

Perm + Include Magnetism, Magnetic Forces & Fields

Mark Scheme

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Physics
Exam Board	AQA
Topic	6.7 Magnetism and Electromagnetism
Sub-Topic	Prem + Include Magnetism, Magnetic Forces & Fields
Difficulty Level	Bronze Level
Booklet	Mark Scheme

Time Allowed: 51 minutes

Score: /49

Percentage: /100

Grade Boundaries:

M1.(a) S – top, N – bottom

1

(b) touch / attracted to magnet **A**

1

(c) the magnetic needles point to the north pole

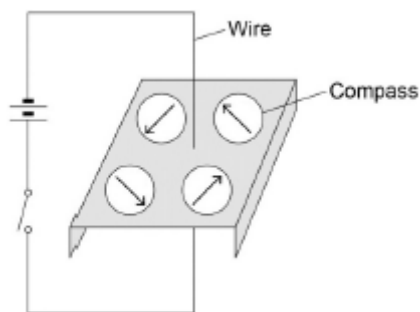
1

because The Earth has a magnetic field

1

accept the needles align to the Earth's magnetic field for 2 marks

(d)



1

(e) point in the opposite direction
change direction is insufficient

1

(f) uniform field lines through the wire coil.

1

field lines curving round the top and bottom of the wire coil.

1

arrows indicating direction from N to S
do **not** accept conflicting arrows

1

[9]

M2.(a) The movement of liquid iron in the Earth's outer core

1

(b) will attract

1

will repel

1

(c) **Level 2 (3–4 marks):**

A detailed explanation is provided that includes a coherent comparison of the properties of the types of magnet and presents a clear argument to support the use of electromagnets. Logical links are made between relevant points and use in a scrapyard

Level 1 (1–2 marks):

Relevant points made about the properties of the magnets. An attempt at comparison may be made, but logic is unclear and unstructured and links to use in scrapyard may not be present

0 marks:

No relevant content.

Allow steel or iron for car body throughout

Indicative content

- an electromagnet can be switched on and off
- so it can be used to lift a car body
- and release a car body
- so it can easily be used to move car bodies from one place to another in the scrapyard

- a permanent magnet cannot be switched off to release a car body
- so would not be as useful in the scrapyards
- the strength of the magnetic field of an electromagnet can be varied
- so an electromagnet can lift different masses
- so can deal with different vehicles
- but the strength of the magnetic field of a permanent magnet cannot be varied or is fixed
- so a permanent magnet can only lift up to a certain mass

4

[7]

M3.(a) Cobalt

1

Nickel

1

(b) **Either**

- put iron filings
- on a piece of paper
- over the magnet

1

1

1

or

- use (plotting) compass(es) (1)
- around the magnet (1)
- with the needle showing the direction (1)

(c) all points plotted correctly

2 points plotted correctly for 1 mark

2

correctly drawn line of best fit

allow ecf from incorrectly drawn points

1

(d) as the number of turns increases so does the amount of paper clips picked up

1

linear / directly proportional

allow doubling the number of turns doubles the number of paper clips picked up

1

(e) 32

allow number correctly extrapolated from student's graph

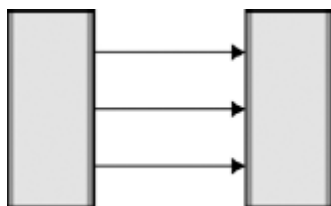
1

[11]

M4.(a) (i) field pattern shows:
some straight lines in the gap

1

direction N to S



1

(ii) north poles repel

1

(so) box will not close

1

- (b) (i) as paper increases (rapid) decrease in force needed 1
- force levels off (after 50 sheets) 1
- (ii) the newtonmeter will show the weight of the top magnet 1
- (iii) (top) magnet and newtonmeter separate before magnets separate
accept reverse argument 1
- (because) force between magnets is greater than force between magnet and hook of newtonmeter 1
- (iv) any **three** from:
- means of reading value of force at instant the magnets are pulled apart
 - increase the pulling force gently
 - or
 - use a mechanical device to apply the pulling force
 - clamp the bottom magnet
 - use smaller sheets of paper
 - fewer sheets of papers between readings (smaller intervals)
 - ensure magnets remain vertical
 - ensure ends of magnet completely overlap
 - repeat the procedure several times for each number of sheets and take a mean
 - make sure all sheets of paper are the same thickness
- 3
- (v) 3 (mm)
- 30×0.1 *ecf gains 2 marks*

2.1 N corresponds to 30 sheets gains 1 mark

3
[15]

M5.(a) (i) increase

1

(ii) A and B
and
B and C

*both required for the mark
either order*

1

(iii) any **two** from:

- size of nail
or
nail material
allow (same) nail
- current
*allow (same) cell
allow p.d.
same amount of electricity is insufficient*
- (size of) paper clip
- length of wire
accept type / thickness of wire

2

(b) 4

1

B picks up the same number as C, so this electromagnet would pick up the same number as A

or

direction of current does not affect the strength of the electromagnet

allow it has got the same number of turns as A

1

(c) 2

allow 1 or 3

1

[7]

