Describe a.c and d.c.

1

Peak Voltage & Peak current

2

V_{rms}

I_{rms}

3

Formulae for V_{rms} & I_{rms}

4

Find frequency of an a.c. supply from an oscilloscope

5

Find the peak voltage from an oscilloscope

6

Use appropriate relationships to solve problems involving potential difference, current, power and resistance

7

Use appropriate relationships to solve problems involving potential divider circuits.

8

Define electromotive force (EMF)

9

Internal resistance

10

The maximum voltage / current produced by an a.c. supply. These can be measured using an oscilloscope.

a.c. is a current which changes direction and instantaneous value with time.
d.c. is a current which travels in one direction.

$$V_{rms} = \frac{V_{peak}}{\sqrt{2}}$$

$$I_{rms} = \frac{I_{peak}}{\sqrt{2}}$$

The values given to an a.c supply that would have the same heating effect as an equivalent d.c supply

Count the number of divisions for the amplitude of the wave. Multiply this by the number of volts per division.

Find the period (time for one wave (T)).

frequency = $\frac{1}{T}$

$$V_1 = \left(\frac{R_1}{R_1 + R_2}\right) V_S$$

$$\frac{V_1}{V_2} = \frac{R_1}{R_2}$$

$$V = IR$$

$$P = IV = I^2 R = \frac{V^2}{R}$$

$$R_T = R_1 + R_2 + \ldots$$

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \ldots$$

The resistance of a power supply.

The total amount of energy given to each coulomb of charge by a power supply.

Lost volts

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Terminal potential difference

12

Short circuit current

13

$E = V_{tpd} + Ir$

14

Describe an experiment to find the EMF and internal resistance of a supply.

15

Be able to find the EMF, internal resistance and short circuit current from a graph of V_{tpd} vs current

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Define Capacitance

17

$C = \frac{Q}{V}$

18

$Q = It$

19

Find the total energy stored in a capacitor from a charge vs potential difference graph.

20

$V_{tpd} = E - V_{lost}$

The voltage across the terminals of a supply when a load resistance is connected.

$V_{lost} = Ir$

The voltage across the internal resistance when a load resistance is connected.

$E = V_{tpd} + V_{lost}$

$E = IR + Ir$

$E = I(R + r)$

The current drawn from a supply when the terminals are connected together with no load resistance. This can produce a large current and can be dangerous.

$I = E/r$

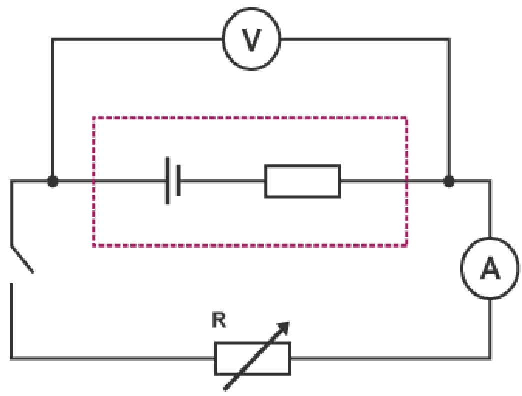
$V = -rI + E$

$(Y = mx + c)$

EMF = Y-intercept

Internal resistance = negative the gradient.

Short circuit current = current when $V_{tpd} = 0$



C = Capacitance – measured in farads (F)

Q = Charge – measured in coulombs (C)

V = potential difference – measured in volts (V)

A capacitor of 1 farad capacitance will store 1 coulomb of charge when the potential difference across it is 1 volt.

The energy stored by a capacitor is equal to the area under a charge vs potential difference graph.

Q = Charge – measured in coulombs (C)

I = Current – measured in amperes (A)

t = time – measured in seconds (s)

Equations to find the energy stored by a capacitor

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Sketch a graph of voltage vs time for a charging capacitor

22

Sketch a graph of current vs time for a charging capacitor

23

Sketch a graph of voltage vs time for a discharging capacitor

24

Sketch a graph of current vs time for a discharging capacitor

25

Describe the effect of changing resistance on the charging and discharging curves for a capacitor?

