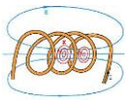
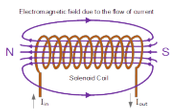
EDEXCEL TOPIC 12 MAGNETISM AND THE MOTOR EFFECT

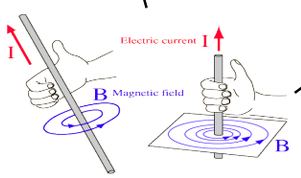
Electromagnetism





When current flows through a wire, a concentric magnetic field is created.

Concentric magnetic field	*Circles which share the same centre, perpendicular to the wire.*	The strength of the field depends on: • The size of current • The distance from the wire



A compass or iron filings placed near the wire, will show the direction of the magnetic field.

Thumb	Direction of current.
Fingers	Direction of magnetic field.

Solenoid	*A long coil of wire*	Magnetic field from each loop adds to the next.

Fields from individual coils add together to form an almost uniform filed along the centre of solenoid.

Fields from individual coils cancel out to give a weaker field outside the solenoid.

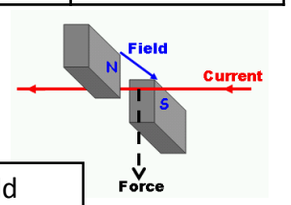
Increase strength of magnetic field	*Use larger current*
	Use more turns of wire
	Put turns of wire closer together
	Use iron core in middle

Electromagnet	*Lots of turns of wire increase the magnetising effect when current flows*
	Turn current off, magnetism lost.

Magnetic forces

HIGHER ONLY

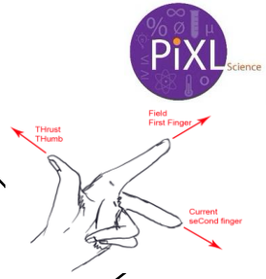
Magnetic force	*Place a wire carrying current near a magnetic, a force is exerted.*	An equal and opposite force acts on the magnet.



Force on a conductor at right angles to a magnetic field carrying a current = magnetic flux density X current X length.

$$F = B X I X l$$

Fleming's left-hand rule	*To predict the direction a straight conductor moves in a magnetic field.*	Thumb	Direction of movement.
		First finger	Direction of magnetic field.
		Second finger	Direction of current.



If current and magnetic field are parallel to each other , no force on wire.

Electric motor	*Force on a conductor in a magnetic field causes rotation.*	A conductor carrying current produces a magnetic field. Put the conductor into another magnetic field and the two magnetic fields interact.

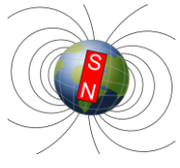
They exert equal and opposite forces on each other.

Split –ring commutator makes sure current always flows in correct direction to make coil spin.

Magnets and magnetic fields

Permanent	*A bar magnet that produces its own magnetic field*	Will repel or attract other magnets and magnetic materials.
Induced	*A temporary magnet*	Becomes magnet when placed in a magnetic field.

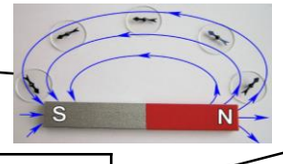
Magnetic elements are Nickle, Iron and Cobalt.



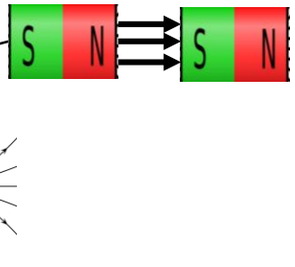
Earth's magnetic field	*Plotting compass needle is a tiny magnet. It points north. This behaviour is evidence that the Earth has a magnetic field.*	The Earth's magnetic field exists because of electric currents in the molten outer core which is made from a mixture of iron and nickel.

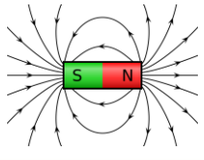
Magnetic	*Materials attracted by magnets*	Uses non-contact force to attract magnetic materials.
North seeking pole	*End of magnet pointing north*	Compass needle is a bar magnet and points north.
South seeking pole	*End of magnet pointing south*	Like poles (N – N) repel, unlike poles (N – S) attract.
Magnetic field	*Region of force around magnet*	Strong field, force big. Weak field, force small. Field is strongest at the poles.

Plotting compass	*Show the direction of magnetic field lines. Strongest when lines are close together.*



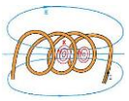
Uniform field	*Same strength and direction between two magnets*
Ununiformed field	*Direction goes North to South. Filed lines stronger closer to magnet.*

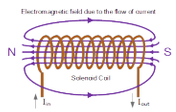




EDEXCEL TOPIC 12 MAGNETISM AND THE MOTOR EFFECT

Electromagnetism





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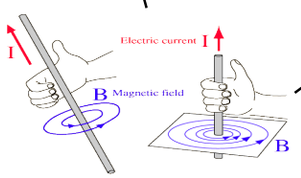

Direction of current.	
Direction of magnetic field.	

