

Magnets and Magnetic Fields

Q1.a(2018)

hold thumb, first finger and second finger at 90° or perpendicular to each other / AW ✓

And any two from

first or index finger is (magnetic) field ✓

second or middle finger is current ✓

thumb is direction/motion/force ✓

3

3 x 1.1

ALLOW diagram showing the perpendicular positions (labels do not need to be correct for this mark)

DO NOT ALLOW incorrect fingers e.g. ring finger is field / second finger is field

ALLOW thumb shows the force of the field

Q1.b(2018)

Any three from

flow of current creates a magnetic field (around the coil) ✓

magnetic fields (of coil and magnets) interact ✓

opposite sides of the coil experience forces in opposite directions / AW ✓

the split-ring commutator ensures that the current is always flowing in the right direction (for clockwise rotation) / the split-ring commutator reverses the (direction of) current every **half** turn ✓

3

3 x 1.1

ALLOW magnetic field overlap
IGNORE magnetic fields touch

Q1.c(2018)

FIRST CHECK THE ANSWER ON THE ANSWER LINE

If answer = 1.5 (T) award 3 marks

(magnetic flux density) = force ÷ [current x length] ✓

= 0.6 ÷ [0.8 x 0.5] **or** 0.6 ÷ 0.4 ✓

= 1.5 (T) ✓

3

1.2

2.1

2.1

ALLOW $B = F \div [I \times L]$
IGNORE triangle style equations

Q2.a(2019)

OCR [Physics] | Higher
Topic [1]: [Electricity and Magnetism]

Yes AND gives a correct stated trend shown by the data to support the conclusion ✓	1	3.1b	Examples of the trend shown by the data: the 10 turns picks up less than the 50 turns 10 turns attracts 1 pin but 50 attracts 4 pins a stronger magnetic field means more pins attracted as coils increase so does number of pins attracted as the turns increase so do the number of pins
OR			
No AND gives a correct stated trend shown by the data to support the conclusion ✓			IGNORE just part of the trend e.g. when there were 50 coils it picked up 4 pins
			Examples of the trend shown by the data: when turns increase 20 to 40 then 2 pins attract when the current is 0.25 (A) there is no difference between 20 and 30 turns
			IGNORE just part of the trend e.g. when there were 20 coils it picked up 2 pins

Q2.b(2019)

Lower current (has less heating effect) / less power required / AW	1	3.2a	ALLOW uses less amps IGNORE less energy / stronger (magnetic field) / quicker / more reliable
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Q3.a(2019)

Clockwise	1	1.2	BOTH needed for mark IGNORE upwards / downwards / right
AND			
(Fleming's) left hand rule ✓			IGNORE other names

Q3.b(2019)

FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 1.2×10^{-3} (N) award 4 marks	4		
(F =) BIL ✓		1.2	ALLOW correct equation in words or symbols
(Length in field = 3 cm =) 0.03 (m) ✓		1.2	DO NOT ALLOW 0.03 (m) + another length e.g. 0.03 (m) + 0.02 (m)
F = $0.08 \times 0.5 \times 0.03$ ✓		2.1	ALLOW (ecf for using cm) $0.08 \times 0.5 \times 3$ ✓✓
= 1.2×10^{-3} (N) ✓		2.1	ALLOW (ecf for using cm) 0.12 ✓✓✓

Q4.(2020)

Any two from: Strength of field ✓	2	2 × 1.1	ALLOW strongest close to magnet/poles / ORA IGNORE just north is strongest / just south is strongest
Magnitude of force ✓			ALLOW stronger forces where the field lines are closer / ORA
Direction of field or force ✓			ALLOW (field or force goes) north to south / (field or force) into south / (field or force) out of north / (field or force) starts from north
Position of poles ✓			ALLOW north at one end and south at other end / where (the position) of north and south are IGNORE references to opposites attract / same poles repel

Q5.(2020)

(idea that when tested using a permanent magnet)	3	3 × 3.3a	If no mark awarded ALLOW max 1 mark for correct description without explanations for all three blocks
Permanent magnet as there is repulsion because like poles repel ✓			
Copper as no attraction (or repulsion) because it is not magnetic ✓			ALLOW copper as no attraction (or repulsion) because it is not affected by magnets
Iron as attraction (only) because iron is magnetic ✓			Ignore induction / stick (for attract)

Q6.a(2020)

As distance increases, dip angle decreases / ORA ✓	2	2 × 3.1a	ALLOW inverse relationship IGNORE negative correlation
As the distance increases, dip angle decreases at an increasing rate / ORA ✓			ALLOW not linear / not proportional / change is more gradual / slower near pole / ORA ALLOW comparison of two data points
			For 1 mark only ALLOW inversely proportional

Q6.b(2020)

72 (°) ✓	1	2.2	ALLOW 72 (°) + or - 2
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Q6.c(2020)

