

THE ATOM. A CONCENTRATED CLUSTER OF PROTONS AND NEUTRONS, SURROUNDED BY SWARMING ELECTRONS THAT MOVE AT TREMENDOUS SPEEDS.

COMPARED TO PROTONS AND NEUTRONS, ELECTRONS ARE A GREAT DEAL SMALLER....

...BUT DESPITE THEIR SMALL SIZE, THEY ARE EXTREMELY CRITICAL TO SHAPING THE WORLD AS WE KNOW IT.

PUT SIMPLY, ELECTRONS ALLOW ATOMS TO CONNECT WITH EACH OTHER BY FORMING BONDS.

IN AN IONIC BOND, AN ATOM GIVES AN ELECTRON TO ANOTHER ATOM, RESULTING IN EACH ATOM BEING CHARGED.

IN A COVALENT BOND, THE ATOMS SHARE ELECTRONS IN ORDER TO ACHIEVE STABLE OUTER ELECTRON SHELLS.

ATOMS BOND TO FORM THE MOLECULES THAT EVERYTHING AROUND US IS COMPOSED OF.

SO YOU'RE SAYING THAT THIS BENZENE MOLECULE IS BASICALLY A BUNCH OF ATOMS HOLDING HANDS AND SINGING KUMBAYAH?

NOT REALLY. IT'S A BUNCH OF ATOMS FORMING COVALENT BONDS AND SINGING KUMBAYAH.

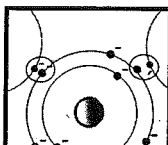
HE ALWAYS TAKES THE FUN OUT OF MY ANALOGIES.

Study Questions

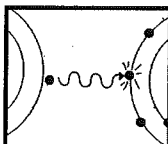
Directions: Read the related source cartoon and then answer the questions that follow.



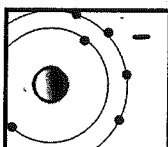
1. Why are electrons so important?



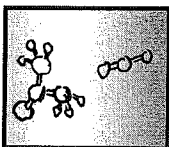
2. How are covalent bonds different from ionic bonds?



3. Which element is the negatively charged ion? Why does accepting an electron cause this atom to take on a partially negative charge?



4. Which element is the positively charged ion? Why does donating the electron cause this atom to take on a partially positive charge?



5. How does bonding relate to the formation of molecules?

HEY. AREN'T YOU A NEUTRAL LITHIUM ATOM? DON'T SEE TOO MANY OF YOU AROUND. WHAT'S IT LIKE BEING THE SMALLEST UNIT OF MATTER?

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NOT THAT IT'S ANY OF MY BUSINESS, BUT THAT CHLORINE ATOM JUST SWIPED YOUR ELECTRON.

GUESS I SHOULD CALL YOU "ION." SO HOW DO YOU LIKE THAT FULL OUTER SHELL?

I KNOW YOU'RE JUST AN ION, BUT YOU SHOULD BE ABLE TO HOLD MORE OF A CONVERSATION.

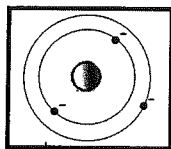
WELL, BETTER BE ON MY WAY. CONGRATULATIONS ON ACHIEVING STABILITY.

THAT'S ONE CRANKY CHAP, IF YOU ASK ME.

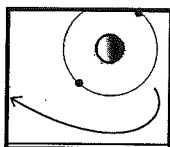
THOSE BIRDS ALWAYS HAVE ISSUES.

Study Questions

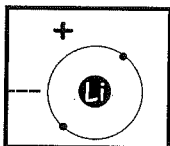
Directions: Read the related source cartoon and then answer the questions that follow.



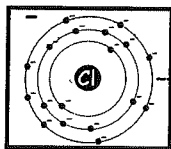
1. How does the lithium atom become an ion?