Fields from individual coils add together to form an almost uniform filed along the centre of solenoid.

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	A long coil of wire	Magnetic field from each loop adds to the next.

Use larger current	
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Lots of turns of wire increase the magnetising effect when current flows	
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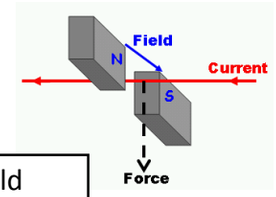
Magnetic forces

HIGHER ONLY

	Place a wire carrying current near a magnetic, a force is exerted.	An equal and opposite force acts on the magnet.



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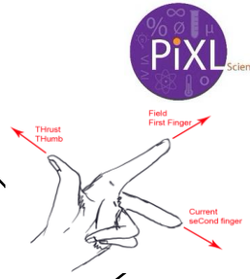

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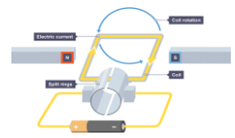

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Split –ring commutator makes sure current always flows in correct direction to make coil spin.

Magnets and magnetic fields

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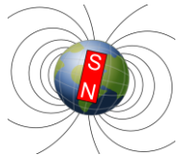

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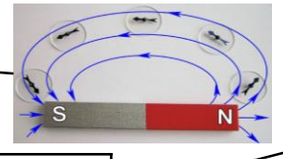

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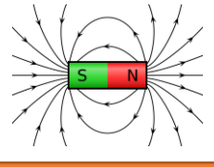
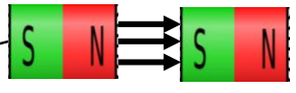




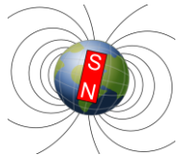
EDEXCEL TOPIC 12 MAGNETISM AND THE MOTOR EFFECT

Magnets and magnetic fields

Permanent		
Induced		

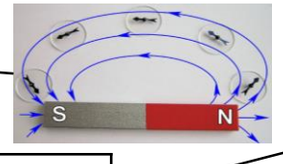
Magnetic		
North seeking pole		
South seeking pole		
Magnetic field		

Magnetic elements

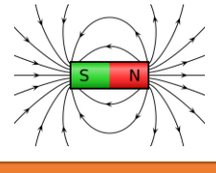


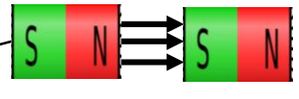
Earth's magnetic field		

Plotting compass		



Uniform field	
Ununiformed field	





Electromagnetism

Electromagnet

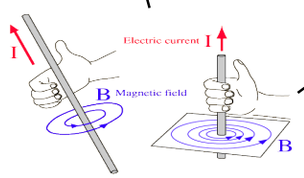
Increase strength of magnetic field

Fields from individual coils add together to form an almost uniform filed along the centre of solenoid.

Fields from individual coils cancel out to give a weaker field outside the solenoid.

Solenoid		

Thumb	
Fingers	



A compass or iron filings

When current flows

Concentric magnetic field		

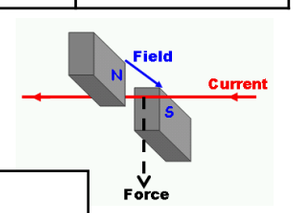
Magnetic forces

HIGHER ONLY

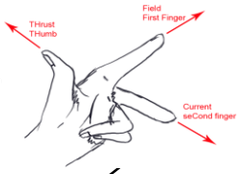
Magnetic force		

Force on a conductor

$F = B X I X l$



Fleming's left-hand rule



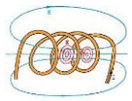
If current and magnetic field

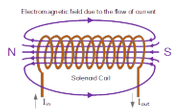
Electric motor		

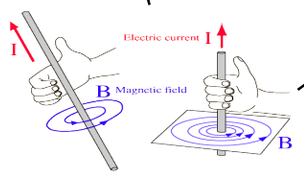
Split –ring commutator makes sure current always flows in correct direction to make coil spin.

They exert

PiXL
Partners in excellence







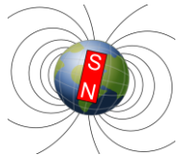
A compass

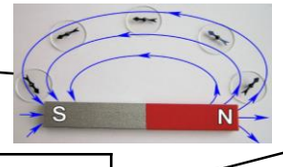
When current flows

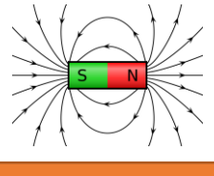
Electromagnetism

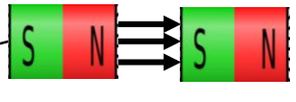
EDEXCEL TOPIC 12 MAGNETISM AND THE MOTOR EFFECT

Magnets and magnetic fields









Magnetic forces

HIGHER ONLY