Any one from: Not accurate AND value not (close enough to) 66° ✓	1	3.2a	ALLOW ecf from cii ALLOW description in form of a calculation e.g. 72 – 3 = 69 not 66 ALLOW Not accurate AND because it is too different/more than 3° different
Accurate AND value close to 66° ✓			ALLOW Accurate AND only slightly different/less than 3° different

Q6.d(2020)

Earth's core is magnetic / the direction of Earth's magnetic field / the Earth has a magnetic field AW ✓	1	3.2b	ALLOW Earth has a magnetic force / has magnetic poles / Earth is magnetic
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Q7.(2020)

Any two from: Both students or both statements are incorrect ✓	2	2 × 3.1b	
(As distance doubles,) field strength halves or is multiplied by 0.5 / ORA ✓			ALLOW inversely proportional
Use of values from graph showing inversely proportional relationship or showing field strength is not multiplied by 0.25 or 0.75 ✓			ALLOW use of any 2 suitable values to show inversely proportional relationship or that field strength is not multiplied by 0.25 or 0.75, e.g. (0.01, 4) to (0.02,2) or (0.02,2) to (0.04,1) etc.

Q8.(2021)

B ✓

Q9.(2021)

B ✓

Q10.(2022)

C ✓

Q11.a(2022)

No current (in wire) / AW ✓	1	2.1	ALLOW no electron flow (in wire) / no current flow (in wire) ALLOW no force ALLOW balance has been zeroed IGNORE no electricity / no electricity flowing / circuit not complete / reference to resistance
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Q11.b(2022)

Any three from:	3	3 × 1.1	
Current in wire causes magnetic field (around wire) ✓			
Magnetic field interacts with field around (U shaped) magnet ✓			ALLOW magnetic fields interact
Force on wire ✓			
(Force on wire is acting) downwards ✓			

Q11.c(2022)

– 0.3 (g) ✓	1	2.1	DO NOT ALLOW 0.3 or + 0.3
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Q11.d(2022)

– 0.3 (g) ✓	1	2.1	DO NOT ALLOW 0.3 or + 0.3
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Q11.e(2022)

FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 0.1 (T) award 3 marks	3		
(Flux density =) force ÷ (current × length) ✓		1.2	ALLOW symbol equation / equation in any form
Flux density = $0.004 \div (0.8 \times 0.05)$ ✓		2.1	ALLOW in any correct arrangement
Flux density = 0.1 (T) ✓		2.1	

Q11.f(2022)

Current ✓	1	3.3a	ALLOW number of cells / number of batteries / slider on variable resistor / voltage setting on power pack
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Q11.g(2022)

Any one from:	1	3.3a	
Length (of wire) ✓			IGNORE thickness of wire / type of wire / force on wire
Magnetic flux density / strength of magnet ✓			
Direction of magnetic field ✓			
Direction of current ✓			

Q12.(2023)

D

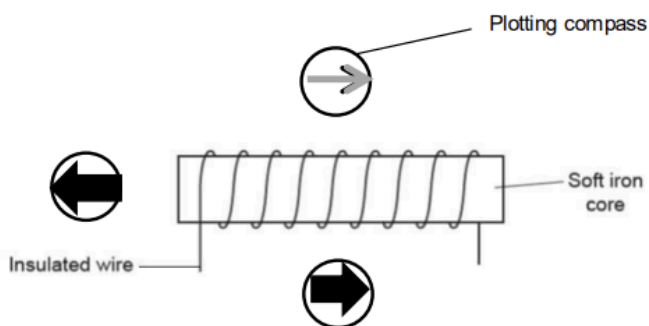
Q13.(2023)

B

Q14.(2024)

At the North magnetic pole AND At the South magnetic pole ✓	1	3.1b	Both required for 1 mark
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Q15.a(2024)



Left hand compass points left ✓
Bottom compass points right ✓

Q15.b(2024)

	2	2 × 1.1	DO NOT ALLOW answers in terms of charge / positive / negative / electrons
Nail becomes an induced magnet ✓			ALLOW iron is (easily) magnetised/magnetic
Top of nail is opposite in polarity to the electromagnet / opposite poles attract ✓			ALLOW clear indications of opposite polarities on diagram ALLOW N and S for opposite polarity

Q15.c(2024)

Moves up ✓	2	2 × 1.1	ALLOW 'jumps up' / upward force / vertical upwards arrow drawn on wire in diagram
Fleming's left hand rule ✓			

Q15.d(2024)

First check the answer on the answer line If answer = 1.2 (mN) award 3 marks	3		
(F =) $0.12 \times 0.25 \times 0.04$ ✓		2.1	
(F =) 1.2×10^{-3} (N) or 0.0012 (N) ✓		2.1	ALLOW 1.2×10^{-3} or 0.0012 as final answer for 2 marks
(F =) 1.2 (mN) ✓		1.2	ALLOW 1.2×10^n e.g. 1.2×10^{-4} for 2 mark