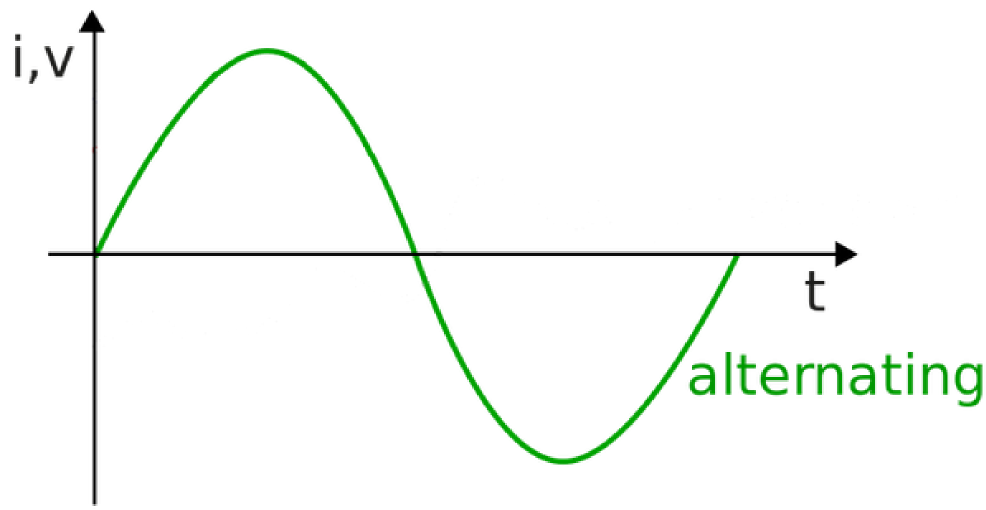
Alternating current:

Alternating current (**AC**) is an electric current which periodically reverses direction, The usual waveform of alternating current in most electric power circuits is a sine wave, whose positive half-period corresponds with positive direction of the current and vice versa.

Alternating current is the form in which electric power is delivered to businesses and residences, and it is the form of electrical energy that consumers typically use when they plug kitchen appliances, televisions, fans and electric lamps into a wall socket.



Dielectric Material:

Dielectric is insulating material or a very poor conductor of electric current. When dielectrics are placed in an electric field, practically no current flows in them because, unlike metals, they have no loosely bound, or free, electrons that may drift through the material.

Dielectric materials are basically plain and simple electrical insulators.

The examples of solid dielectric materials are ceramics, paper, mica, glass etc. Liquid dielectric materials are distilled water, transformer oil etc. Gas dielectrics are nitrogen, dry air, helium, oxides of various metals etc. Perfect vacuum is also a dielectric.

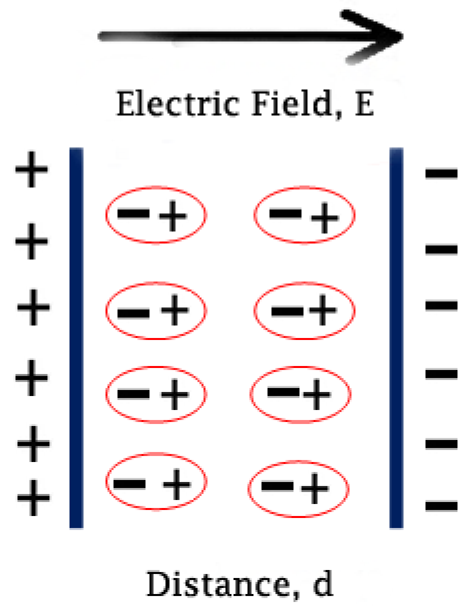
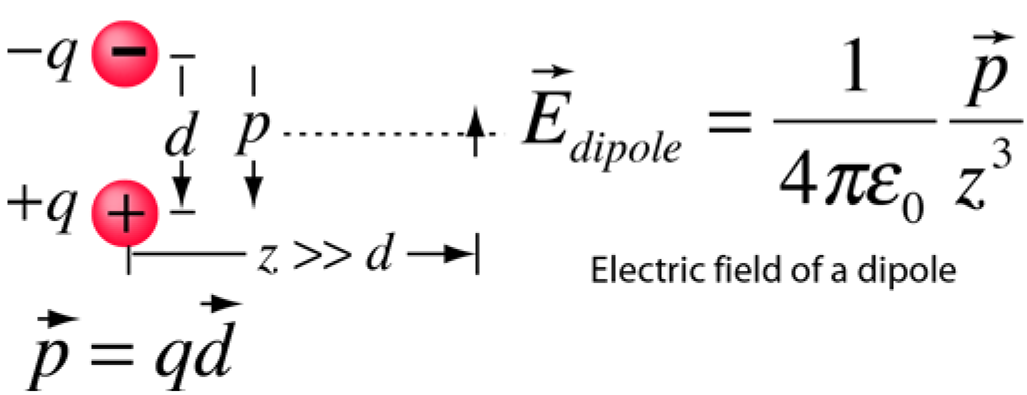


Figure 2

Electric dipole:

The electric dipole moment for a pair of opposite charges of magnitude q is defined as the magnitude of the charge times the distance between them and the defined direction is toward the positive charge. It is useful concept in dielectrics and other applications in solid and liquid materials.

