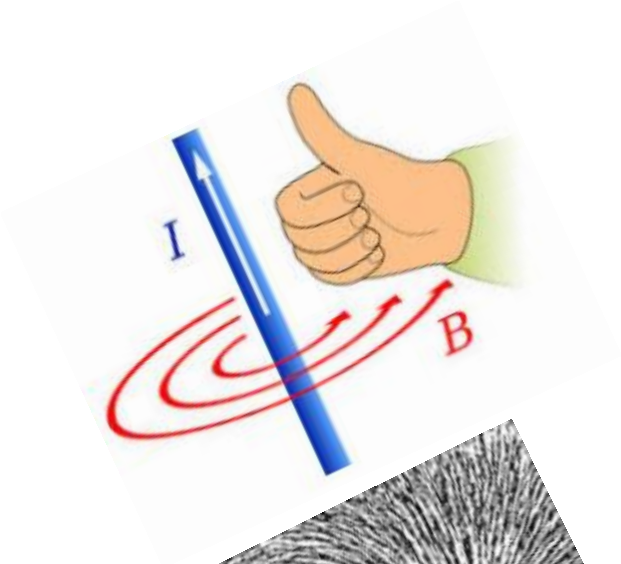
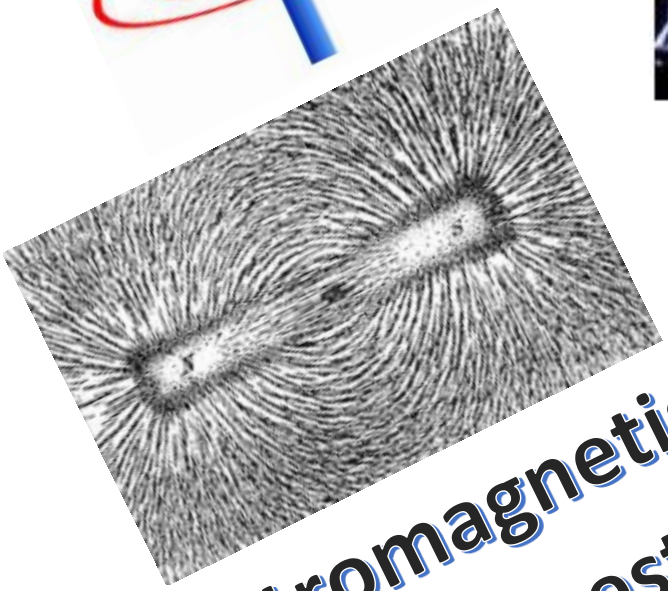
Name ……

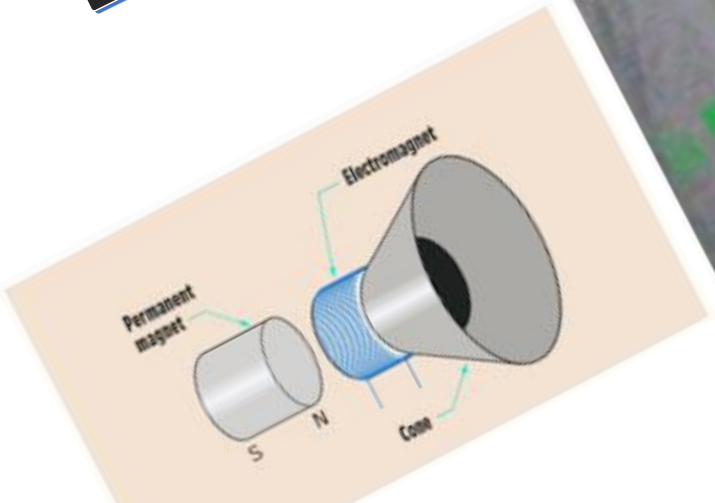
Total marK: / 50

Anything that still needs work?





Electromagnetism Intervention Question Pack



Name ……..

AQA GCSE Magnetism & Electromagnetism Intervention Pack

Q1 weaker field repel poles non-contact cobalt

Magnets are strongest at their …….

