**AP CHEMISTRY CHAPTER 8: BASIC CONCEPTS OF CHEMICAL BONDING (Pgs. 298-341)**

EQ: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Questions:

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| **Chemical Bonds-2**Three types of bonds:-Ionic:-Covalent:-Metallic: | **Lewis Symbols-3**G.N. Lewis developed a method to denote potential bonding electrons by using one dot for every \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ around the element \_\_\_\_\_\_\_\_\_\_\_.When forming compounds, atoms tend to \_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_, or share electrons until they are surrounded by \_\_\_\_\_\_\_\_\_ valence electrons (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_). |
| **Ionic Formation-4**Atoms tend to \_\_\_\_\_\_\_\_\_ (\_\_\_\_\_\_\_\_\_\_) or \_\_\_\_\_\_\_\_\_\_\_\_\_ ( \_\_\_\_\_\_\_\_\_\_\_) electrons to make them \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to the noble gases. | **Energetics of Ionic Bonding-Born-Haber Cycle-5**Many factors affect the energy of ionic bonding.-Start with the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_:Ex.-Make \_\_\_\_\_\_\_\_\_\_\_\_\_\_ atoms:Ex.-Make ions:Ex.-Combine the ions: Ex. |
| **Energetics of Ionic Bonding-6*** It takes energy to convert the elements to atoms. (\_\_\_\_\_\_\_\_\_\_\_\_\_)
* It takes energy to create a cation (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_).
* Energy is released by making the anion (\_\_\_\_\_\_\_\_\_\_\_\_\_\_).
* The formation of the solid releases a *huge* amount of energy (\_\_\_\_\_\_\_\_\_\_\_\_).
* This makes the formation of salts from the elements *\_\_\_\_\_\_\_\_\_\_\_\_\_*.
 | **Lattice Energy-7**Lattice energy:The energy associated with electrostatic interactions is governed by \_\_\_\_\_\_\_\_\_\_\_\_\_\_ Law.Eel= |
| **Lattice Energy-8**Lattice energy increases with:1.
2.
 | **Covalent Bonding-9**Atoms \_\_\_\_\_\_\_\_\_\_\_\_ electrons in covalent bonds.There are several \_\_\_\_\_\_\_\_\_\_\_\_\_\_ interactions in these bonds:1.
2.

For a bond to form, the attraction must be \_\_\_\_\_\_\_\_\_\_\_\_\_ than the \_\_\_\_\_\_\_\_\_\_\_\_\_\_. |
| **Lewis Structures-10**Step 1:Ex.  | **Electrons on Lewis Structures-11**Lone Pairs:Bonding Pairs: |
| **Multiple Bonds-12**Single bonds:Double bonds:Triple Bonds:Example of each: | **Polar Covalent Bonds-13**Electrons in \_\_\_\_\_\_\_\_\_\_\_\_\_ bonds are not always shared \_\_\_\_\_\_\_\_\_\_\_\_\_.\_\_\_\_\_\_\_\_\_\_\_ pulls harder on the electrons it shares with \_\_\_\_\_\_\_\_\_\_\_\_\_ than hydrogen does.This make it so the \_\_\_\_\_\_\_\_\_\_\_\_\_ end of the molecule has more electron \_\_\_\_\_\_\_\_\_\_ than the \_\_\_\_\_\_\_\_\_\_\_\_ end. |
| **Electronegativity-14**What is electronegativity?Electronegativity generally \_\_\_\_\_\_\_\_\_\_\_\_\_ as you go:-from left to right across a period-from the \_\_\_\_\_\_\_\_\_\_\_\_ to the \_\_\_\_\_\_\_\_\_\_\_ of a group. | **Electronegativity and Polar Covalent Bonds-15**What is it called when atoms share electrons unequally?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Where do electrons tend to spend more time?: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_This results in a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.It is represented by \_\_\_\_\_\_\_\_\_.This makes the other atom \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.It is represented by \_\_\_\_\_\_\_\_. |
| **Polar Covalent Bonds-16**The greater the difference in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_,The more \_\_\_\_\_\_\_\_\_\_\_\_ is the bond. | **Dipoles-17**A dipole forms when two \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_A dipole moment, \_\_\_\_, is produced by \_\_\_\_\_\_\_ equal but opposite charges, separated by a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_. It is calculated by the formula:It is measured in \_\_\_\_\_\_\_\_\_\_\_\_ (D) |
| **Is a Compound Ionic or Covalent?-18**\_\_\_\_\_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_\_\_ = ionic \_\_\_\_\_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_\_\_ = covalentDoes not take into account \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Electronegativity difference can be used, but it still does not take into account the \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_.Properties of compounds are often best: \_\_\_\_\_\_\_\_\_\_ melting points mean \_\_\_\_\_\_\_\_\_\_ bonding, for example. |
| **Writing Lewis Structures (Covalent Molecules)-19**1. Sum the \_\_\_\_\_\_\_\_\_\_\_\_ electrons from all atoms, taking into account overall charge.

