**pHet Building Molecules Virtual Lab Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_**

**Review of key concepts:**

**Oxidation states/charges** = how many electrons an element needs to gain/lose in a bond/molecule to become like the nearest noble gas. If they lose electrons – they become positive. If they gain electrons – they become negative.

example: NaCl – Na is #11 on periodic table so he wants to lose 1 electron in order to be like neon who is #10. So Na becomes +1. Cl is #17 on the periodic table so he wants to gain 1 electron in order to be like argon that is #18. So Cl becomes -1. Together in NaCl they are +1, -1 which equals a net charge of zero

 Atoms bond together in order to obtain the electron configuration they need and to add up to a neutral (zero) net charge. *(Hint: If it is a diatomic molecule made up of a single element – oxidation state/charge will ALWAYS be zero)*

**Lewis Dot Structures:** based on how many valence electrons an element has. Any electrons that are shared are drawn as a line. If two pairs are shared, draw a double bond (equal sign). If 3 pairs are shared, draw a triple bond/three lines.



Source: http://chemwiki.ucdavis.edu/Theoretical\_Chemistry/Chemical\_Bonding/Lewis\_Theory\_of\_Bonding

**Directions:** go to <https://phet.colorado.edu/> Click on ‘Play with Simulations’. Click on ‘Chemistry’. Click on ‘Build a Molecule’. Click on the play symbol.

In the ‘Make Molecules’ Sim

1. Try bonding the two hydrogen atoms together. Then try to bond the oxygen atom on one end. Will it bond there? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Draw the Lewis dot structure of the H2 molecule:

Are there any extra electrons on the hydrogens after they bond with each other?\_\_\_\_\_\_\_\_\_\_ Now, Play with the atoms until the oxygen is bonded to both hydrogens. Draw the Lewis structure of this molecule below:

What is the oxidation state/charge of oxygen in this molecule?*(Hint: how many e- does oxygen need to gain/lose in order to be like neon)* \_\_\_\_\_\_ What is the oxidation state/charge of each of the hydrogens in this molecule? \_\_\_\_\_\_\_\_ Now store the water molecule in ‘your molecules collection 1’

1. Click on ‘Kit #1’ to get the next set. Create a hydrogen molecule, H2. Draw the Lewis dot structure: Now store it in the collection.
2. Create an oxygen molecule, O2. Draw the Lewis structure below – then store it in the collection.
3. Click on ‘Kit #2’. Create a nitrogen molecule, N2. Draw the Lewis dot structure below. Then store it in your collection.
4. Make an oxygen molecule, O2. Now try and bond the carbon atom to one end. Will it bond? \_\_\_ Now try and store it in your collection. Will it store? \_\_\_\_\_\_\_\_\_\_ Alter the arrangement of the carbon dioxide molecule until it will allow you to store it. Once you are successful, draw the Lewis Structure below:
5. Go to the next collection. Create a hydrogen molecule, H2. Try and create an H3 molecule. Will it allow you to? \_\_\_\_\_\_\_\_\_\_ Use the Periodic Table and valence electrons to explain why three hydrogens cannot bond together. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Now, create an ammonia molecule. Draw the Lewis dot structure below – then store the molecule.

1. Click on ‘Kit #1’. Create a phosphine molecule. Try to bond the extra phosphorus to the phosphine. What happens? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Draw the Lewis structure of phosphine below – then store the molecule.