Two magnets exert a force on each other when they are close enough.

Two like poles ……. . Two unlike poles attract.

Magnetic attraction is an example of a ……. force.

The region around a magnet that affects magnetic materials is called a magnetic …….

Magnets affect magnetic materials.

The only magnetic elements are iron, ……. & nickel. Most steel is magnetic too.

The strength of a magnetic field is ……. further away from the magnet.

Q2 Repulsion magnet permanent magnetism

A ……. magnet produces its own magnetic field.

An induced magnet becomes a ……. when it is in a magnetic field.

An induced magnet becomes magnetised when it is in a magnetic field.

When an induced magnet is removed from a magnetic field it loses all (or most) of its

……. quickly.

……. can only happen between two permanent magnets.

Attraction can happen between a permanent magnet and any magnetic material.

Q3 Earth's lines pole magnetic

Magnetic field ……. show the direction of the force that would act on a north magnetic pole.

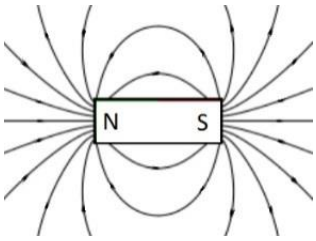
Magnetic field lines run from the north seeking ……. of a magnet to the south seeking pole.

A compass needle is a small bar magnet. The compass needle turns to line up with the magnetic field it is in.

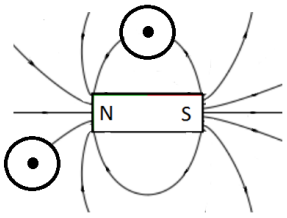
A compass needle will line up with the ……. magnetic field unless it is near another magnet.

This shows that the Earth has a magnetic field. The Earth's magnetic field is produced by the Earth's core, which is ……. .

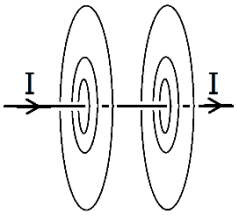
Q4 Draw arrows on the field lines around the bar magnet.



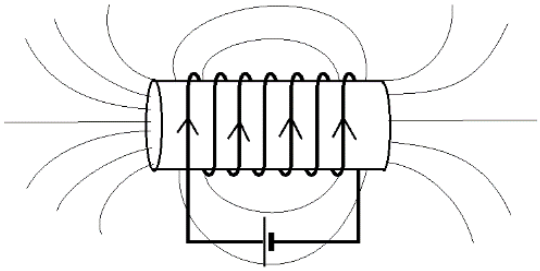
Q5 Draw arrows on the compasses to show the direction that they would point.



Q6 Use the right hand grip rule or the corkscrew rule to work out the direction of the field lines around the straight conductor.
Draw arrows on the field lines around the straight conductor.
"I" shows the direction of the current flowing along the wire.



Q7 Use the right hand grip rule to work out the direction of the field lines around the solenoid.
Draw arrows on the field lines to show their direction.



Q8 **direction** **current** **straight** **changes** **magnetic**

When a current flows through a ……. wire a circular ……. field is produced around the wire.

The strength of the magnetic field depends on the size of the ……. and the distance from the wire.

The magnetic field around a straight current carrying wire is concentric circles.

The ……. of the field lines is given by using the right hand grid rule or the corkscrew rule.

A magnetic compass can be used to show that a current flowing through a wire produces a magnetic field.

If the current through the wire is turned on or off, it ……. the direction that the compass needle points.

Q9 **solenoid** **increases** **combines** **shape** **uniform**

Making the wire into the shape of a solenoid ……. the strength of the magnetic field created by the current in the wire.

The magnetic field inside a solenoid is strong and …….. .

The magnetic field around a solenoid has a similar ……. to the magnetic field around a bar magnet.

The direction of the magnetic field lines around a solenoid is given by the right hand grip rule.

Putting an iron core inside the solenoid increases the strength of the magnetic field of the ……. .

A solenoid produces a much stronger magnetic field than a straight wire carrying the same current. That is because each loop of wire produces a field at least as strong as a straight conductor, and the field produced by each loop ……. to give a stronger overall field.

