



Revision Workshop 2014

PHYSICS

PROGRAMME

0930 Registration
 0945 Introduction
 0955 **Session 1 – Mechanics**
 1130 Short break
 1140 **Session 2 – Electricity and Magnetism**
 1300 LUNCH
 1340 **Session 3 – Waves, Matter and Materials**
 1455 Final comments
 1500 END



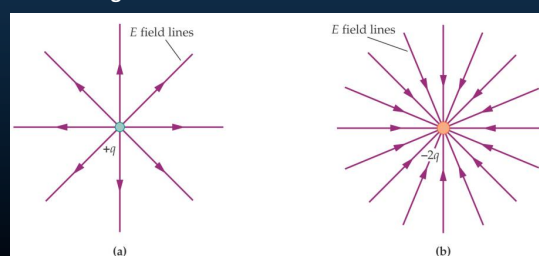
ELECTRICITY & MAGNETISM

DBE 37% | IEB 37%

- Electrostatics
 - Coulomb's Law
 - Elec Field
- Elec Circuits
 - Ohm's Law
 - Resistance and Int resistance
- Electrodynamics
 - Motors and Generators
 - A.C.
 - Transformers (IEB Only)

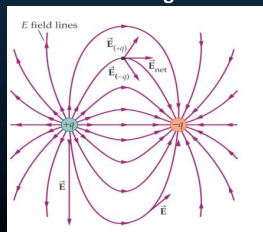


ELECTRIC FIELD PATTERNS Point Charges

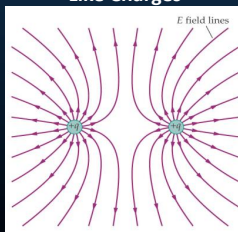


ELECTRIC FIELD PATTERNS

Unlike Charges



Like Charges



COULOMB'S LAW

The magnitude of the electrostatic force exerted by one point charge (Q_1) on another point charge (Q_2) is directly proportional to the product of the magnitudes of the charges and inversely proportional to the square of the distance (r) between them.

$$F = k \frac{Q_1 Q_2}{r^2}$$

Example : Calculate the net force on a charge



ELECTRIC FIELD STRENGTH

$$E = \frac{F}{q}$$

q is the charge experiencing the force in the electric field

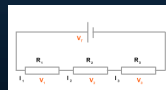
$$E = \frac{kQ}{r^2}$$

Q is the charge that creates the electric field

If the fields around charges overlap, the net field strength at any point = the vector addition of all the field strengths at that point.

Electric Circuits

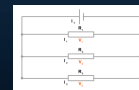
- Lots of formulae – plenty of "tools" to learn to use
- Also remember principles of V and I in series, parallel



SERIES

$$I_T = I_1 = I_2 = I_3$$

$$V_T = V_1 + V_2 + V_3$$



PARALLEL

$$I_T = I_1 + I_2 + I_3$$

$$V_T = V_1 = V_2 = V_3$$

- Problem solving! i.e....
- PRACTICE!!!**

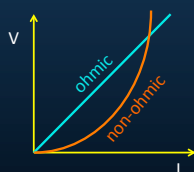
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Ohm's Law

- $V \propto I$ @ const temp

$$R = \frac{V}{I}$$

Ohmic
- standard resistor
- nichrome wire

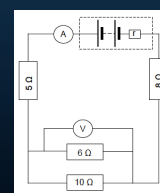
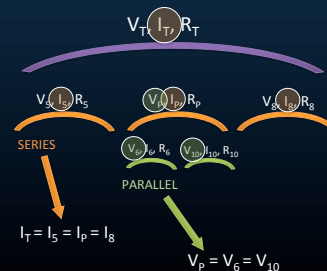


Non-ohmic
- light bulb
- thermistor

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Electric Circuits

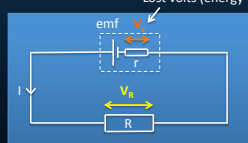
"Umbrellas" (like Rhianna :)



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Electric Circuits

- Internal resistance = resistance within the cell
- Causes "lost volts"



$r = \text{int res}$
 $R = \text{ext res}$

$$V_R = IR$$

$$\text{emf} = V_R + V_r$$

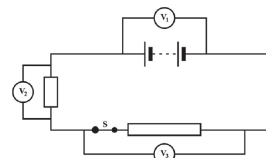
$$\text{emf} = IR + Ir$$

$$\text{emf} = I(R + r)$$

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Electric Circuits

1.5 In the circuit shown below the resistance of the switch and connecting wires is negligible. The voltmeters have very high resistance. The battery has significant internal resistance.



