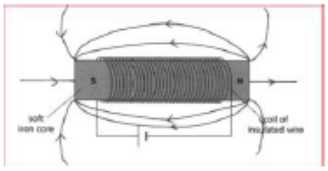
Mark Scheme

Q1.

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

(Total for question = 4 marks)

Q2.

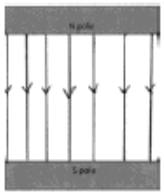
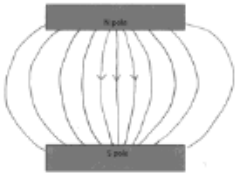
Question number	Answer	Notes	Marks
(a) (i)	Any three from MP1. parallel field shown inside the core; MP2. one complete line from a pole and to the other pole; MP3. at least three lines at **each** pole with a minimum of two correctly curved lines; MP4. Arrow on any external field line from N or into S; 	Condone dotted lines Reject Crossing field lines for MP3 only conflicting arrows for MP4 only	3
(ii)	idea that strength of magnetic field is increased;	allow concentrates the magnetic field ignore • 'channels the magnetic field'/eq • references to soft iron • references to easily magnetised /demagnetised	1
(b)	any two from:- MP1 Steel is magnetically hard material/eq ; MP2 Steel **becomes** (permanently) magnetised; MP3 Steel **remains** magnetised (when current switched off) /paper clips **remain attracted** to steel;	NB do not credit repeat of stem (*remain attached* is in the stem)	2

Q3.

Question number			Answer	Notes	Marks
	a		**one** of: iron is (soft) magnetic; iron loses its magnetism easily;	allow RA for steel	1
	b		**these can be shown on a labelled diagram** MP1. current carrying (insulated) wire; MP2. wrapped into coil; MP3. wrapped on **iron** core;	allow wire shown connected to a battery solenoid = MP2 only	3
	c		Any two **ideas** from: MP1. current/ voltage reduces OR eq; MP2. magnetic field of em reduces; MP3. (magnetic) force holding the iron plate to the magnet no longer present;	do not give marks for • 'the door closes'/eq • electricity • power allow current stops circuit broken • iron plate no longer magnetised	2

Total 6 marks

Q4.

Question number	Answer	Notes	Marks
(a) (i)	arrows on two or more {lines from N to S and/or clockwise on loops around wire};	accept arrows beside lines showing correct directions reject contradicting arrows (i.e. one correct and one incorrect)	1
(ii)	horizontal arrow (by eye); pointing to the left;	accept • arrow not passing through wire • unlabelled arrow if clear DOP	2
(b)	EITHER: **Uniform field drawn** MP1. single straight line drawn perpendicular to and between poles; MP2. additional straight lines drawn either side that are parallel and evenly spaced (by eye); OR **Non-uniform field drawn** MP1. central straight line(s) drawn perpendicular to and between poles; MP2. correctly curved lines drawn either side of the centre and drawn symmetrically (by eye);	Lines can start/end at faces or edges of poles   ignore all arrows on lines	2
(c)	MP1. place compass around magnet and note / mark its direction; MP2. place compass in **new position** and note / mark its direction again; MP3. directions linked together to find a field line / pattern;	ignore references to iron filings award marks if clear in diagram if contradiction between words and diagram, go by the diagram allow use of additional compass(es)	3

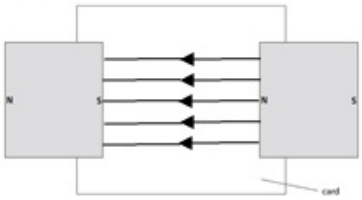
(Total for question = 8 marks)

Q5.

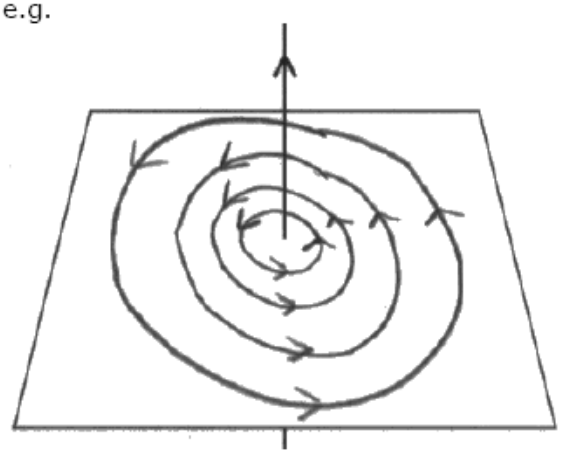
Question number	Answer	Notes	Marks
(a) (i)	MP1. minimum of 3 straight lines evenly spaced (by eye); MP2. at least one arrow showing direction from N to S;	ignore field outside the rectangle defined by the magnets	2
(b) (i)	any sensible suggestion; e.g. otherwise large heat loss/overheating thin wire 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)	MP1. reduce current; MP2. use less powerful magnets/greater separation of magnets;	ACCEPT Use thinner wire, switch off, reduce voltage not 'smaller' magnets allow rotate the wire so that the angle with the magnetic field is smaller	2

Total 8 marks

Q6.