A solenoid with an iron core is called an electromagnet.

HIGHER TIER ONLY

Q10 **length** **current** **motor** **tesla** **left** **flux** **newton**

When a current carrying wire is placed in a magnetic field the magnet producing the field and the conductor exert a force on each other (unless the wire is parallel to the field lines).

This is called the ……. effect.

The direction of the force produced on the wire is given by Fleming's …….hand rule.

The size of the force depends on the size of the ……., the strength of the magnetic field (the magnetic ……. density) and the ……. of the wire in the magnetic field.

For a conductor at right angles to the magnetic field and carrying a current:

$$force = magnetic\ flux\ density \times current \times length \qquad F = B\,I\,\ell$$

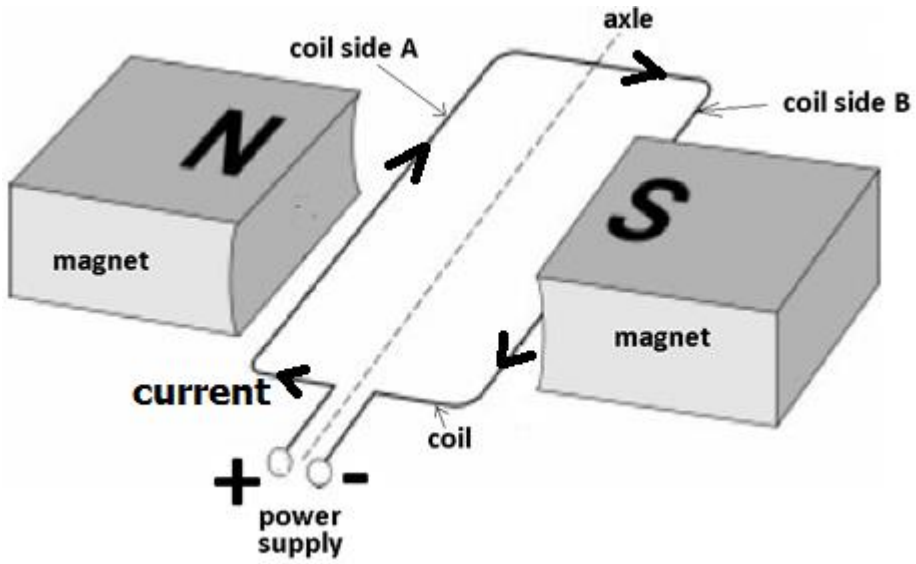
where: force, *F*, in ……., N

magnetic flux density, *B*, in ……., T

current, *I*, in ampere, A (amp is acceptable for ampere)

length, ℓ, in metre, m

Q11



current **opposite** **rotate** **motor**

A coil of wire carrying a current in a magnetic field tends to …… .

This is the basis of an electric …… .

The rotation is caused because the motor effect causes a force on each side of the coil and the forces on each side are in …… directions.

The forces are in opposite directions because the current in one side of the coil is in the opposite direction to the …… in the other side of the coil.

Q12 When would two magnets experience repulsion?

……

…… [1]

Q13 Give the names of three magnetic elements.

(1) …… (2) …… (3)…… [3]

Q14 Describe the difference between a “permanent magnet” and an “induced magnet”.

……

……

…… [3]

Q15 Explain how the behaviour of a compass needle provides evidence that supports the idea that the Earth has a magnetised core.

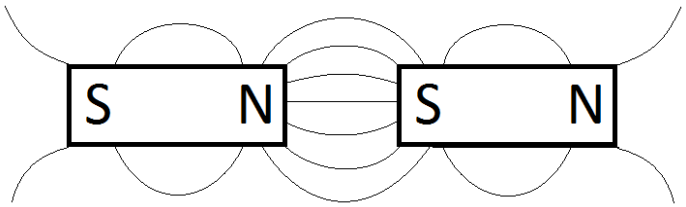
……

……

……

…… [3]

Q16 The diagram shows two bar magnets and the magnetic field lines in between them.



