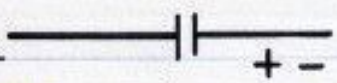
Electric Current and Its Effects – Class 7

① Symbols of Electric Components :

- Symbols are used because drawing real electric components is difficult.
- **Electric Cell:** Long line shows the positive terminal, short thick line shows negative terminal.
- **Battery:** A combination of two or more electric cells.
- Switch : ON 
  - ON → Closed circuit (current flows)
- OFF 
  - OFF → Open circuit (no current flows)

② Electric Circuit :

- A circuit is the complete path through which electric current flows.

- **Closed Circuit :**
  - Switch is ON
  - Current flows
  - Bulb glows



- **Open Circuit :**
  - Switch is OFF
  - No current flows
  - Bulb does not glow



③ Heating Effect of Electric Current :

- When electric current flows through a wire, the wire becomes hot.
- This is called the heating effect of electric current.
- Uses of heating effect :
  - Electric heater
  - Electric iron
  - Geyser


Heater

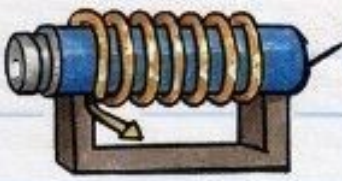

Electric iron


Geyser

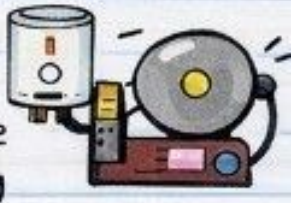

Hair dryer

④ Electric Fuse :

- A safety device
- Made of a thin wire
- Melts when excess current flows.
- Breaks the circuit and prevents damage


Iron Core

- **Magnetic Effect of Electric Current**
  - A current-carrying wire behaves like a magnet.
  - **Electromagnet :**
    - Made by winding a wire around an iron core
    - Acts as a magnet only when current flows.



Heating Effect of Electric Current

- When electric current passes through a conductor, heat is produced. This is known as the heating effect of electric current.

The heat produced in a conductor depends on :

- Square of current (I^2)
- Resistance (R)
- Time (t)



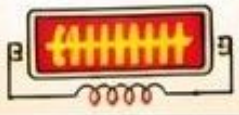
According to Joule's Law of Heating :

$$H = I^2Rt$$

Where: H = Heat produced
I = Current
R = Resistance
t = Time

Applications

- **Electric Heater**



- **Iron**



- **Geyser**



- **Electric Bulb (Filament)**



- **Fuse**



- Prevents damage from excessive heating.

Applications of MAGNETIC EFFECT OF ELECTRIC CURRENT

Did you know? Electric current can make magnets!

How does this work?

When electric current flows through a wire, it creates a magnetic field, making the wire act like a magnet. This is used in many devices we see every day!

Electric Bell

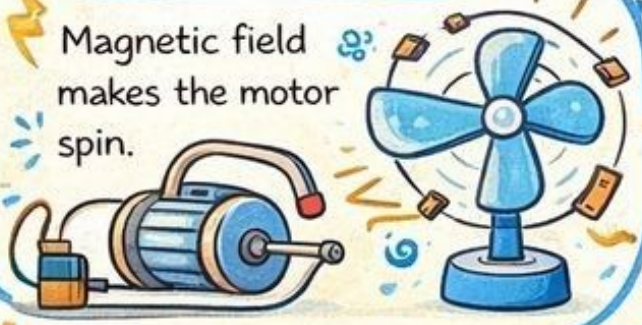
Electromagnet attracts the hammer to ring the bell.



Electromagnet attracts the hammer to ring.

Electric Motor

Magnetic field makes the motor spin.



Magnetic field makes the motor spin.

Where do you see it?



HOMES



FACTORIES



SCHOOLS



SCRAPYARDS



D.A.V PUBLIC SCHOOL, PTPS, PATRATU

SUBJECT: PHYSICS

CHAPTER: 17

CLASS NOTES

→ Heating effect of electric current: When electric current flows through a conductor, it can produce heat. This is known as the Heating Effect of Electric Current. This is also known as Joule's heating effect of electric current.

