

ICT Physics data logging Project

Current Electricity

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Electricity

PHYSICS 9702 A/AS LEVEL 2007

- Candidates should be able to:
- (a) show an understanding that electric current is the rate of flow of charged particles.
- (b) define charge and the coulomb.
- (c) recall and solve problems using the equation $Q = It$.
- (d) define potential difference and the volt.
- (e) recall and solve problems using $V = W/Q$.
- (f) recall and solve problems using $P = VI$, $P = I^2R$.
- (g) define resistance and the ohm.
- (h) recall and solve problems using $V = IR$.
- * (i) sketch and explain the I-V characteristics of a metallic conductor at constant temperature, a semiconductor diode and a filament lamp.
- (j) sketch the temperature characteristic of a thermistor.
- (k) state Ohm's law.
- (l) recall and solve problems using $R = \rho l/A$.
- (m) define e.m.f. in terms of the energy transferred by a source in driving unit charge round a complete circuit.
- (n) distinguish between e.m.f. and p.d in terms of energy considerations.
- (o) show an understanding of the effects of the internal resistance of a source of e.m.f. on the terminal potential difference and output power.

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At the end of this lesson, you should be able to:

- ✓ Explain the meaning of current, potential difference, emf, resistance
- ✓ Show understanding of internal resistance of cells
- ✓ Solve circuits problems

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Current

It is the rate of flow of charges.

$$I = Q/t \text{ - steady flow}$$

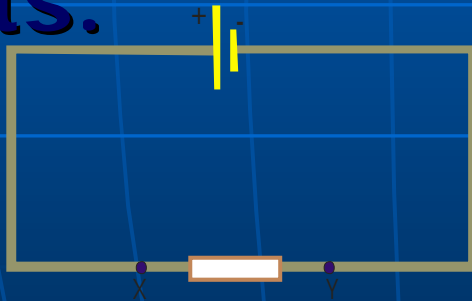
$$I = dQ/dt \text{ - non steady flow}$$

What do you understand by 'conventional flow' of current?

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Potential difference

It is the work done in taking unit positive charge between two points.

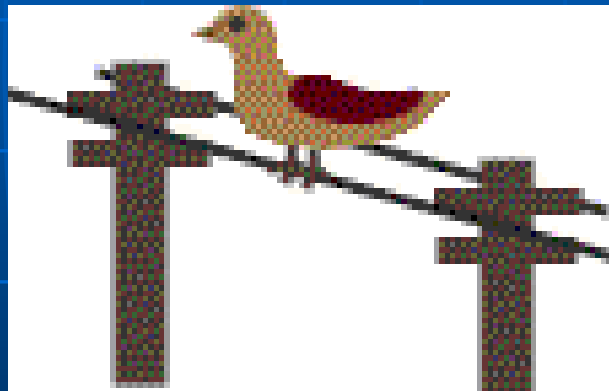


Write down a mathematical relationship based on the above definition.

Refer to worksheet 1

Electricity

- Why can a bird sit on the power line?



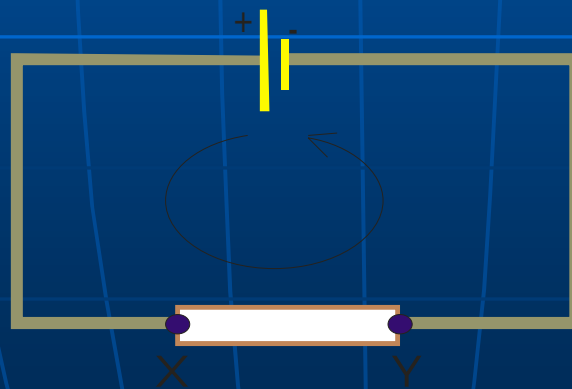
Misconceptions in interpretation of electricity

<http://amasci.com/miscon/elect.html>

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Electromotive force (e.m.f.)

It is the work done in taking unit positive charge round a complete circuit.



Worksheet 2

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$$\text{e.m.f. of a cell} = \frac{\text{ener. transf. to ext. circ} + \text{ener. dissip. within battery}}{\text{charge moved}}$$

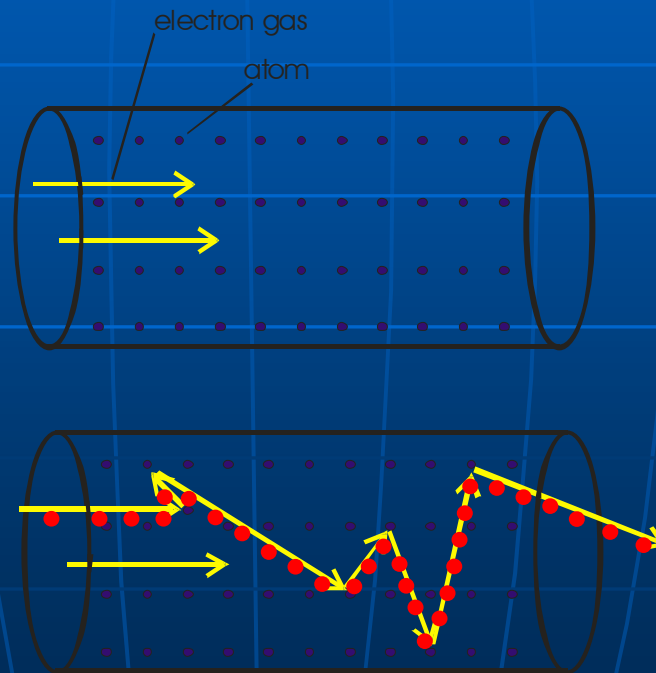
e.m.f. – p.d across terminals = ‘lost volts’

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Resistance

It is the opposition to the flow of electric current in a wire.

