

# Magnetism

## Mark Scheme 1

<b>Level</b>	IGCSE(9-1)
<b>Subject</b>	Physics
<b>Exam Board</b>	Edexcel IGCSE
<b>Module</b>	Double Award (Paper 1P)
<b>Topic</b>	Magnetism and Electromagnetism
<b>Sub-Topic</b>	Magnetism
<b>Booklet</b>	Mark Scheme 1

**Time Allowed:** 72 minutes

**Score:** /60

**Percentage:** /100

**Grade Boundaries:**

A*	A	B	C	D	E	U
>85%	775%	70%	60%	55%	50%	<50%

Question number	Answer	Notes	Marks
1 (a) (i)	Any two of: MP1. Idea of marking the line/points; MP2. Idea of moving the compass (to a new point along the line); MP3. Idea of starting a new line from a different place;	accept a labelled diagram allow use of iron filings use a compass allow • tapping paper to line up iron filings • multiple compasses	2
	(ii) Any two of: MP1. Correct shape <b>only</b> ; MP2. lines not crossing each other; MP3. correct direction arrow shown on at least one line;	all field lines must be correct minimum of two curved lines of correct shape added anywhere in the field reject for MP3 any conflict of arrows	2

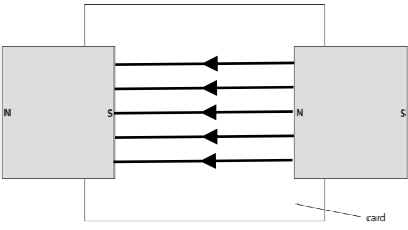
(b)	MP1 <b>all</b> field lines between the poles shown parallel and straight (by eye);  MP2 minimum of 3 straight lines evenly spaced (by eye) between the poles; MP3 Opposite poles shown adjacent;	ignore arrows can only be given if minimum of 2 lines shown	3
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Total 7 marks

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)	<p>any 3 of:</p> <p>MP1. magnetic field of wire/current;</p> <p>MP2. interacts with;</p> <p>MP3. magnetic field of (2) magnets;</p> <p>MP4. Fleming's left hand rule;</p>	<p>For MP1 and MP3 must refer to what is causing the magnetic field</p>	<p>3</p>
(iii)	<p>MP1. reduce current;</p> <p>MP2. use less powerful magnets/greater separation of magnets;</p>	<p>ACCEPT 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>	<p>2</p>

Total 8 marks

Question number	Answer	Notes	Marks
3 (a) (i)	<p>1. at least one arrow showing direction from N to S (right to left);</p> <p>2. one <b>horizontal</b> line between shaded faces;</p> <p>3. minimum of 3 horizontal lines evenly spaced (by eye);</p> <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)	<p>1. a method <b>to show shape</b>;</p> <p>e. use compass(es) Use of iron <b>filings/ powder</b></p> <p>2. Use f (plotting) compass <b>to show direction</b>;</p> <p>3. further <b>method detail</b>;</p> <p>e. 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><b>Ignore</b> Position of card /Cling film <b>Ignore</b> pour/place/ drop /spill</p>	3

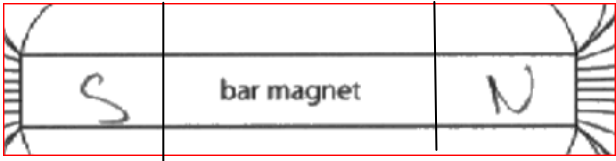
Question number	Answer	Notes	Marks
(b)	any <b>two</b> of 1. (Fleming's) Left Hand (Motor) rule OR (current generates) magnetic field <b>around</b> the rod; 2. Idea that there is a force (on rod); 3. (translational) movement of rod; 4. Correct direction given, i.e. out of the paper;	allow LHM rule/LH rule/motor rule/ motor effect  <b>Ignore</b> upwards rod is magnetic	2
		<b>Total</b>	<b>8</b>

Question number		Answer	Notes	Marks
4 (a)		any three of  MP1 idea that there is <b>current</b> (in the wire/coil);  MP2 idea that (the coil has) a <b>magnetic field</b> ;  MP3 idea that coil's magnetic field <b>interacts</b> with field of permanent magnet;  MP4 idea that there is a <b>force</b> on the coil/wire;  MP5 Idea that current or force <b>reverses</b> every half turn;	Allow ideas of electromagnetic field, electromagnet  Allow - 'magnetic fields touch / overlap' Ignore - 'cutting of magnetic fields'  Allow ideas of LHM rule, Fleming's LHR, catapult field, attraction, repulsion  Allow action of a commutator described	3



