Sensor Material Clues

Use atomic data and material properties to compare elements.

8.4 "Obtain and communicate information from the periodic table, including atomic number, number of electrons and neutrons, average atomic mass, groups, and periods, to illustrate the structure and composition of atoms of different elements. a..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the rule for estimating neutrons, then circle the property clues that help you classify elements.

Choosing Materials for a Sensor

1. A repair crew is choosing materials for a solar-powered sensor. The periodic table gives each element an atomic number, which is its number of protons. In a neutral atom, the electron count matches the proton count. A row is a period, and a column is a group. Elements in a group often share properties, but the crew checks each material before using it.

2. The table reports average atomic mass in atomic mass units, or u. This value combines the masses of naturally occurring isotopes, so it is often a decimal. To make a rough neutron estimate, round the average mass to a whole number and subtract the atomic number. The result is an estimate, not the exact neutron count of every atom of that element.

SENSOR MATERIAL DATA

Element	Atomic number	Average atomic mass (u)	Group	Period
Sodium	11	22.99	1	3
Aluminum	13	26.98	13	3
Silicon	14	28.09	14	3
Sulfur	16	32.06	16	3

3. Metals are usually shiny and conduct electricity. Nonmetals generally conduct poorly, while metalloids show a mix of properties. In the crew's tests, sodium and aluminum are shiny conductors. Silicon is brittle and conducts only under certain conditions. Sulfur is dull, brittle, and a poor conductor. The crew can use these observations alongside periodic table data to compare the materials.

2 ANSWER WITH EVIDENCE

Use the passage

1. How many electrons does a neutral atom of sodium have? How many does a neutral atom of aluminum have? Give each element's group and period.

2. Estimate the number of neutrons in an atom of silicon and an atom of sulfur. Show each subtraction.

3. Classify aluminum and sulfur as metals, nonmetals, or metalloids. Give one property clue for each.

4. Which classification best fits silicon? Use two observations from the passage to support your answer.

3 YOUR TURN

Your own words

Design a model sensor circuit with one material that carries current and a different material that shows where current stops. In 3 or 4 sentences, name and classify both elements, give each one's group and estimated neutron count, and explain how its properties fit its role.

ANSWER KEY

Sensor Material Clues

GRADE 8 · 8.4

PART 1 · READ AND MARK

Underline the rule for estimating neutrons, then circle the property clues that help you classify elements. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How many electrons does a neutral atom of sodium have? How many does a neutral atom of aluminum have? Give each element's group and period.	**Sodium has 11 electrons and is in group 1, period 3. Aluminum has 13 electrons and is in group 13, period 3.**
2	Estimate the number of neutrons in an atom of silicon and an atom of sulfur. Show each subtraction.	**Silicon: 28 − 14 = about 14 neutrons. Sulfur: 32 − 16 = about 16 neutrons.**
3	Classify aluminum and sulfur as metals, nonmetals, or metalloids. Give one property clue for each.	**Aluminum is a metal because it is shiny and conducts electricity. Sulfur is a nonmetal because it is a poor conductor.**
4	Which classification best fits silicon? Use two observations from the passage to support your answer.	**Silicon is a metalloid. It is brittle and conducts electricity only under certain conditions.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Aluminum can carry current in my model because it is a shiny conductor, so I classify it as a metal. It is in group 13 and has about 14 neutrons (27 − 13). Sulfur can show where current stops because it is a poor conductor, so I classify it as a nonmetal. It is in group 16 and has about 16 neutrons (32 − 16).

Accept neutron estimates based on rounded average atomic masses. For the model, accept any two different listed elements whose stated properties fit the chosen roles.