26

Describe the effect of changing capacitance on the charging and discharging curves for capacitors?

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Describe experiments to measure the current and voltage for charging and discharging capacitors

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Conduction band

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Valence band

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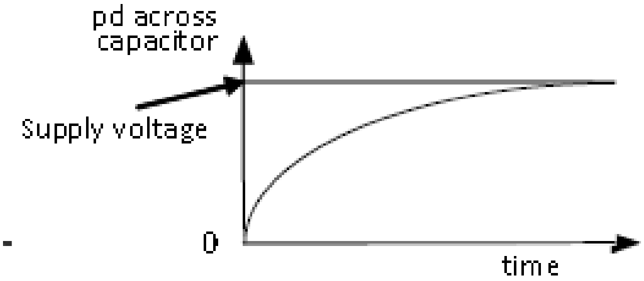
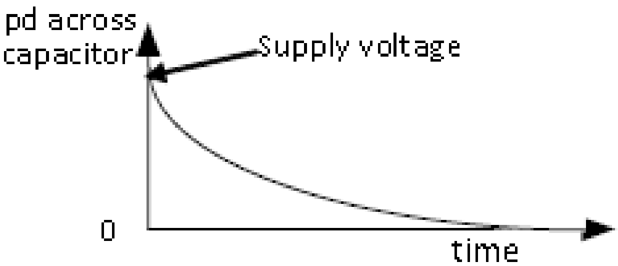
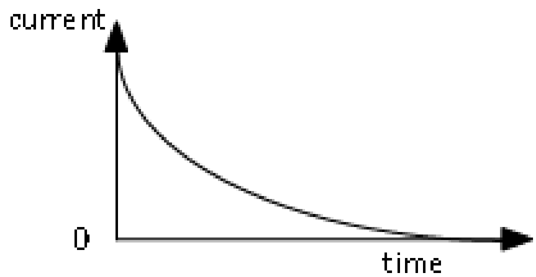
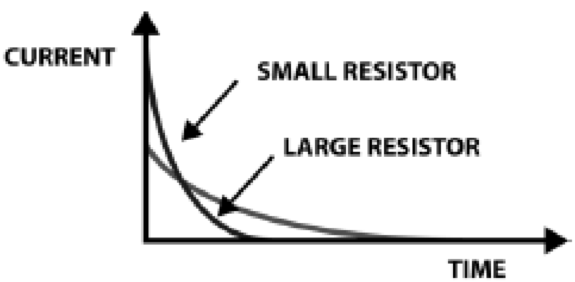
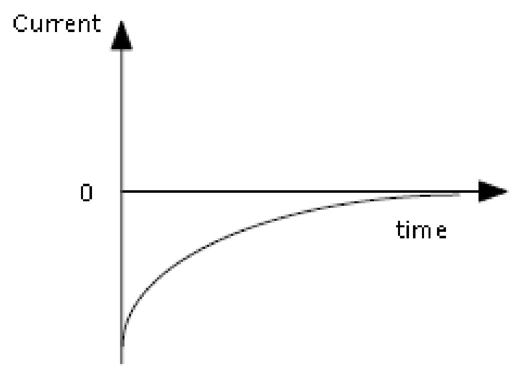


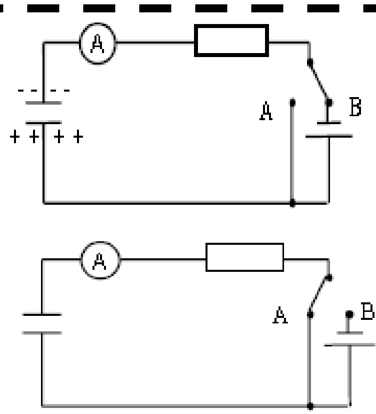
$$E = \frac{1}{2}QV = \frac{1}{2}CV^2 = \frac{1}{2}\frac{Q^2}{C}$$

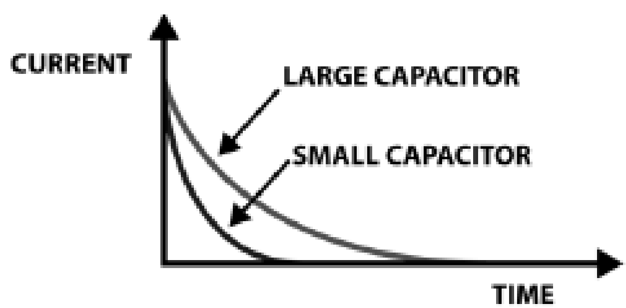












The range of possible energies an electron can have and still be part of an atom.