1. Click on ‘kit #2’. Bond two hydrogen to a single carbon. Then bond the extra carbon on its other side. Will it bond there? \_\_\_\_\_\_\_\_\_\_\_\_ Now, try and store the molecule. Will it allow you to store it? \_\_\_\_\_\_\_\_ Play with the arrangement of the acetylene molecule until it lets you store it. Draw the Lewis structure of that molecular arrangement below:
2. Click on ‘kit #3’. Bond 3 fluorine atoms together. Will it allow you to do that? \_\_\_\_\_\_\_\_\_\_\_\_\_ Draw the Lewis Dot Structure of the fluorine molecule, F2. Then store it.
3. Click on ‘kit #4’. Create an ozone molecule, O3. Now try and bond the Sulphur to it on one side. Will it allow that? \_\_\_\_\_\_\_\_\_ Now play with the molecular arrangement until you have created a sulfur dioxide molecule that it will allow you to store. Draw the Lewis Dot Structure of that molecule below:
4. Click on ‘next collection’- you should now be on ‘collection 3’. Build each molecule, Fill in the name and chemical equation, draw the Lewis dot structure below, fill in the oxidation states/charges for each element involved. Then store them.

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| Molecular formula | Molecule name | Lewis dot structure | Oxidation state/charges |
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1. Click on ‘next collection’ - you should now be on ‘collection 4’. Build each molecule, Fill in the name and chemical equation, draw the Lewis dot structure below, fill in the oxidation states/charges for each element involved. Then store them.

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| --- | --- | --- | --- |
| Molecular formula | Molecule name | Lewis dot structure | Oxidation state/charges |
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1. Click on ‘next collection’ You should now be on ‘collection 5’. Build each molecule, Fill in the name and chemical equation, draw the Lewis dot structure below, fill in the oxidation states/charges for each element involved. Then store them.

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| --- | --- | --- | --- |
| Molecular formula | Molecule name | Lewis dot structure | Oxidation state/charges |
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1. Click on ‘next collection’. Build each molecule, Fill in the name and chemical equation, draw the Lewis dot structure below, fill in the oxidation states/charges for each element involved. Then store them.

|  |  |  |  |
| --- | --- | --- | --- |
| Molecular formula | Molecule name | Lewis dot structure | Oxidation state/charges |
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1. Now click on ‘collect multiple’. Fill in the table below as you finish collection 1

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| Molecular equation | Lewis dot structure  | Oxidation states/charges of each element in the molecule | How many total atoms of each element are in this collection of molecules? |
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1. Now click on ‘collect multiple’. Fill in the table below as you finish collection 2

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| Molecular equation | Lewis dot structure  | Oxidation states/charges of each element in the molecule | How many total atoms of each element are in this collection of molecules? |
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1. Now click on ‘collect multiple’. Fill in the table below as you finish collection 3

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| Molecular equation | Lewis dot structure  | Oxidation states/charges of each element in the molecule | How many total atoms of each element are in this collection of molecules? |
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1. Now click on ‘collect multiple’. Fill in the table below as you finish collection 4

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| Molecular equation | Lewis dot structure  | Oxidation states/charges of each element in the molecule | How many total atoms of each element are in this collection of molecules? |
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1. Now click on ‘collect multiple’. Fill in the table below as you finish collection 5

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| --- | --- | --- | --- |
| Molecular equation | Lewis dot structure  | Oxidation states/charges of each element in the molecule | How many total atoms of each element are in this collection of molecules? |
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1. Now click on ‘collect multiple’. Fill in the table below as you finish collection 6

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| --- | --- | --- | --- |
| Molecular equation | Lewis dot structure  | Oxidation states/charges of each element in the molecule | How many total atoms of each element are in this collection of molecules? |
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1. Go to ‘larger molecules’ and ‘kit #1’. Use your charts from the ‘make molecules’ sections to find out the molecular formulas of the following molecules in order to build them

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| --- | --- | --- |
| How many and Molecule name | Molecular formula | Lewis dot structure of molecule |
| 1 Oxygen gas |  |  |
| 1 hydrogen chloride |  |  |
| 1 water |  |  |
| 1 methane |  |  |
| 2 hydrogen cyanide |  |  |
| 1 chloroamine |  |  |
| 1 hydrogen gas |  |  |

**\*\*Once you have finished the ‘Larger molecules – Kit #1’ and filled in the table above – bring laptop and this paper to your teacher to prove that you have completed the activity. \_\_\_\_\_\_\_\_\_ (teacher initial). You now have an ‘A’ on this assignment!\*\***