Chemistry
Covalent Compounds

Learning Outcomes
- I can use Lewis Dot Diagrams to show how covalent compounds form.

Covalent Compounds
- form when two or more non-metals form a compound

Steps
1. determine the total number of valence electrons in the molecule
2. put the single atom in the center and show all valence electrons
3. add the other atoms so that the unpaired electrons are beside the unpaired electrons of the first atom
4. check that each atom has an octet (8) of electrons
   - remember that hydrogen only has 2 electrons in its valence shell

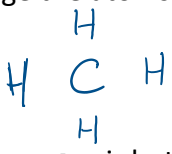
Exercises:

1. Draw a Lewis dot structure for methane (CH_4)

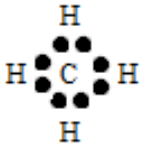
Step 1: Valence e^- calculation

1C × 4 valence e^- = $4e^-$
4H × 1 valence e^- = $4e^-$
Total e^- = $8e^-$

Step #2: Arrange the atoms with the single atom in the middle



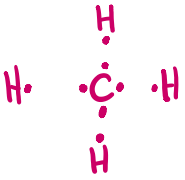
Step #3: Place an e^- pair between bonding atoms.



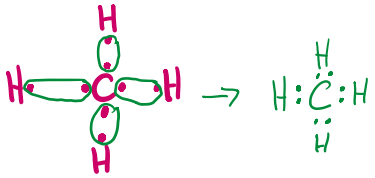
Step #4: Complete all outer shells with e^-.

(Since hydrogen is full with 2 electrons, the diagram is complete)

Another way:
Step #1: Same
Step #2: Arrange atoms with single atom in middle as their Lewis Dot structures.



Step #3: Draw loops around bonding electrons to show where bonds will form



2. Draw Lewis dot diagram for H_2O

1. 2H × 2 valence e^- = $2e^-$
   1O × 6 valence e^- = $6e^-$
   $8e^-$

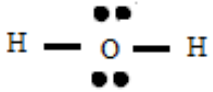
2. H O H

3. H : O : H

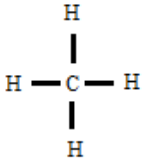
4. H : Ö : H

Or

- structural diagrams are often used in drawing covalent molecules
  - a dash is used to represent bonding pairs of electrons
  - lone pairs are still shown as dots
  - example: water



  - example: CH_4



Videos: Comparing ionic vs covalent bonds and crash course chem
https://www.youtube.com/watch?v=PKA4CZwbZWU
https://youtu.be/a8LF7JEb0IA

- some covalent compounds can form ions
  - example: OH^{-1}, NH_4^{+1}, CO_3^{-2}

Practice:
Label the following substances as ionic or covalent:

1. CH_3OH Covalent (C)
2. $Ca(OH)_2$ Ionic (I)
3. PO_4^{-3} C
4. KBr I
5. N_2O_4 C
6. SCN^- C
7. NaSCN I
8. Na_2CO_3 I
9. $(NH_4)_2SO_4$ I
10. H_2O C

Worksheet (Covalent Lewis Dots)