

Bonding Forces at Work

Read how electrical forces create new substances.

6.5.d “two or more atoms interact to form new substances, which are held together by electrical forces (bonds);”

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each sentence that tells how electrical forces hold atoms or ions together. Circle each new substance named, so you can connect bonding to new properties.

When Atoms Connect

- ① Atoms are tiny building blocks of matter. A single atom has a center with positively charged protons and electrons with negative charge moving around it. Charges affect one another. Opposite charges pull together, while like charges push apart. When atoms get close enough, these electrical forces can make the atoms interact. If the pull creates a stable connection, the atoms are bonded. The bonded atoms are no longer just a nearby group, they are part of a new substance with its own properties.
- ② Water forms when hydrogen and oxygen atoms interact. In a water molecule, two hydrogen atoms share electrons with one oxygen atom. Shared electrons are attracted to the positive centers of both atoms. This electrical attraction holds the atoms together in covalent bonds. The formula H_2O shows that each water molecule has two hydrogen atoms and one oxygen atom. Water acts very differently from hydrogen gas or oxygen gas. Its ability to remain liquid at ordinary room temperatures is one of its distinct properties.
- ③ Not all bonds involve shared electrons. When a sodium atom interacts with a chlorine atom, sodium can transfer one electron to chlorine. Sodium then becomes a positive ion, Na^+ , and chlorine becomes a negative ion, Cl^- . The opposite charges attract strongly. That electrical force holds many sodium and chloride ions in a repeating arrangement called sodium chloride, or table salt. Salt is a new substance. It has properties unlike sodium metal, which reacts strongly with water, or chlorine gas, which is poisonous.

2 ANSWER WITH EVIDENCE Use the passage

1 How do shared electrons help hold the atoms together in a water molecule?

2 What does the formula H_2O tell you about one water molecule?

3 Describe what happens when sodium interacts with chlorine before they form table salt.

4 Why is table salt called a new substance instead of just a mixture of sodium and chlorine? Use one detail from the passage.

3 YOUR TURN Your own words

Choose a substance not named in the passage, such as carbon dioxide or magnesium oxide. Write exactly two sentences that name the atoms and new substance, then explain whether electrons are shared or transferred and how electrical forces hold the particles together.

PART 1 • READ AND MARK

Underline each sentence that tells how electrical forces hold atoms or ions together. Circle each new substance named, so you can connect bonding to new properties. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	How do shared electrons help hold the atoms together in a water molecule?	The shared electrons are attracted to the positive centers of both atoms. This electrical attraction holds the atoms together in covalent bonds.
2	What does the formula H ₂ O tell you about one water molecule?	It has two hydrogen atoms and one oxygen atom.
3	Describe what happens when sodium interacts with chlorine before they form table salt.	Sodium transfers one electron to chlorine. Sodium becomes a positive ion and chlorine becomes a negative ion. Their opposite charges attract.
4	Why is table salt called a new substance instead of just a mixture of sodium and chlorine? Use one detail from the passage.	The sodium and chloride ions are held together by electrical attraction in a repeating arrangement. Salt has properties unlike sodium metal and chlorine gas.

PART 3 • YOUR TURN (SAMPLE ANSWER)

Carbon and oxygen atoms can form carbon dioxide, CO₂, a new substance. Carbon and oxygen share electrons, and the shared electrons are attracted to the positive centers of the atoms, holding them together with covalent bonds.

Accept explanations that correctly connect a new substance to atom interactions and electrical attraction. For the open response, accept another accurate substance and a correct description of electron sharing or transfer and the resulting electrical force.