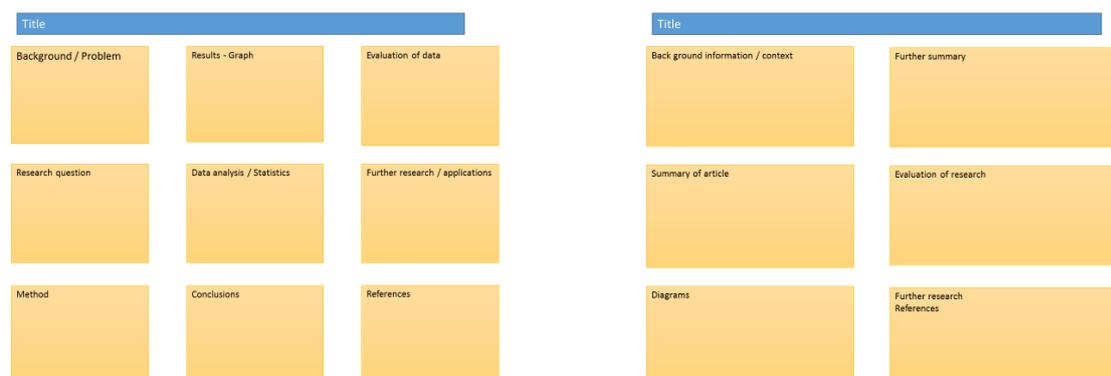
Scientists communicate research findings in three main ways. Primarily, they write journal articles much like an experiment write up. These are very concise, appraise the current literature on the problem and present findings. Scientists then share findings at conferences through talks and scientific posters. During a science degree, you would practice all three of these skills.

Scientific posters are a fine balance between being graphically interesting and attracting attention and sharing just the right amount of text to convey a detailed scientific message. They are more detailed than a talk and less detailed than a paper.

Use this information to help structure your poster – www.tiny.cc/posterskills (that's Poster Skills not Posters Kill!) More detailed guidance is available at: www.tiny.cc/posterskills2

Creating your poster

It is easiest to create a poster in PowerPoint; however, you need to add custom text boxes rather than using the standard templates.



Posters need to be eye catching, but readable from a distance. If you use PowerPoint, start with a 4:3 slide (for easier printing, it can then be printed on A3) and use a 14-16 pt font.

The first box could be larger to draw people in. You can use a background image, but pick a simple one that is of high quality. Select 'text box fill' and select 'change the transparency' to maintain the contrast and partially show the picture.

You can experiment with different layouts and you should include images. Avoid a chaotic layout, posters are read from top left column downwards.

Remember to include the authors and references.

Finally, look at the examples given on the University of Texas website which also offers an evaluation of each www.tinyurl.com/postereg

How are electromagnets used in devices?

Background

Electromagnets are used in lots of devices, including hard disk drives, speakers, motors, and generators, as well as in scrap yards to pick up heavy scrap metal. They're even used in MRI machines so that doctors can take a detailed look inside your body. In this poster you will explore how a circuit breaker, electric bell, relay switch and a scrapyard crane use electromagnets.

Source articles

<http://www.gcsescience.com/pme8.htm>

<http://www.gcsescience.com/pme7.htm>

<https://animatedscience.co.uk/blog/electromagnetic-relay-circuit>

<http://www.s-cool.co.uk/gcse/physics/magnetism-and-electromagnetism/revise-it/uses-of-electromagnetism>

<http://www.bbc.co.uk/education/clips/z4shfg8>

Use other sources as necessary.

Task:

Produce a scientific poster on how the following devices use electromagnets: circuit breaker, electric bell, relay switch and a scrapyard crane.

Recall	What is an electromagnet and how can you alter its strength?
Describe	Describe, using diagrams, how each of the devices use electromagnets.
Compare	Compare each device – what are the similarities about how they work?
Evaluate	Evaluate the benefits of using electromagnets in devices.

PiXL Independence – Level 5

Video summaries

GCSE Physics – Magnetism and electromagnetism

Cornell Notes

At A level and University, you will make large amounts of notes, but those notes are only of use if you record them in a sensible way. One system for recording notes is known as the Cornell notes system. This method encourages you to select relevant information, rather than trying to write a transcript of everything said. More importantly, it forces you to spend a few minutes reviewing what you have written, which has been scientifically proven to aid learning and memory retention.

The ideal is to write everything on one page, but some students may prefer to type and others will to handwrite their notes. Whichever option you use, remember the aim is to summarise and condense the content with a focus on the objectives that you are trying to learn and understand.

There are three main sections to the Cornell notes

- 1 **Cue/ Objectives** – This can be done before or after the lecture. You may have been provided with the objectives or you may need to decide what they were or you may want to make the link to your learning if this is an additional task or lecture you are viewing, such as this video.
- 2 **Notes** – In this space you record concisely, simply the things you are LESS likely remember - **The NEW knowledge**.
- 3 **Summary** – The most important step that is carried out after the lecture or video. This helps to reinforce learning.

Background

The following short YouTube videos present two topics that link to your learning. The first is on the basics of electromagnets, including inducing currents in a copper tube to light LEDs. The second video discusses the physics behind roller coasters, including using magnets as a braking system.

Source article:

Video 1 – National Geographic – magnets as brakes?

YouTube: <https://www.youtube.com/watch?v=F66pBxgFNBI>

Video 2 – SciShow – The physics of roller coasters.

YouTube: <https://www.youtube.com/watch?v=J8pJiV44hVM>

Task:

**You need to produce a set of Cornell notes for the videos given above.
Use the following objective to guide your note taking, this links to your learning.**

- 1 Discuss the basics of electromagnets.
- 2 Discuss the physics behind rollercoasters, including how magnets are used in the braking system.

Objectives
What are the main learning outcomes that have been shared with you?
This will help guide you to taking the RIGHT notes during the video.

Title
Date

Sketch down note and key words
Do not write in full sentences whilst you listen, put quick sketches, single words, mind maps, short hand etc.
To help train you for university, try not to pause the video because you could not pause a live lecture (However, a lecture may give more natural pauses for you to catch up).

Summary (after the video)
What are your main points of learning from this video.
This is your chance to make sense of your notes.
Make clear connections to the things you need to know

Objectives:	Title:
	Date:
Summary:	



Commissioned by The PiXL Club Ltd.

This resource is strictly for the use of member schools for as long as they remain members of The PiXL Club. It may not be copied, sold, or transferred to a third party or used by the school after membership ceases. Until such time it may be freely used within the member school.

All opinions and contributions are those of the authors. The contents of this resource are not connected with, or endorsed by, any other company, organisation or institution.

PiXL Club Ltd endeavour to trace and contact copyright owners. If there are any inadvertent omissions or errors in the acknowledgements or usage, this is unintended and PiXL will remedy these on written notification.