<p>(b) (i)</p>		<p>any two of</p> <p>MP1 increase magnetic field( e.g. stronger magnets or magnets closer or magnets curved round coil);</p> <p>MP2 increase current OR voltage Or more cells;</p> <p>MP3 increase number of turns (on coil);</p> <p>MP4 a sensible alternative suggestion e.g. use two or more sets of coils at angles, lubricate axle;</p>	<p>Allow “use thicker wire”</p> <p>Ignore “stronger battery”</p> <p>Allow idea of 3 phase supply, iron stator</p>	<p>2</p>
<p>(ii)</p>		<p>Suggestion that clearly results in reversal of the current OR the cell connections OR the magnet’s field;</p>		<p>1</p>
<p>(c)</p>		<p>any two of</p> <p>MP1 Idea that force is increased (by stronger field);</p> <p>MP2 Idea of radial magnetic field (rather than a uniform one);</p> <p>MP3 Coil remains in the field for a longer time;</p>	<p>Allow idea that iron is magnetised</p> <p>Allow idea that magnetic field acts “all the way around”</p> <p>Allow idea that force acts over a larger part of a cycle</p>	<p>2</p>

Question number	Answer	Notes	Marks
5 (a) i	there is a voltage;  And one of (because there is a) change of flux OR field (lines) are cut; (which is) an induced voltage / emf;	Allow induced current	2
ii	greater deflection/voltage; Idea that rate of change of flux (linkage) is greater; eg more magnetic field lines cutting coil (per second)	ignore speed of magnet	2
(b) i	Idea that deflection is smaller;		1
ii	Idea that deflection is greater;		1
iii	Idea that deflection is in opposite direction;		1
		<b>Total</b>	<b>7</b>

Question number	Answer	Notes	Marks
6 (a)	Position of poles indicated correctly near end of magnet;  S on L AND N on R ;	Allow  at the end of the magnet  within $\frac{1}{4}$ of either end  	2
(b)	Any suitable method, e.g. <ul style="list-style-type: none"> <li>• Place plotting compass at side/end of magnet;</li> <li>• Mark position of end of compass;</li> <li>• Move end of compass needle to new mark (and repeat);</li> </ul> OR <ul style="list-style-type: none"> <li>○ Place magnet under paper / plastic;</li> <li>○ Sprinkle iron filings over;</li> <li>○ Tap paper gently (to reveal pattern);</li> </ul>	allow suitably clear diagram(s)  reject for one mark 'charges'  ignore comments about finding the direction of the field  allow: steel dust for iron filings place for sprinkle	3

Total 5 marks

Question number	Answer	Notes	Marks
7 (a)	parallel field (DOP)	ACCEPT equally spaced and straight / equally spaced and do not change direction	2
(b)	two (permanent / bar) magnets  pole pieces arranged correctly e.g. North facing South  idea of magnets being the correct distance apart	ACCEPT points made on an annotated diagram  REJECT description of poles as positive / negative  ACCEPT "close together", "not touching" ACCEPT idea that field is produced in the space between the N pole of one magnet and the S pole of the other  REJECT answers that are clearly referring to electromagnets	3

Question number	Answer	Notes	Marks
8 (a)	A carbon;		(1)
(b)	A negatively charged electrons;		(1)
(c)	D steel;		(1)
(d)	C 2 N poles facing;		(1)

**Total for Question 8 = 4 marks**

Question number	Answer	Notes	Marks
9 (a) (i)	any two ideas from: - MP1. voltage / current is <u>induced</u> ; MP2. (because) field in coil is changing / field (lines) cut; MP3. current/voltage changes direction when magnet does; MP4. magnet slows down causing decrease in amplitude;	allow voltage for amplitude	2
(ii)	Either of - (voltage/current) changes direction; Positive <u>and</u> negative (voltage/current);	Ignore "wave"	1
(iii)	any two of - MP1. direction of magnet changes; MP2. amount of field (lines) cut changes / rate of flux cutting; MP3. direction of flux cutting changes; MP4. speed of magnet changes / slows down; MP5. as movement diminishes, so does voltage;		2
(b)	Any three of - MP1. Alternating trace that diminishes; MP2. Amplitude is larger; MP3. Frequency is lower;		3

Total 8 marks