According to Joule, the amount of heat produced in a conductor depends on following factors:

- Strength of the current through the wire
- Nature of the material of wire
- Length and thickness of wire
- Time for which electric current flows through the wire.

→ Advantages of Heating Effect of Electric Current: Many devices work on heating effect of electric current. These appliances have a 'heating coil'. The coil is usually made of nichrome wire and is known as element. The coil becomes hot or sometimes red hot due to heating effect of electric current. Due to this, a particular appliance serves some useful purpose for us.
Examples: electric iron, toaster, sandwich maker, geyser, water heater, electric kettle, etc. Electric bulb is a common appliance which works because of heating effect of electric current. The filament of the bulb becomes 'white hot' and glows and thus the bulb gives light.

→ Disadvantages of Heating Effect of Electric Current: During transmission of electricity through wires, a major portion of electric current goes waste in the form of heat energy. The heating effect of electric current also breaks the insulation of wiring and various devices.

→ Electric Fuse: Because of the heating effect of electric current, a wire can become hot beyond a limit and can melt down and break. This fact is used for making electric fuse for household circuits and for protection of different electrical and electronic devices.

→ An electric fuse is a safety device. When the electric current goes beyond a limit, the fuse wire melts and breaks the circuit. This helps in protecting the wiring or a device from getting damaged.

→ Following are the reasons for electric current crossing its limit:

- Short circuit: This happens when two wires touch each other.
- Overload: This happens when more than one appliance is connected to a single socket.
- Insulation breakdown: This happens when wires get overheated.

→ MCB (Miniature Circuit Breakers): Electric fuse has been replaced by MCBs in most of the households. MCB is an automatic device which turns off when the current exceeds its safety limit. These switches work on the magnetic effect of electric current.

→ Magnetic Effect of Electric Current: When electric current flows through a conductor, a magnetic field is created around it. This is known as Magnetic Effect of Electric Current. The magnetic effect of electric current was first discovered by Hans Christian Oersted. He observed that when a magnetic compass needle was placed near a current carrying conductor, there was deflection in the compass needle. This happens because of magnetic effect of electric current.

→ Electromagnet: Electromagnet works on the principle of magnetic effect of electric current. Electromagnet is made up of a coil which is wrapped around a cylindrical core. When current flows through the coil, the coil behaves like a magnet.

→ Factors affecting the strength of an electromagnet:

- Wrapping the insulated coil around a soft iron core
- Increasing the number of turns in the coil
- Increasing the strength of electric current

Practical Uses of Electromagnet:

→ Electromagnets can be made very powerful. Such magnets are used for lifting heavy objects.

- Electromagnets are used in many devices; like microphone, speaker, telephone, etc.
- Electromagnets are used in automatic switches; like in MCBs.
- Electric bell works because of electromagnet.

→ Structure of Electric Bell: An electric bell consists of an electromagnet, a gong, a hammer and electric wires.

→ Working of Electromagnet:

- When current flows through the coil, it becomes electromagnet.
- The electromagnet attracts the soft iron armature. With this, the iron hammer moves and hits the gong to produce sound.
- When the iron hammer and armature move towards the gong, the electric circuit breaks and electromagnet loses its magnetic property.
- The iron armature returns to its original position which helps in completing the circuit again. The process keeps on repeating and the bell produces a continuous ringing sound.

→ Element: The heating coil of an appliance is called element.

→ Short circuit: When a positive wire touches a negative wire, it results in electric spark and sometimes can lead to accidental fire. This is called short circuit.

→ Overload in a circuit: When more than one appliance is attached to a socket, it leads to overload in the circuit.

→ Electric fuse: A safety device which helps in protecting the wiring and electrical appliance.

→ Electromagnet: A coil wrapped around a cylindrical core behaves like magnet when electric current flows through it.

→ Electric bell: A device which produces a ringing sound when electric current flows through it.

→ Miniature Circuit Breaker (MCB): MCBs are now being used in place of electric fuse.

→ Nichrome: An alloy of nickel and chromium. It is used for making resistance coils.