What is the unit of resistance?



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The resistance of a wire can be determined by Ohm's law.

What is Ohm's law?

Under what condition does it apply?

activity

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Resistors in series and parallel

Resistors in series

$$R = \sum R_i$$

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Resistors in series and parallel

Resistors in parallel

$$R = \left(\sum \frac{1}{R_i} \right)^{-1}$$

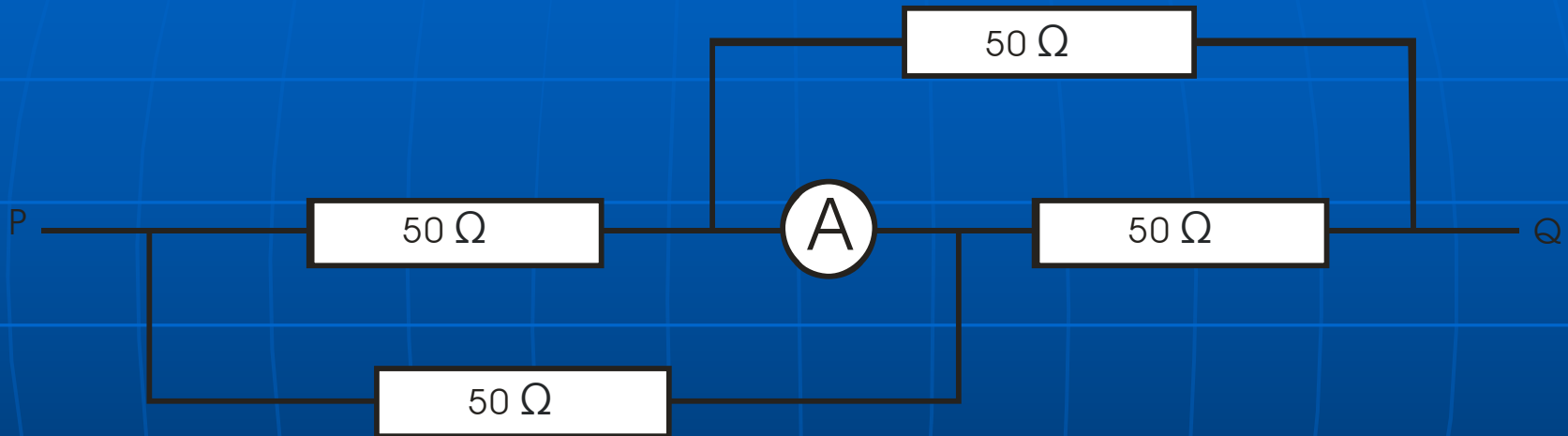
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I / V Characteristic

Worksheet 3

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Application – Problem solving



What current is registered by the meter (which is of negligible resistance)?

Worksheet 4

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Energy consideration: Power Theorem



Worksheet 5

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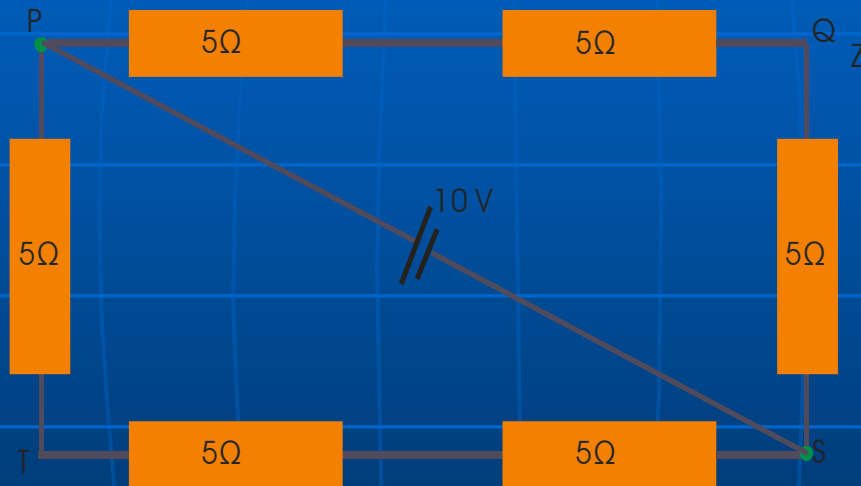
Problem solving



Worksheet 6

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Problem solving



What is the potential difference between Q and T?

Worksheet 7

Thank You

Thank You

Thank You

