

Eduqas Physics GCSE
Topic 8.2: Magnetic effects of
currents and the motor effect
Mark Schemes for Questions by topic

1.

(a) move a (magnetic / plotting) compass around the wire

1

the changing direction of the compass needle shows a magnetic field has been produced

OR

sprinkle iron filings onto the card (1)

tapping the card will move the filings to show the magnetic field (pattern) (1)

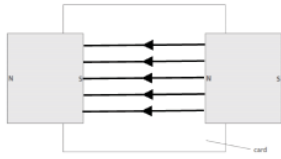
1

2.

Question number	Answer	Notes	Marks
2 (a) (i)	MP1. minimum of 3 straight lines evenly spaced (by eye); MP2. at least one arrow showing direction from N to S;	ignore field outside the rectangle defined by the magnets	2
(b) (i)	any sensible suggestion; e.g. otherwise large heat loss/overheating thin wire would melt to reduce the resistance so it does not sag/bend/eq		1
(ii)	any 3 of: MP1. magnetic field of wire/current; MP2. interacts with; MP3. magnetic field of (2) magnets; MP4. Fleming's left hand rule;	For MP1 and MP3 must refer to what is causing the magnetic field	3

(iii)	<p>MP1. reduce current;</p> <p>MP2. use less powerful magnets/greater separation of magnets;</p>	<p>ACCEPT</p> <p>Use thinner wire, switch off, reduce voltage</p> <p>not 'smaller' magnets</p> <p>allow rotate the wire so that the angle with the magnetic field is smaller</p>	2
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3.

Question number	Answer	Notes	Marks
3 (a) (i)	<ol style="list-style-type: none"> at least one arrow showing direction from N to S (right to left); one horizontal line between shaded faces; minimum of 3 horizontal lines evenly spaced (by eye); <p>e.</p> 	<p>Reject contradictory arrows</p> <p>For MP2,3 ignore any lines outside the rectangle between the shaded faces</p> <p>allow field lines that almost touch the faces</p>	3
(ii)	<ol style="list-style-type: none"> a method to show shape; <p>e.</p> <p>use compass(es) Use of iron filings/ powder</p> <ol style="list-style-type: none"> Use f (plotting) compass to show direction; further method detail; <p>e.</p> <p>mark card /move compass/multiple compasses idea of another line or lines added sprinkle (iron filings evenly on card) tap card (to distribute iron filings)</p>	<p>Ignore Position of card /Cling film Ignore pour/place/ drop /spill</p>	3

Question number	Answer	Notes	Marks
(b)	<p>any two of</p> <ol style="list-style-type: none"> (Fleming's) Left Hand (Motor) rule OR (current generates) magnetic field around the rod; Idea that there is a force (on rod); (translational) movement of rod; Correct direction given, i.e. out of the paper; 	<p>allow LHM rule/LH rule/motor rule/ motor effect</p> <p>Ignore upwards rod is magnetic</p>	2
Total			8

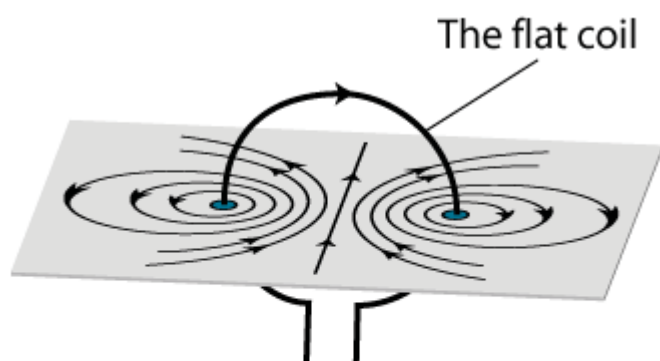
4.

Question			Answer	Marks
2	(a)	(i)	(weight = BIL) $6.8 \times 10^{-5} = 0.070 \times I \times 0.01$ (Any subject) $I = 0.097$ (A)	C1 A1

5.

Question	Expected Answers	Marks	Additional guidance
5 (a)	Down(wards)	B1	Note: Can be on Fig. 5.1
(b)	(Fleming's) left-hand rule	B1	Allow: Thumb in direction of force, first finger in direction of (magnetic) field and second finger in direction of (conventional) current
(c) (i)	force = $BIL = 0.080 \times 4.0 \times 5.0 \times 10^{-2}$ force = 0.016 (N)	B1	
(ii)	reading = 2.500 – 0.016 reading = 2.484 (N) The force on <u>core/magnets</u> is up(wards) (According to Newton's third law) the forces (on the rod and steel core/magnets) are equal <u>and</u> opposite	B1 B1 B1	Allow: 'up and down' as equivalent to 'opposite'

6.