ASSIGNMENT

Section A: Multiple Choice Questions (1–15)

1. What is an electric circuit?
   a) A magnetic field
   b) A closed path for electric current
   c) A battery
   d) A switch

2. Which of the following is a source of electric current?
   a) Bulb
   b) Battery
   c) Wire
   d) Switch

3. In a circuit diagram, a cell is represented by:
   a) Circle
   b) Triangle
   c) Two parallel lines of unequal length
   d) Square

4. A circuit in which current cannot flow is called:
   a) Closed circuit
   b) Open circuit
   c) Complete circuit
   d) Magnetic circuit

5. Which material is commonly used as a fuse wire?
   a) Iron
   b) Copper

c) Alloy of tin and lead
d) Aluminium

6. The heating effect of electric current is used in:
   a) Electric bell
   b) Electric iron
   c) Compass
   d) Magnet

7. Which device protects electrical appliances from excessive current?
   a) Bulb
   b) Cell
   c) Fuse
   d) Wire

8. MCB stands for:
   a) Main Circuit Board
   b) Mini Current Breaker
   c) Miniature Circuit Breaker
   d) Magnetic Circuit Breaker

9. The filament of an electric bulb is usually made of:
   a) Copper
   b) Aluminium
   c) Tungsten
   d) Iron

10. An electromagnet works due to:
   a) Heating effect of current
   b) Magnetic effect of current
   c) Chemical effect of current
   d) Sound effect of current

11. Which part of an electric bell becomes magnetic when current flows?
a) Battery
b) Switch
c) Electromagnet
d) Bell

12. Current can flow only through a:
a) Broken circuit
b) Closed circuit
c) Open switch
d) Damaged wire

13. Which appliance mainly uses the heating effect of current?
a) Fan
b) Electric iron
c) Compass
d) Electromagnet

14. The SI unit of electric current is:
a) Volt
b) Watt
c) Ampere
d) Ohm

15. Which of the following is NOT a safety device?
a) Fuse
b) MCB
c) Switch
d) Circuit breaker

Section B: Fill in the Blanks (16–25)

16. An electric current flows through a _____ circuit.

17. The thin wire inside a bulb is called a _____.

18. The heating effect of current is used in an electric _____.

19. A fuse melts when the current becomes too _____.

20. MCB automatically _____ the circuit when excess current flows.

21. A magnet produced by electric current is called an _____.

22. The magnetic effect of current was discovered by _____.

23. The symbol used to open or close a circuit is a _____.

24. Electric bells work on the principle of _____ effect of current.

25. The material placed inside an electromagnet is usually a soft _____ core.

Section C: Very Short Answer Questions (26–35)

26. Define electric current.

27. What is a circuit diagram?

28. What is a closed circuit?

29. Name two conductors of electricity.

30. What is the function of a switch?

31. Why is tungsten used in electric bulbs?

32. What is a fuse?

33. What is the full form of MCB?

34. What is an electromagnet?

35. Name one appliance that uses the heating effect of current.

Section D: Short Answer Questions (36–43)

36. Differentiate between an open circuit and a closed circuit.

37. Draw the symbols of a cell, battery, bulb, and switch.

38. Explain the heating effect of electric current.

39. How does a fuse protect electrical appliances?

40. State two advantages of MCB over a fuse.

41. Explain the construction of an electromagnet.

42. List any four uses of electromagnets.

43. Explain the role of the iron core in an electromagnet.

Section E: Competency-Based and Application Questions (44–50)

44. Ravi notices that the electric iron is not heating. The plug, switch, and power supply are working. Which safety device might have blown and why?

45. During a thunderstorm, an appliance suddenly stops working due to excess current. Which device protects the appliance: fuse or bulb? Explain.

46. A student connects a bulb, cell, and switch but the bulb does not glow. Give two possible reasons.

47. Why are electromagnets used in scrapyards to lift heavy iron objects instead of permanent magnets?

48. An electrician replaces a fuse wire with a thick copper wire. Is it safe? Give reasons.

49. Explain how an electric bell produces sound using the magnetic effect of current.

50. Your school wants to install a safety device that can be used repeatedly without replacing any wire after a fault. Would you recommend a fuse or an MCB? Justify your answer.