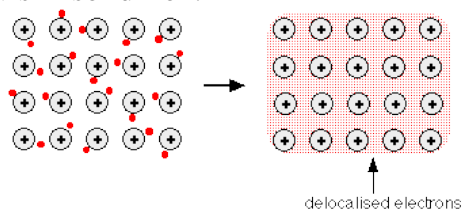


Title:	Metallic, Covalent, and Ionic Bond Properties
Standard:	4.a Students know atoms combine to form molecules by sharing electrons to form covalent or metallic bonds or by exchanging electrons to form ionic bonds.

- What type of bonding will each set of atoms exhibit?
 - Na and Br **-ionic**
 - Cl and I **-covalent**
 - Ba and Cl **-ionic**
 - Ba and Sr **-metallic**
 - P and O **-covalent**
- What do the electrons do in each type of bonding?
 - Ionic **-transferred**
 - Covalent **-shared**
 - Metallic **wander in a sea of electrons**
- What is an example of two elements which would bond and form a compound with a high melting point that will conduct electricity only if dissolved in water?

Any nonmetal and metal will form an ionic bond. Ionic bonds are strong and have high melting points. They also will conduct electricity only if dissolved in water.

- Diagram the bonding that occurs in solid iron.



- Why do metals always form positive ions and why do metals conduct electricity so well?

Metals have very low ionization energy. This means that it is relatively easy to remove valence electrons from metals, which forms positive ions and makes conducting electricity easy.

- What are some likely properties of carbon tetrachloride: CCl_4 ?

Carbon tetrachloride is covalent and will have weak bonds, a low melting point, a molecular structure, and will not conduct electricity.

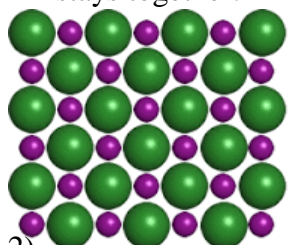
Title:	Explaining and Naming Ionic Compounds
Standard:	4.b Students know salt crystals, such as NaCl, are repeating patterns of positive and negative ions held together by electrostatic attraction. 4.e Students know how electronegativity and ionization energy relate to bond formation.

1) Define the terms 'cation' and 'anion'.

a. Cation = an atom that has lost electrons and become positive

b. Anion = an atom that has gained electrons and become negative

1) Draw a diagram of an ionic crystal (show at least 8 cations and 8 anions) and explain why the structure stays together.



The structure stays together because each ion is surrounded by oppositely charged ions on every side. They attract each other through electrostatic forces.

2)

3) Diagram and describe what is happening in the bond in lithium nitride (Li_3N).

	Diagram	Description (Discuss EN, electrons, any ions present, and the structure)
Before bonding		<p>Lithium has 1 valence electron and a low ionization energy whereas nitrogen has 5 valence electrons and a high electronegativity. Nitrogen will take one electron from 3 different lithium atoms. Each lithium atom will form a +1 cation and nitrogen will form a -3 anion. The ions will attract and form a crystal lattice.</p>
During bonding		
After bonding		

4) Diagram and describe what is happening in the bond in calcium iodide (CaI_2).

	Diagram	Description (Discuss EN, electrons, any ions present, and the structure)
Before bonding		<p>Calcium has 2 valence electrons and a low ionization energy. Iodine has 7 valence electrons and a high electronegativity. Two iodine atoms will each take 1 electron from a calcium atom. Iodine will form a -1 anion and calcium will form a +2 cation. The ions will attract and form a crystal lattice.</p>
During bonding		
After bonding		

Title:	Explaining and Naming Covalent Compounds
Standard:	4.c Students know chemical bonds between atoms in molecules such as H ₂ , CH ₄ , NH ₃ , H ₂ CCH ₂ , N ₂ , Cl ₂ , and many large biological molecules are covalent. 4.e Students know how electronegativity and ionization energy relate to bond formation.

1) Proteins are made of amino acids, which contain mostly carbon, hydrogen, oxygen, and nitrogen. What type of bond holds proteins together? Explain how you know.




Because carbon, hydrogen, oxygen, and nitrogen are all nonmetals, proteins will be held together by covalent bonds.

2) Which one of the three pairs of electronegativities will most likely form a covalent bond? Why? (0 is low, 4.0 is high).

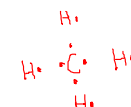
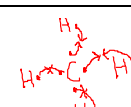
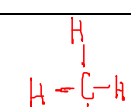
- 0.5 and 4.0
- 0.5 and 0.5
- 4.0 and 4.0

Electrons are shared in covalent bonds because each atom strongly attracts the electrons. The only choice that has both atoms with a high electronegativity is choice c.

3) Diagram and describe what is happening in the bond in fluorine gas (F₂).

	Diagram	Description (Discuss EN, electrons, any ions present, and the structure)
Before bonding		<p>Fluorine has 7 valence electrons and has a very high electronegativity. Two fluorine atoms will bond by each sharing one electron with each other. No electrons are gained or lost, and so no ions are formed. The two fluorine atoms will form a molecule.</p>
During bonding		
After bonding		

4) Diagram and describe what is happening in the bond in methane (CH₄).

	Diagram	Description (Discuss EN, electrons, any ions present, and the structure)
Before bonding		<p>Carbon and hydrogen both have high electronegativities. They will share electrons to form full valence shells. Carbon will share 1 electron each with four different hydrogen atoms. Since no electrons are gained or lost, no ions are formed. The atoms bind together to form a molecule.</p>
During bonding		
After bonding		

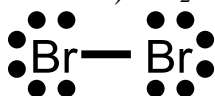
Title:	Drawing Lewis Dot Structures
Standard:	4.c Students know chemical bonds between atoms in molecules such as H ₂ , CH ₄ , NH ₃ , H ₂ CCH ₂ , N ₂ , Cl ₂ , and many large biological molecules are covalent. 4.d Students know how to draw Lewis dot structures.

1) What is the octet rule?

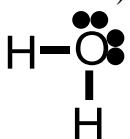
The octet rule states that atoms tend to be most stable when they have eight electrons in their outer shell.

2) Draw Lewis Dot structures for the following compounds:

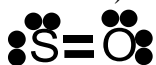
a) Br₂



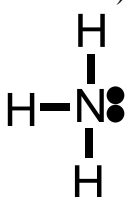
b) H₂O



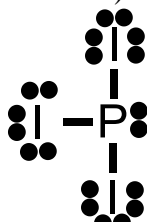
c) SO



d) NH₃



e) PI₃



f) HCN



g) HF