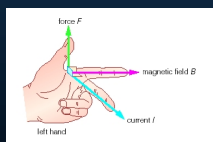
How are the readings on the voltmeters V_1 and V_2 affected when switch S is opened?

	V_1	V_2
A	No change	Increase
B	No change	Decrease
C	Increase	Decrease
D	Increase	Increase

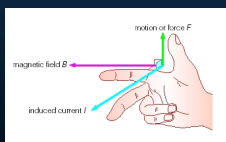
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Electromagnetism

HAND RULES



Fleming's Left Hand Rule
MOTOR RULE



Fleming's Right Hand Rule
GENERATOR RULE

Current → Motion (Force)

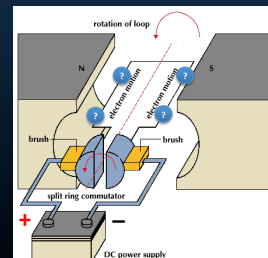
Motion → Induced Current

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Electromagnetism

MOTORS

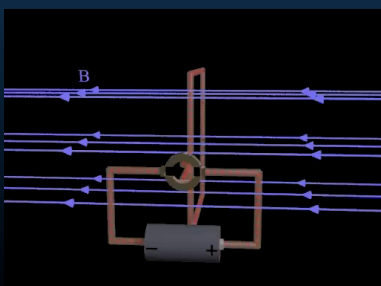
- Energy:
Electrical to Mechanical
- Split-ring commutator:
Reverses the current in the coil every half turn.



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Electromagnetism

MOTORS



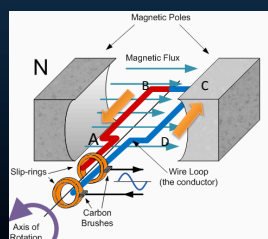
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Electromagnetism

Direction? Strength?
DCBA MAX

GENERATORS

- Energy:
Mechanical to Electrical
- Slip rings and brushes:
Maintains an electrical connection between the coil and the external circuit whilst in motion.

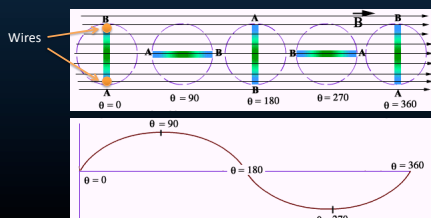


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Electromagnetism

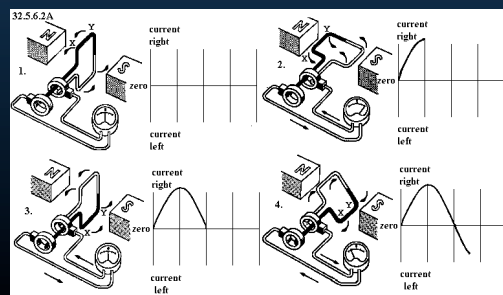
- Position of coil in the field relative to emf output?
NB – think about how the movement of the WIRES is "cutting" through the magnetic field lines

FARADAY'S LAW
$$\text{emf} = -N \frac{\Delta \Phi}{\Delta t}$$



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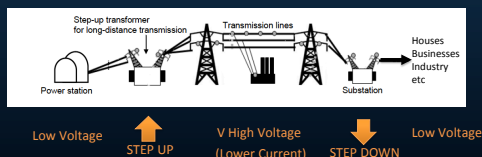
Electromagnetism



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AC & Power Transmission

Why AC?



- AC can be stepped up and down with transformers
- So can be transmitted at v high voltage, reduces current
- Reduces loss of energy through heat (more efficient)
- Stepped down again at the other end

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ELECTRICITY & MAGNETISM

FINAL TIPS

- Practice!
- Attempt easier problems first
- Do as many challenging questions as you can
- Try lots of Past Paper questions
- How can I rephrase this again... ?

•PRACTICE!

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