**2-ELECTRIC POTENTIAL AND CAPACITANCE**

**1. Electric Potential**

1. Potential difference =  or  2. Electric potential due to a point charge q at distance *r* from it  3. Electric potential at a point due to N point charges  4. Electric potential at a point due to a dipole, 

**2. Relation between Electric Field and Potential**

1. Electric field in a region can be determined from the electric potential by using relation.  or  2. Electric field between two parallel conductors  3. Electric potential in a region can be determined from the electric field by using the relation 

**3. Electric Potential Energy**

1. Electric potential energy of a system of N point charges 

2. Electric potential of a system of two point charges  3. Potential energy of an electric dipole in a uniform electric field,  If initially the dipole is perpendicular to the field E,  and (say), then  If initially the dipole is parallel to the field E,  and (say), then 

**4. Capacitance of Spherical Conductors**

1. Capacitance of a spherical conductor of radius R, C =  2. Capacitance =  or 

**5. Capacitance of Air-Filled Capacitors**

1. Capacitance,  2. Capacitance of a parallel plate capacitor,  3. P.D. between the two plates of a capacitor having charges *q1* and *q2*,  4. Capacitance of a spherical capacitor,  Here *a* and *b* are the radii of inner and outer shells of the spherical capacitor. 5. Capacitance of a cylindrical capacitor 

Here *a* and *b* are the radii of inner and outer coaxial cylinders and L is the length of the capacitor.

**6. Grouping of Capacitors**

1. In series combination,  2. In parallel combination,  3. In series combination charge on each capacitor is same (equal to the charge supplied by battery) but potential difference across the capacitors may be different. 4. In parallel combination potential difference on each capacitor is same but the charges on the capacitors may be different.

**7. Energy Stored in Capacitors**

1. Energy stored in capacitor  2. Energy stored per unit volume or the energy density of the electric field of a capacitor `  3. Electric field between capacitor plates, 

**8. Capacitors Filled with Dielectrics and Conductors**

1. Capacitance of a parallel plate capacitor filled with a dielectric constant,  2. Capacitance of a parallel plate capacitor with a dielectric slab of thickness *t (< d)* in between its plates, 

3. Capacitance of a parallel plate capacitor with a conducting slab of thickness *t* (< *d*) in between its plates.  4. Capacitance of a spherical capacitor filled with a dielectric,  5. Capacitance of a cylindrical capacitor filled with a dielectric,  6. Effect of dielectric with battery disconnected from the capacitor 

7. Effect of dielectric with battery connected across the capacitor