Question number	Answer	Notes	Marks
(a) (i)	1. at least one arrow showing direction from N to S (right to left); 2. one **horizontal** line between shaded faces; 3. minimum of 3 horizontal lines evenly spaced (by eye); e.g.  	Reject contradictory arrows For MP2,3 ignore any lines outside the rectangle between the shaded faces allow field lines that almost touch the faces	3
(ii)	1. a method **to show shape**; e.g. use compass(es) Use of iron **filings/ powder** 2. Use of (plotting) compass **to show direction**; 3. a further **method detail**; e.g. 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)	**Ignore** Position of card /Cling film **Ignore** pour/place/ drop /spill	3
(b)	any **two** of 1. (Fleming's) Left Hand (Motor) rule OR (current generates) magnetic field **around** 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 **Ignore** upwards rod is magnetic	2
		Total	**8**

Q7.

Question number	Answer	Notes	Marks
(a) (i)	MP1. single circle centred on the wire and parallel to the plane of the card; MP2. at least two concentric circles; MP3. anti-clockwise direction arrow marked on at least one line; e.g. 	allow gap where circle crosses wire circles do not have to stay within the card DOP ignore spacing reject if contradicting arrows	3

(ii)	EITHER: MP1. iron filings used; MP2. tap card / eq.; OR MP1. (plotting) compass used; MP2. multiple compasses used / compass moved to new position; OR MP1. use of a magnet / another current-carrying conductor; MP2. to produce a force / movement;	ignore references to magnets, other current-carrying wires being used allow iron powder, steel dust etc. allow use of a magnetometer	2

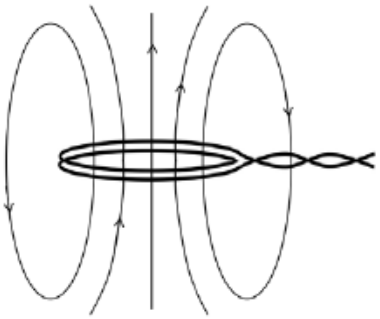
(b)	(i)	<table><tr><th>Statements</th><th>Order</th></tr><tr><td>the switch is closed</td><td>1</td></tr><tr><td>the lamp is on</td><td>(6)</td></tr><tr><td>the armature is attracted</td><td>3</td></tr><tr><td>the contacts are pushed together</td><td>5</td></tr><tr><td>the electromagnet is magnetised</td><td>2</td></tr><tr><td>the armature rotates</td><td>4</td></tr></table> all five numbers in correct positions = 3 marks;;; three-four numbers in correct positions = 2 marks only;; one-two numbers in correct positions = 1 mark only;		3
	(ii)	idea that electromagnet loses its magnetism; AND 1 of; • armature no longer attracted / idea that armature moves away from the magnet • opens the contacts / breaks the **lamp** circuit	condone idea that electromagnet is not magnetic allow iron for armature ignore references to current not flowing	2

Total for question = 10 marks

Q8.

Question number	Answer	Notes	Marks
a	Any FOUR from: MP1. Current in <u>coil</u> ; MP2. (Creates) magnetic field (around the wires of the coil); MP3. Interaction of (this) field with that of (permanent) magnets; MP4. There is a force on the wire(of coil); MP5. Reference to left hand rule; MP6. force up on one side and down on other side;	 current in circuit is not enough coil becomes an electromagnet allow field cutting as the interaction idea of catapult field reference to moment/turning effect on the coil	4
b i	one of • Reverse supply polarity (however described); • reverse current direction (however described); • swap magnets over(however described);		1
ii	any one from: • Reduce current (however described); • Reduce voltage (however described); • increase resistance of circuit (however described); • weaker magnetic field (however described);	 Allow : less turns on coil Condone: fewer coils	1

Q9.

Question number	Answer	Notes	Marks
(a)	MP1. at least one straight, vertical central field line; MP2. any field line drawn circling the wire / at least one peripheral field loop; MP3. field directions correct and consistent throughout and shown on at least two lines; 	ignore breaking of field lines as they pass through the centre of the coil by eye condone spiral drawn round wire	3
(b)	any 3 from: MP1. idea of magnetic fields interacting; MP2. idea of (magnetic) attraction or repulsion; MP3. reversing current reverses direction of magnetic field / force; MP4. some comparison with magnets, e.g. like poles repel, unlike poles attract;	allow field lines crossing ignore 'cutting' reject mention of electrostatic force or charge mention of having 'poles'	3

(Total for question = 6 marks)