Dots or Sticks?

Use two models to show how valence electrons form bonds.

CHE.4.2 "Use models such as Lewis structures and ball and stick models to depict the valence electrons and their role in the formation of ionic and covalent bonds."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline words that describe electron transfer, circle words that describe electron sharing, and box what dots and sticks show. Use your marks to connect each model to the kind of bond it represents.

What Bond Models Reveal

1. At a battery recycling plant, atoms do not arrive with labels saying how they will bond. A Lewis model places dots around an element symbol to represent valence electrons, the electrons in the outer energy level. A ball and stick model uses balls for atoms and sticks for connections. Neither model shows atoms at their real size. Read the models together: dots track electrons, while a stick can show a covalent bond formed by shared electrons.

2. Lithium and bromine provide a simple example of an ionic bond. A lithium atom has one valence electron, and a bromine atom has seven. Lithium transfers its electron to bromine. The resulting lithium ion, Li^+, has lost that electron; the bromide ion, Br^-, has eight outer electrons. Opposite charges attract, forming an ionic bond. A solid sample contains many ions in a repeating arrangement, not separate LiBr molecules joined by shared-electron sticks.

3. Now picture two fluorine atoms in a sealed container. Each fluorine atom has seven valence electrons, so each needs one more to complete an outer shell of eight. They share one pair of electrons, making F_2. In a Lewis structure, dots between the F symbols show that shared pair, and each F also has three unshared pairs. A ball and stick model shows two atoms linked by one stick, but it does not display the unshared electrons.

2 ANSWER WITH EVIDENCE

Use the passage

1. A sodium atom has one valence electron, and an iodine atom has seven. Sketch Lewis models before and after sodium transfers its electron. Label the ions.

2. A student draws one stick between Na and I to model the bond after the transfer. What does that stick wrongly suggest?

3. Each chlorine atom has seven valence electrons. Sketch a Lewis structure for Cl_2 that shows all its valence electrons.

4. In a ball and stick model of Cl_2, what does the single stick represent? What electron detail would the model leave out?

3 YOUR TURN

Your own words

Carbon has four valence electrons, and hydrogen has one. In two panels, draw a Lewis structure and a ball and stick model for CH_4, then write one sentence explaining how the models show its bonds.

Dots or Sticks?

PART 1 · READ AND MARK

Underline words that describe electron transfer, circle words that describe electron sharing, and box what dots and sticks show. Use your marks to connect each model to the kind of bond it represents. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	A sodium atom has one valence electron, and an iodine atom has seven. Sketch Lewis models before and after sodium transfers its electron. Label the ions.	**Before: Na with one dot and I with seven dots. After: Na^+ with no dot and I^- with eight dots.**
2	A student draws one stick between Na and I to model the bond after the transfer. What does that stick wrongly suggest?	**It wrongly suggests that Na and I share an electron pair in a covalent bond. Their bond is ionic.**
3	Each chlorine atom has seven valence electrons. Sketch a Lewis structure for Cl_2 that shows all its valence electrons.	**One shared pair between the Cl symbols, with three unshared pairs on each Cl.**
4	In a ball and stick model of Cl_2, what does the single stick represent? What electron detail would the model leave out?	**The stick represents a shared electron pair. The model leaves out the three unshared pairs on each chlorine atom.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Lewis panel: C at the center with four H symbols around it and one shared dot pair between C and each H. Ball and stick panel: one central C ball connected by one stick to each of four H balls. Each stick represents a shared electron pair shown as dots in the Lewis structure.

Accept any clear placement of Lewis dots that shows the correct number of shared and unshared pairs. In Part 3, the four hydrogen atoms may be arranged in any order around carbon.