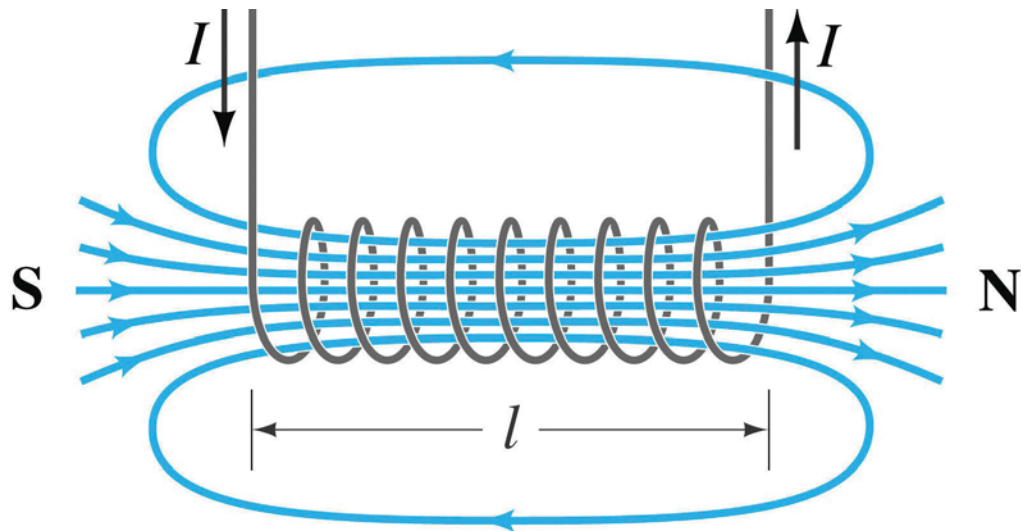


Magnetic field pattern generated by a flat coil

- Straight line through middle of coil (1)
- Nearly circular paths on plane perpendicular to the plane of the coil (1)
- Arrows showing correct directions – in diagram above (1)

Total 3 marks

7.



Straight lines (approximately a uniform field) through middle of solenoid (1)
Shows the idea that the lines eventually curl around the solenoid from north to south (1)
Arrows showing correct directions – in diagram above (1)

Total 3 marks

8.

(a) (i) *an electric motor*

1

(ii) *force*

1

(b) any **two** from:

- *more powerful magnet*
do **not** allow 'bigger magnet'
- *reduce the gap (between magnet and coil)*
- *increase the area of the coil*
- *more powerful cell*
do **not** allow 'bigger cell'
accept battery for cell
accept add a cell
accept increase current / potential difference

- *more turns (on the coil)*
allow 'more coils on the coil'
*do **not** allow 'bigger coil'*

2

- (c) *reverse the (polarity) of the cell*
allow 'turn the cell the other way round'
accept battery for cell

1

reverse the (polarity) of the magnet
allow 'turn the magnet the other way up'

1

[6]

9.

- (a) electric drill, electric fan, electric food mixer and electric screwdriver
all four ticked and no others (2)
***either** all four of these ticked and only one other (1)*
***or** any three of these ticked and none/one/two of the others (1)*

2

- (b) (i) reverse (the direction of the) current (1)
***or** reverse the connections (to the battery)*
- reverse (the direction of the) magnetic field (1)
***or** reverse the (magnetic) poles /ends*
*do **not** credit 'swap the magnets (around)'*

2

(ii) any **two** from:

- increase the strength of the magnet(s)/(magnetic) field
do not credit 'use a bigger magnet'
- increase the current
allow 'increase the voltage/p.d.'
allow add cells/batteries
allow increase the (electrical) energy
allow increase the power supply
allow 'decrease the resistance'
allow 'increase charge'
allow 'increase the electricity'
do not credit 'use a bigger battery'
- reduce the gap (between coil/armature and poles/magnets)
allow increase the (number of) coils
- increase the turns (on the coil/armature)
do not credit 'use a bigger coil'

2

[6]

10.

- (b) turns clockwise
oscillates/reverses
comes to rest facing field/at 90° to field/vertically
for 1 mark each

3

- (c) number of turns or linear number density of turns current core
for 1 mark each

3