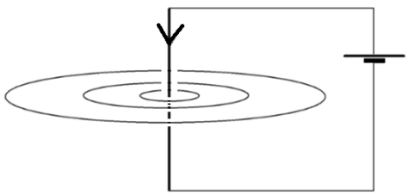
Q16a Explain how the diagram shows that the magnetic field is strongest in the space between the two magnets.

……

…… [1]

Q16b Add an arrow to each field line to show the direction of the magnetic field. [1]

Q17 The diagram shows a straight wire carrying an electric current downwards.



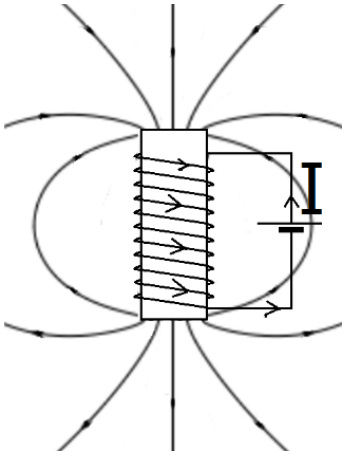
Q17a Add arrows to the field lines to show their direction.

Q17b The magnetic field lines are more closely spaced where they are nearer to the wire.
What does that tell you about the magnetic field around the wire?

……

…… [1]

Q18 The diagram shows the magnetic field lines around a solenoid.
Arrows on the solenoid show the direction that current is flowing around the solenoid.



Q18a Use the right hand grip rule to work out the direction of the magnetic field lines.

Add arrows to the magnetic field lines to show their direction. [1]

Q18b Explain why the magnetic field around a solenoid stronger than the magnetic field around a straight wire that carries the same electric current?

……

……

……

…… [2]

Q18c A solenoid can be used in a recycling centre to separate steel cans from aluminium cans.
Suggest how this might be done.

……

……

…… [3]

Q19 When the switch is closed, the hammer moves left and strikes the gong.

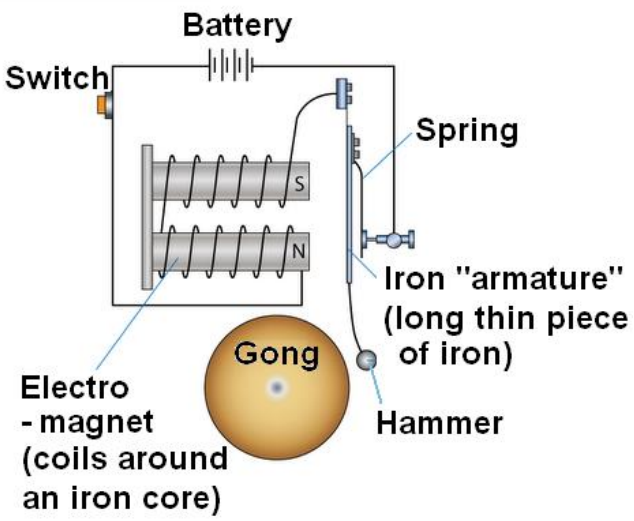
Why does the hammer move left when the switch is closed?

……

……

……

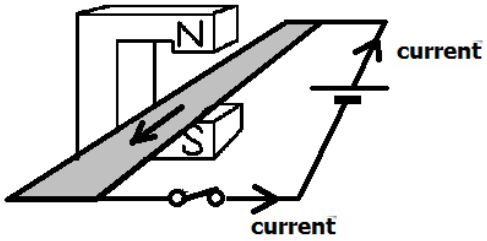
……



…… [2]

HIGHER TIER ONLY

Q20 When the switch is closed current flows through the aluminium strip between the magnetic poles.
The arrows labelled “current” show the direction of the current flowing around the circuit.



Q20a When the current is switched on the aluminium strip is pushed by a force acting on it due to the motor effect.
Use Fleming’s left hand rule to work out the direction of the force on the magnetic strip.
What direction would the force on the aluminium strip be in?

…… [1]

Q20b What three things affect the strength of the force acting on the aluminium strip?