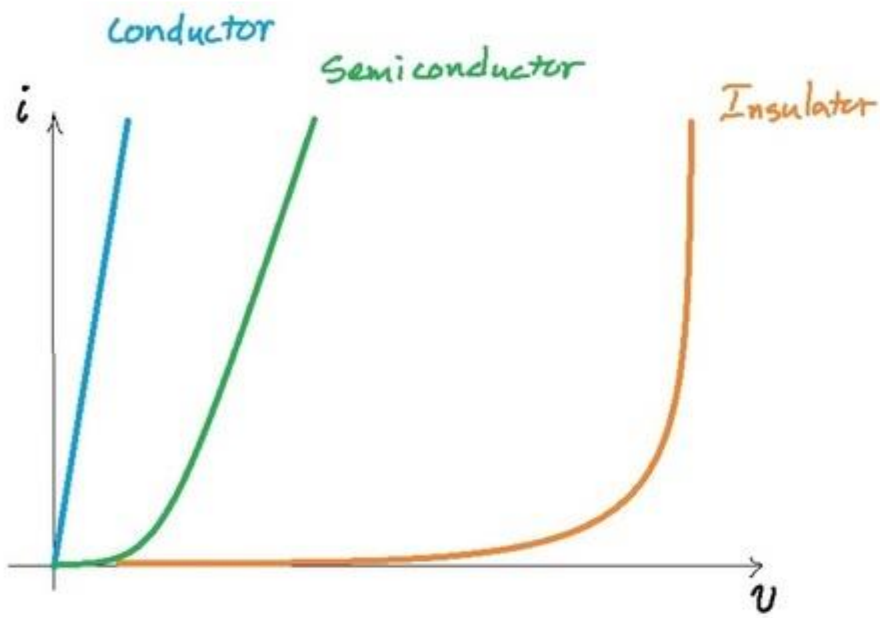


Dielectric constant:

It is a property of an electrical insulating material or dielectric which is equal to the ratio of the capacitance of a capacitor filled with the given material to the capacitance of an identical capacitor in a vacuum without the dielectric material. The dielectric constant is sometimes called relative permittivity.

The dielectric constant, symbolized by the Greek letter kappa, κ, is simply expressed as $\kappa = C/C_0$.

Draw the I-V graph for conductor, semiconductor and insulator material:



Internal resistance:

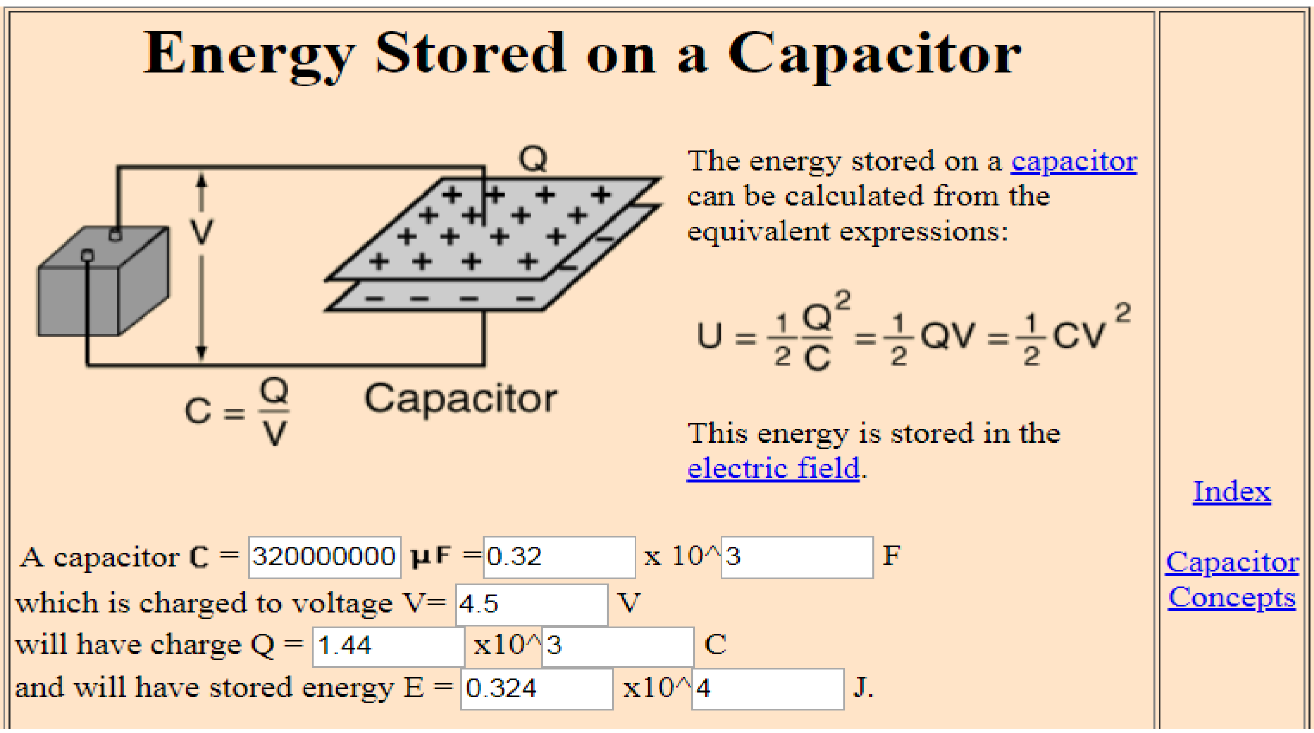
It refers to the opposition to the flow of current offered by the cells and batteries themselves resulting in the generation of heat. Internal resistance is measured in Ohms.

The relationship between internal resistance (r) and emf (E) of cell is given by.

$E = I\,(r + R)$

Where, E = EMF i.e. electromotive force (Volts), I = current (A), R = Load resistance, and r is the internal resistance of cell measured in ohms.

Energy of a capacitor:



Energy Stored on a Capacitor

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

The energy stored on a capacitor can be calculated from the equivalent expressions:

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

This energy is stored in the electric field.

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Capacitor Concepts

A capacitor C = 320000000 μF = 0.32 x 10^3 F
which is charged to voltage V= 4.5 V
will have charge Q = 1.44 x10^3 C
and will have stored energy E = 0.324 x10^4 J.