

Unit 11: Charge

Essential Questions

- How is electric charge stored?
- How does a battery power an electric circuit?
- Why does charge flow?
- How do conductors and insulators affect the flow of electricity?
- What is electrical resistance?
- How is bulb brightness related to flow charge in a circuit?
- How do series and parallel circuits differ from each other?

Instructional Goals

By the end of this unit, you should be able to do the following:

1. Identify situations in which a bulb will and will not light.
2. Identify the differences between conductors and insulators.
3. Trace continuous conducting path in conductors and through the internal parts of a light bulb.
4. Give evidence based on compass deflections to support one-way direction of flow.
5. Identify and apply the definition of conventional current.
6. Represent simple circuits with schematic diagrams.
7. Indicate the direction of charge flow throughout a circuit
8. Identify the places in a circuit where mobile charge originates.
9. Indicate the origin of conventional charge flow in a complete circuit.
10. Identify bulb filaments as parts of circuits that resist charge flow.
11. Use bulb brightness and compass deflection as indicators of flow rate.
12. Explain how adding series/parallel bulbs will raise/lower “overall” resistance.
13. Explain how to determine the resistance of an Ohmic resistor
14. Demonstrate that an instrument labeled “voltmeter” measures electric pressure differences.
15. Demonstrate that an instrument labeled “ammeter” measures flow rates of moving charge.

Sequence

1. Activity 1 – What will happen to bulbs when you disconnect at various points?
2. Activity 2 – What objects, when inserted into the loop, will allow the bulbs to light?
3. Activity 3 – What parts of a socket and bulb are conductors and what are insulators?
4. Activity 4 - How can you light a single bulb only a single cell and a single wire?
5. Activity 5 – What does a compass tell you about what is happening in the wires?
6. Exercise 1 – Application of closed and open loop models
7. Reading 1 - What is moving in the wires and in what direction is it going?
8. Reading 2 – Schematics
9. Activity 6 – What causes charge to flow in a circuit?
10. Reading 3 – Energy in electric circuits
11. Activity 7a – What effect does bulb type have on brightness?
12. Activity 7b – How are filaments different in round and long bulbs?
13. Reading 4 – Resistance, conductance and flow rate
14. Activity 8 – How does the number of bulbs in a single loop effect overall resistance?

15. Activity 9 – How does the number of bulbs connected side by side effect overall resistance?
16. Reading 5 – Overall resistance in series and parallel circuits
17. Exercise 2 – Resistance in series and parallel circuits
18. Activity 10 – What is the relationship between voltage and current?
19. Exercise 3 – Practice with Ohm’s Law