Note on Electricity and Magnetism

1**. Electricity:**
- Electricity is a form of energy resulting from the movement of charged particles (such as electrons or protons).

2. **Current Formula and Units:**
- Current $((I))$ is the flow of electric charge. The formula is $(I = \frac{Q}{t})$, where (Q) is charge in coulombs and \(t\) is time in seconds. Unit: Ampere (A).

3. 1 **Coulomb Charge:**
- One coulomb of charge is the charge transported by a constant current of one ampere in one second.

4. Direct Current and Alternating Current:
- Direct Current (DC): Current flows in one direction.
- Alternating Current (AC): Current periodically changes direction.

5. Magnetic Effect of Current:
- When current flows through a conductor, it produces a magnetic field around it.

6. Magnetic Field and Magnetic Field Lines:
- Magnetic Field: A region around a magnet or a current-carrying conductor where a magnetic force is experienced.
- Magnetic Field Lines: Imaginary lines representing the direction of the magnetic field.

7. **Magnetic Field of a Straight Current-Carrying Conductor:**
- The magnetic field forms concentric circles around the conductor.

8. **Magnetic Field of a Solenoid:**
- A solenoid is a coil of wire with a current flowing through it, producing a strong and uniform magnetic field inside it.

9. **Electromagnetic Induction:**
- The production of an electromotive force (EMF) across a conductor when exposed to a varying magnetic field.

10. **Induced Current:**
- A current that flows in a circuit due to electromagnetic induction.

11. **Faraday's Law of Electromagnetic Induction:**
- The magnitude of the induced EMF is directly proportional to the rate of change of magnetic flux.

12. **Generator**
- Generator: device that converts mechanical energy into electrical energy.

13. **Motor Effect:**
- The phenomenon where a current-carrying conductor in a magnetic field experiences a force.

14. **Electric Motor:**
- A device that converts electrical energy into mechanical energy by utilizing the motor effect.

15. **Mutual Induction:**
- The phenomenon where a changing current in one coil induces an electromotive force in a neighboring coil.

16. **Transformer:**
- A device that changes the voltage of an alternating current while keeping the frequency constant.

17. Types of Transformers:
- Step-Up Transformer: Increases voltage.
- Step-Down Transformer: Decreases voltage.

18. **Transformer Formula:**
- The transformer formula is$\frac{(V_1}{V_2} = \frac{N_1}{N_{2)}}$, where (V) is voltage and (N) is the number of turns.