Electromagnetic induction topic tree

Here are **30 key terms and definitions** from the NCERT Class 12 Physics chapter **Electromagnetic Induction**:

Fundamental Concepts

1. **Magnetic Flux (ΦB)** – The total number of magnetic field lines passing normally through a surface; $\Phi B = B \cdot A \cdot \cos\theta$.
2. **SI Unit of Flux** – Weber (Wb), equal to Tesla·m^2.
3. **Faraday's First Law** – Whenever magnetic flux linked with a circuit changes, an emf is induced.
4. **Faraday's Second Law** – The magnitude of induced emf is directly proportional to the rate of change of magnetic flux.
5. **Lenz's Law** – The induced emf always opposes the change in flux that produced it, ensuring conservation of energy.
6. **Induced emf** – The voltage generated in a conductor due to change in magnetic flux.
7. **Induced Current** – The current that flows in a closed circuit when emf is induced.

Types of emf

8. **Motional emf** – emf induced in a conductor moving in a magnetic field.
9. **Statically Induced emf** – emf induced when flux linkage changes because of changing magnetic field with time.
10. **Dynamically Induced emf** – emf induced when flux linkage changes due to relative motion of conductor and field.

Eddy Currents

11. **Eddy Currents** – Circular currents induced in bulk conductors when exposed to changing magnetic fields.
12. **Eddy Current Loss** – Power loss due to heat produced by eddy currents.
13. **Applications of Eddy Currents** – Electromagnetic braking, induction furnace, energy meters.

Inductance

14. **Self-Induction** – The property of a coil to oppose change in current in itself by inducing emf.
15. **Self-Inductance (L)** – Ratio of self-induced emf to rate of change of current; L = (emf)/(di/dt).
16. **SI Unit of Inductance** – Henry (H).
17. **Mutual Induction** – Phenomenon where a changing current in one coil induces emf in another coil.
18. **Coefficient of Mutual Induction (M)** – Ratio of emf induced in secondary coil to rate of change of current in primary coil.

19. **Energy Stored in Inductor** – (1/2) L I^2 joules.

Important Laws and Rules

20. **Right-Hand Rule (Fleming's)** – Determines direction of induced current (thumb = motion, forefinger = field, middle finger = current).
21. **Electromagnetic Induction** – Process of generating emf by changing magnetic flux.
22. **Conservation of Energy Principle** – Basis of Lenz's law, ensuring induced currents oppose flux change.

Practical Devices

23. **AC Generator** – Device that converts mechanical energy into alternating electrical energy using electromagnetic induction.
24. **Dynamo** – Practical generator used in bicycles, based on electromagnetic induction.
25. **Transformer** – Device using mutual induction to increase or decrease AC voltage.

Additional Key Terms

26. **Flux Linkage** – Product of magnetic flux and number of turns in a coil (NΦ).
27. **Magnetic Reluctance** – Opposition offered by magnetic circuit to flux (analogy to resistance).
28. **Back emf in Inductor** – emf induced in a coil that opposes the change in current.
29. **Time Constant (τ)** – Ratio of inductance to resistance in LR circuit; τ = L/R.
30. **Electromagnetic Damping** – Reduction of oscillations due to eddy currents opposing motion.