2. Why did the lithium atom want to lose an electron?



3. Why does the lithium atom develop a positive charge?



4. Which is more stable: neutral chlorine atoms or chlorine ions? Why?



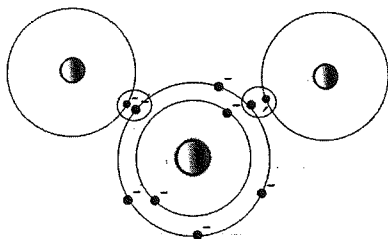
5. Which do you think are fewer in number: neutral unbonded lithium atoms or lithium ions that have connected with other atoms? Why?

BACKGROUND: IONIC AND COVALENT BONDING

An atom will form bonds to achieve a full outer shell of electrons. This may involve sharing, donating, or accepting electrons. To learn more about how this works, read about two types of bonds below:

COVALENT BONDS

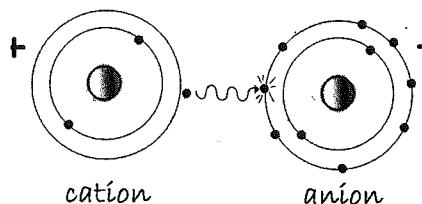
Covalent bonds involve two atoms sharing electrons. They usually occur between two non-metals. When carbon, oxygen, and hydrogen bond together, many of their bonds are covalent. The water molecule pictured below is held together by covalent bonds.



Because each atom still has equal numbers of protons and electrons, atoms that are covalently bonded do not have significant charges. Notice that the atoms are using electrons in their outer shell to bond.

IONIC BONDS

Ionic bonds involve one atom giving one or more electrons to a receiving atom. An atom becomes an ion when it has unequal numbers of protons and electrons. There are two types: anions and cations. Look at the picture below that depicts Lithium bonding to Fluorine:



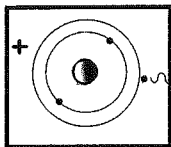
Because the "donor" atom loses an electron, it develops a positive charge and becomes a cation. Because the "accepter" atom gains an electron, it develops a negative charge and becomes an anion.

1. What is the difference between an ionic and covalent bond?

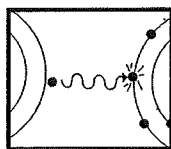
2. Why does lithium take on a positive charge when it bonds to Fluorine? Why does Fluorine take on a negative charge?

Vocabulary & Practice Problems

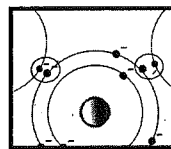
Directions: Use the following underlined words in sentences that convey their meaning.



1. An ion is a charged atom. Ions have unequal numbers of protons and electrons. Use the word ion in a sentence.



2. An ionic bond occurs when an element (usually a metal) donates electron(s) to non-metal element. Use ionic bond in a sentence.



3. A covalent bond involves the sharing of electrons between two non-metal elements. Use the term covalent in a sentence.



4. Identify each molecule as ionic (I) or covalent (C).

- a. H₂O b. LiF c. CaCl₂ d. CH₄
 e. MgCl₂ f. NaCl g. H₂SO₄ h. AlCl₃



5. The charge of an atom is equal to the number of electrons it gains or loses.

If calcium loses two electrons, what is its charge? _____

If chlorine gains one electron, what is its charge? _____

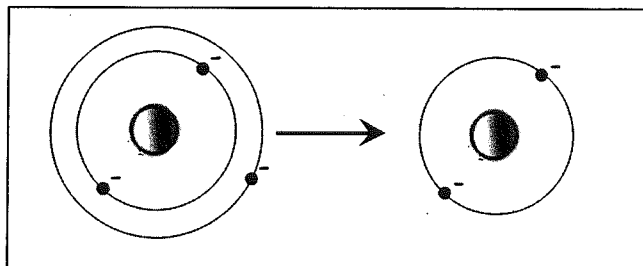
WRITE THE NAME AND SYMBOL FOR EACH ELEMENT. THEN WRITE THE CHARGE IT DEVELOPS WHEN IT BECOMES AN ION.