(1) …… (2) …… (3) …… [3]

Q21 Calculate the force exerted on 1.2 m of wire carrying a current of 2.0 A in a magnetic field of magnetic flux density 0.033 T.
The wire is straight and at right angles to the magnetic field.

Force = …….. unit …… [3]

Q22 A wire of length 80 cm carries a current of 300 mA in a magnetic field of magnetic flux density of 40 mT.

Q22a What is “80 cm” in metre? …… m [1]

Q22b What is “300 mA" in ampere? …….. A [1]

Q22c What is “40 mT" in tesla? …….. T [1]

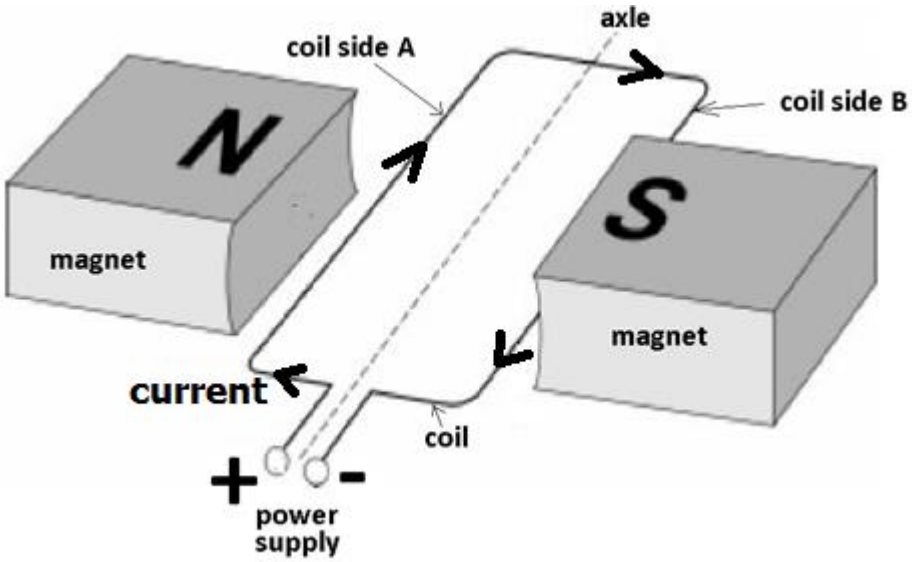
Q22d Calculate the force exerted on the wire by the motor effect.

Force = …….. unit …… [3]

Q23 A wire carries a current of 4.2 A in a magnetic field of flux density 0.22 T.
The force exerted on the wire is 0.50 N.
Calculate the length of wire in the magnetic field.

Length = ... unit ..... [3]

Q24 The diagram shows a simple electric motor.



Explain why the coil of the motor turns when a current flows around it.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [3]