The range of possible energy levels for free electrons. These are electrons that have gained enough energy to escape the valence band.

Describe the band structure of insulators, semiconductors and conductors

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Describe how an n-type semiconductor is formed

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Describe how a p-type semiconductor is formed

33

P-n junction

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Forward bias

35

Reverse bias

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Describe how an LED emits light

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Photovoltaic mode (solar cells)

38

Photoconductive mode (LDR)

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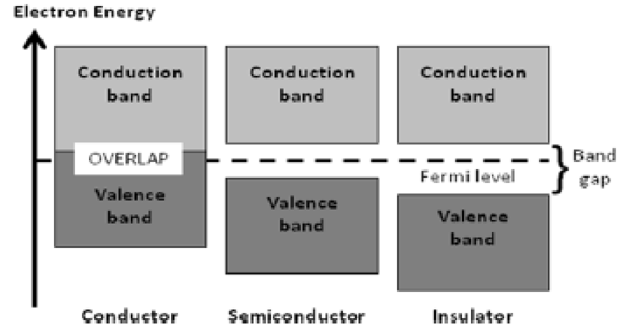
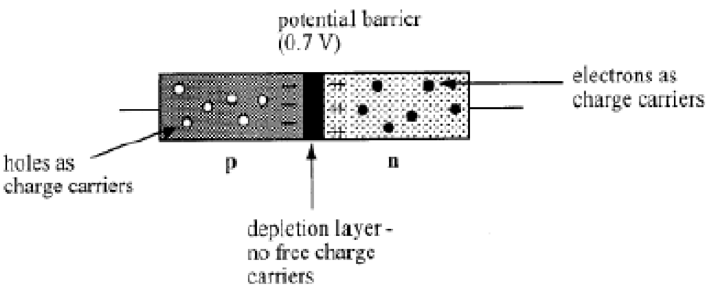
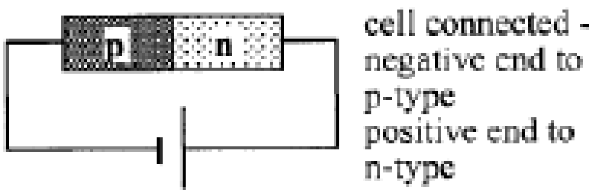
A material such as silicon has impurities added with an extra outer electron e.g. Arsenic

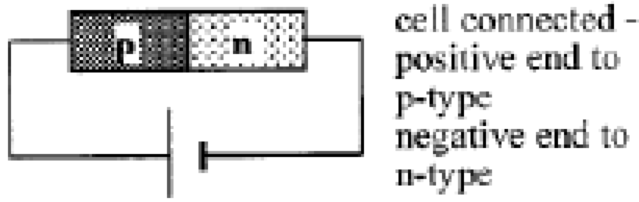




A material such as silicon has impurities added with one fewer extra outer electron e.g. Indium



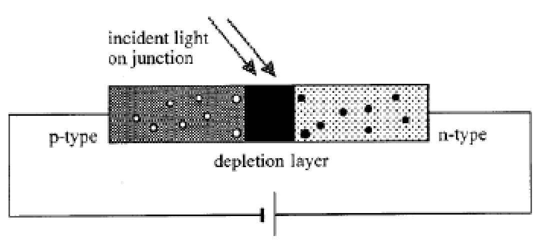
Reverse-biased



Forward-biased

No bias applied

An LED is a forward biased p-n junction. When an electron and a hole recombine. The electron moves from the conduction band into the valence band and emits a photon of light.



Reverse bias