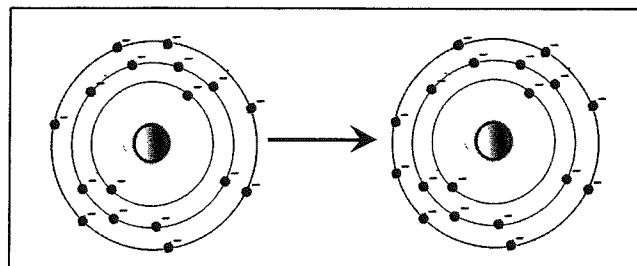
ATOMIC NUMBERS

- | | |
|---------------|----------------|
| HYDROGEN - 1 | SODIUM - 11 |
| CHLORINE - 17 | FLOURINE - 9 |
| LITHIUM - 3 | MAGNESIUM - 12 |
| HELIUM - 2 | CARBON - 6 |

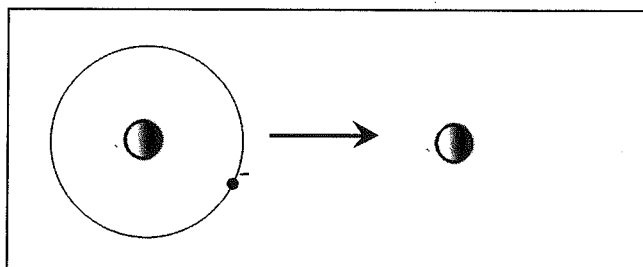
EACH BOX ILLUSTRATES IONIZATION:
WHEN AN ATOM GAINS OR LOSES AN ELECTRON AND BECOMES AN ION.



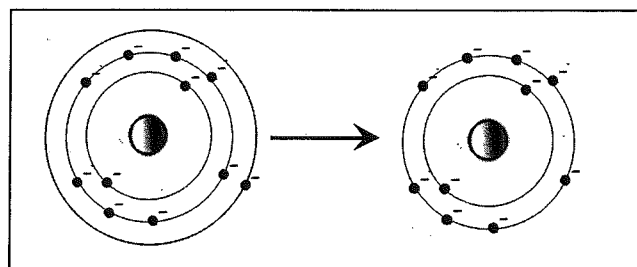
1. Name: _____ Symbol: _____ Charge: _____



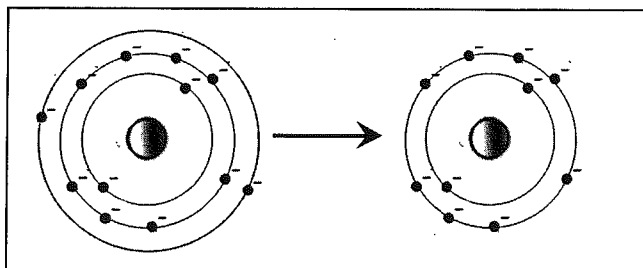
4. Name: _____ Symbol: _____ Charge: _____



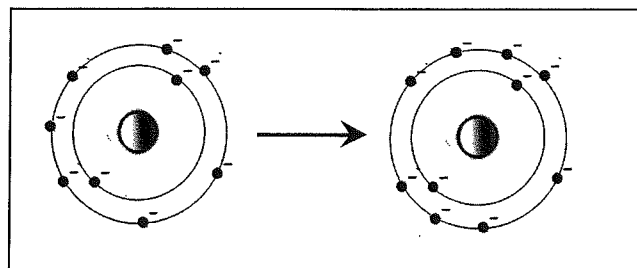
2. Name: _____ Symbol: _____ Charge: _____



5. Name: _____ Symbol: _____ Charge: _____



3. Name: _____ Symbol: _____ Charge: _____



6. Name: _____ Symbol: _____ Charge: _____