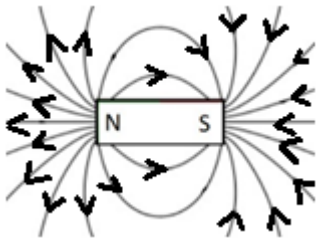
Answers

Q1 poles repel non-contact field cobalt weaker ✓

Q2 permanent magnet magnetism Repulsion ✓

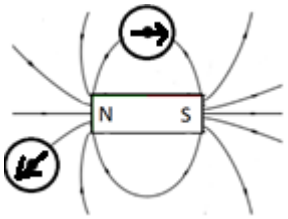
Q3 lines pole magnetic magnetic ✓

Q4



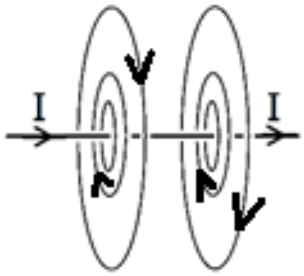
✓

Q5



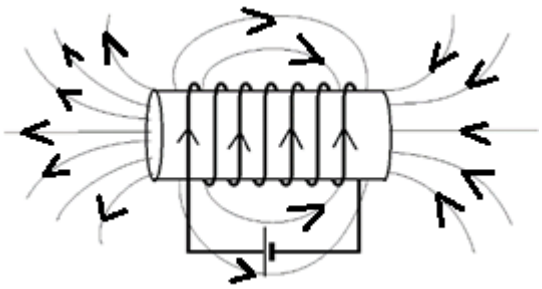
✓

Q6



✓

Q7



✓

Q8 straight magnetic current direction changes ✓

Q9 increases uniform shape solenoid combines ✓

Q10 motor left current flux length newton tesla ✓

Q11 rotate motor opposite current ✓

Q12 When like poles were close together ✓

OR when a north (seeking) pole were close to another north seeking pole

OR when a south (seeking) pole were close to another south seeking pole

Q13 iron, nickel, cobalt [any order] ✓

Q14 A permanent magnet is always a magnet / magnetised ✓

An induced magnet is a magnet / magnetised when in the magnetic field of another magnet ✓

but looses its magnetism (quickly) when removed from a magnetic field ✓

Q15 A compass needle is a tiny bar magnet and always swings to point north-south ✓

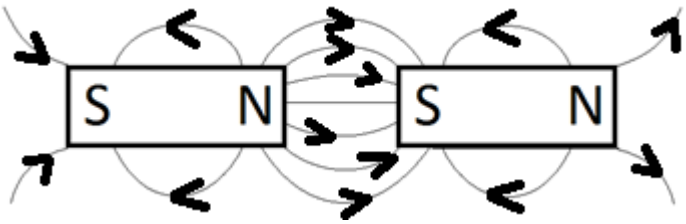
(if it is free to move)

This suggests that there are magnetic field lines running from one pole of the Earth to the other ✓

which are produced from a magnetic core ✓

Q16a The (magnetic) field lines are closer / closest together (there) ✓

Q16b



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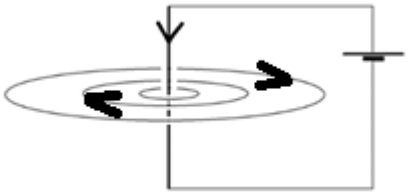
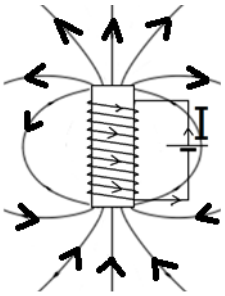
Q17a



✓

Q17b That the (magnetic) field is stronger closest to the wire. ✓

Q18a



✓

Q18b Each turn of wire produces a magnetic field that is as strong as that produced by a straight wire ✓

Putting the turns together combines the magnetic field strength of each turn ✓

Q18c Solenoid positioned near to cans ✓

Steel cans attracted to solenoid. ✓

Aluminium cans not attracted. ✓

Q19 Current flows through coil(s) & they become magnetised / a magnet / an electromagnet ✓

and attract the iron armature ✓

Q20a To the right / away from the magnet / towards the cell ✓

Q20b magnetic field strength/flux density

length of strip in the magnetic field } any order ✓✓✓

electric current flowing in/through strip

Q21 $F = B I \ell$

F = 0.033 × 2.0 × 1.2 ✓

= 0.792 ✓

N ✓

Q22a 0.80 m ✓

Q22b 0.300 A ✓

Q22c 0.040 T ✓

Q22d $F = B I \ell$

F = 0.040 × 0.300 × 0.80 ✓

= 0.0096 or 9.6×10^{-3} ✓

N ✓

Q23 $F = B I \ell$

$0.50 = 0.22 \times 4.2 \times \ell$ OR $0.50 = 0.924 \times \ell$ OR $\ell = \frac{0.50}{0.22 \times 4.2}$ OR $\ell = \frac{0.50}{0.924}$ ✓

= 0.54 ✓

N ✓

Q24 When current flows around the coil, because it is in a magnetic field, a force acts on the coil (except where the parts of the coil run parallel to the field) ✓

The current flows in an opposite direction on opposite sides of the coil ✓

so the forces acting on each side of the coil are in opposite directions ✓

(causing the coil to turn)