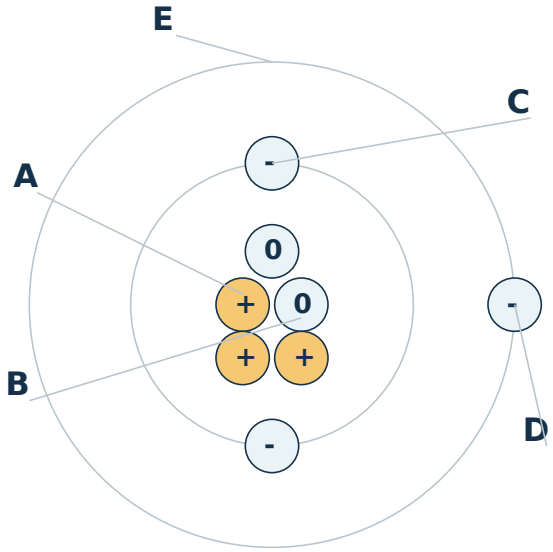
Atoms, charges & materials

Directions: Label the model, complete the tables, and write answers in the spaces provided.

Name: _____ Class: _____ Date: _____

01 Identify the parts of an atom



Simplified shell model; not to scale.

A. _____

B. _____

C. _____

D. _____

E. _____

Label: proton, neutron, inner electron, valence electron, outer shell.

02 Determine the net charge

Write neutral atom, positive ion, or negative ion. Then give the net charge (e.g., +2).

Protons	Electrons	Classification	Net charge
8	8		
8	6		
8	10		

03 Explain the behavior of charges

1. Like charges _____; opposite charges _____.

2. Which electrons occupy the outermost shell of an atom?

3. An atom loses two electrons. It becomes a _____ ion.

Current, voltage & energy

Directions: Use each word-bank term once. Then classify materials and explain energy conversion.

Name: _____ Class: _____ Date: _____

04 Complete the electrical fundamentals

voltage • current • resistance • amperes • conventional • electron
direct • alternating • created • transformed

1. _____ is the rate of flow of electric charge.
2. _____ is electric potential difference between two points.
3. _____ is opposition to current flow.
4. Current is measured in _____ (A).
5. _____ current is defined in the direction positive charge would move:

   from positive to negative through the external circuit.
6. _____ flow in a metal is from negative to positive through the external circuit.
7. _____ current (DC) flows in one direction.
8. _____ current (AC) periodically reverses direction.
9. Energy cannot be _____ or destroyed.
10. Electrical energy can be _____ into other forms of energy.

05 Connect materials to their uses

Classify each as conductor, insulator, or semiconductor under ordinary conditions.

Copper wire: _____ Why is copper useful inside a wire?

Rubber insulation: _____ Why is insulation used around a wire?

Silicon: _____ Name one electronic device that uses silicon.

Think about it: A motor converts electrical energy mainly into _____ energy.

Electrical vocabulary

Directions: Write the matching letter in each blank. Use each answer once within its section.

Name: _____ Class: _____ Date: _____

06 Match the atomic and electrical terms

1. ____ Matter	A. Negatively charged particle
2. ____ Atom	B. Electrons in the outermost shell
3. ____ Nucleus	C. Material that strongly resists current flow
4. ____ Proton	D. Has mass and occupies space
5. ____ Neutron	E. Positively charged particle
6. ____ Electron	F. Magnetic effects produced by electric current
7. ____ Valence electrons	G. Atom with a net electric charge
8. ____ Ion	H. Smallest unit retaining an element's identity
9. ____ Electromagnetism	I. Center of an atom; contains protons and neutrons
10. ____ Insulator	J. Particle with no electric charge

07 Match the circuit terms

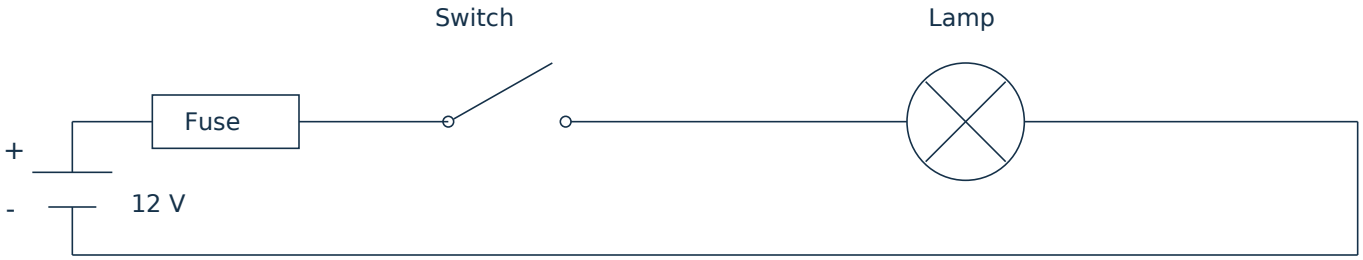
1. ____ Volt (V)	A. Unit of resistance
2. ____ Ohm (ohm)	B. Complete path that allows current flow
3. ____ Ampere (A)	C. Device that opens or closes a path
4. ____ Battery	D. Unit of current
5. ____ Wire	E. Device that converts electrical energy to another form
6. ____ Load	F. Conductive path between components
7. ____ Fuse	G. Incomplete path that interrupts current flow
8. ____ Switch	H. Source of electrical energy
9. ____ Open circuit	I. Unit of electric potential difference
10. ____ Closed circuit	J. Protection device that opens when excessive current flows

Apply it to a vehicle circuit

Directions: Assume a good 12 V source and good components unless a fault is stated.

Name: _____ Class: _____ Date: _____

08 Trace a simple lamp circuit



External circuit shown with switch open.

1. Draw arrows for conventional current with the switch closed.

2. Is this a power-side or ground-side controlled circuit? Explain.

3. The fuse opens. What happens to the lamp and circuit current?

09 Compare circuit arrangements and switch states

4. A series circuit has _____ current path(s). A parallel circuit has _____.

5. Two lamps are in parallel. One lamp opens. What happens to the other lamp?

6. With no actuator force applied, a normally open switch is _____.

7. With no actuator force applied, a normally closed switch is _____.

10 Explain your reasoning

8. A relay coil is energized. What effect allows it to move the relay contacts?

9. Why is “conventional current means electrons flow positive to negative” incorrect?