-If it is an anion \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_-If it is a cation \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Example: Keep track of the electrons: | **Writing Lewis Structures-20**1. Write the symbols for the atoms, show which atoms are attached to which, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Example Continued: Keep track of the electrons: |
| **Writing Lewis Structures-21**1. Complete \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Keep track of the electrons: | **Writing Lewis Structures-22**1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Keep track of the electrons: |
| **Writing Lewis Structures-23**1. If there are not enough \_\_\_\_\_\_\_\_\_\_\_\_\_\_ to give the central atom an \_\_\_\_\_\_\_\_\_\_, try \_\_\_\_\_\_\_\_\_\_\_\_ bonds.
 |
| **Writing Lewis Structures-24**1. Then assign \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the charge an atom would have if all of the \_\_\_\_\_\_\_\_\_\_\_\_ in a \_\_\_\_\_\_\_\_\_\_\_\_\_\_ bond were shared \_\_\_\_\_\_\_\_\_\_.Formal Charge = |
| **Writing Lewis Structures-25**The dominant Lewis structure:-Is the one in which atoms have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.-puts a negative formal charge on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.Which is the dominant Lewis structure? |
| **The Best Lewis Structure?-26**Following our rules, this is the Lewis structure we would draw for ozone, \_\_\_\_\_.Draw it:However, it does not agree with what is observed in nature.What is observed? | **Resonance-27**One Lewis structure cannot accurately depict a molecule like ozone.We use multiple structures called \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ to describe the molecule.Draw an example: |
| **Resonance-28**Benzene, \_\_\_\_\_\_\_\_\_, has \_\_\_\_\_\_\_\_ resonance structures.Draw it:It is commonly depicted as a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_With a circle inside to signify \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Electrons in the ring.Draw it:Localized:Delocalized: | **Exceptions to the Octet Rule-29**There are \_\_\_\_\_\_\_\_\_ types of ions or molecules that do not follow the \_\_\_\_\_\_\_\_\_\_ rule.1.

 1.
 |
| **Odd Number of Electrons-30**These are relatively \_\_\_\_\_\_\_\_\_\_\_\_\_ and usually quite \_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. There are \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_With an odd number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.Example: | **Fewer Than Eight Electrons-31**Where can elements be found that make stable compounds with fewer than eight electrons?:Example:Why?: |
| **Fewer Than Eight Electrons-32**If filling the octet of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ atom results in a \_\_\_\_\_\_\_\_\_\_\_\_ charge on the central atom and a \_\_\_\_\_\_\_\_\_\_\_\_ charge on the more \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ outer atom, don’t fill the octet of the central atom. | **More Than Eight Electrons-33**When an element is in period \_\_\_\_\_\_\_ or below in the PT, it can use \_\_\_\_\_\_\_\_\_\_\_\_ to make \_\_\_\_\_\_\_\_\_ than four bonds.Example: |
| **Covalent Bond Strength-34**How is the strength of a bond determined?:What do we call this? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Example: | **Average Bond Enthalpies-35**Average bond enthalpies are positive because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.These are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ over many different compounds; not every bond in nature for a pair of atoms has exactly the same \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.C—H = Cl—Cl = H—Cl = |
| **Using Bond Enthalpies to Estimate Enthalpy of Reaction-36**One way to estimate Δ*H* for a reaction is to use the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of bonds broken and the new bonds formed.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is added to break bonds, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ when making bonds.In other words:Δ*Hrxn* = Σ(bond enthalpies of all bonds broken) − Σ(bond enthalpies of all bonds formed). | **Example-37**From the figure on the last slide:CH4(*g*) + Cl2(*g*) ⎯⎯→ CH3Cl(*g*) + HCl(*g*)Solve: |
| **Answer-38** | **Bond Enthalpy and Bond Length-39**An average \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ can be measured for different bond types.As the number of bonds between two atoms \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, the bond length \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. |

**SUMMARY**

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