Honors Physical Science 2022
Ionic bonding, Covalent bonding, and electron dot diagrams

Name: Key 2022
Period:

Objectives 4 & 5:
4. Explain how ionic compounds are formed, predict their formulas, and draw the ions.
5. Explain how covalent compounds are formed and draw their Lewis Structures.

Octet rule
https://sciencing.com/use-octet-rule-8651379.html

1. What is the octet rule?

atoms desire 8 e⁻ in outer E level

2. Complete the following table

Element	Periodic table group	Number of outer or valence electrons	Number of additional electrons needed to fill outer energy level (DX #)
Hydrogen	1A	1	+1
Carbon	4A	4	+/- 4
Nitrogen	5A	5	-3
Oxygen	6A	6	-2
Chlorine	7A	7	-1
Silicon	4A	4	+/- 4
Phosphorus	5A	5	-3
Sulfur	6A	6	-2
Bromine	7A	7	-1

3. Why is hydrogen stable with only 2 outer electrons instead of 8 outer electrons?

elements in the first row only have 1 E level & it can only hold 2e⁻

4. Why does the 8A periodic table group not react with other elements?

they already have 8 valence e⁻

Introduction to ionic compounds
http://chemistry.elmhurst.edu/vchembook/143Aioniccpds.html

5. What is the difference between an atom and an ion?

atom - neutral ion - charged atom

6. How do positive ions form?

when atoms lose e⁻

7. Why do metals tend to form positive ions?

lower EN, give e⁻

8. How do negative ions form?

when atoms gain e⁻

9. Why do nonmetals tend to form negative ions?

higher EN, receive e⁻

10. What holds the positive and negative ions together in an ionic bond?

interaction between pos & neg ions attracting each other

Electron dot diagrams (sometimes called Lewis Structure)
http://www.ausetute.com.au/lewisstr.html

11. What is an electron dot diagram?

atomic symbol w/dots representing valence e⁻

12. Draw electron dot diagrams for each of the following elements

Sodium Calcium Aluminum Carbon

Nitrogen Sulfur Fluorine Argon

Dot diagrams for ionic compounds
http://www.kentchemistry.com/links/bonding/IonicLewisDots.htm

14. Write the ions for each of the following compounds

NaCl $[Na]^+ [:\ddot{Cl}:]^-$ $MgCl_2$ $[Mg]^{+2} 2[:\ddot{Cl}:]^-$ Al_2O_3 $2[Al]^{+3} 3[:\ddot{O}:]^{-2}$

15. Complete the following table

Metal element	Number of outer electrons	Charge of metal ion	Nonmetal element	Number of outer electrons	Charge of nonmetal ion	Formula of metal + nonmetal compound	Electron dot diagram of compound Draw Ions
Potassium	1	+1	Fluorine	7	-1	KF	$[K]^{+1}$ $[:\ddot{F}:]^{-1}$
Calcium	2	+2	Oxygen	6	-2	CaO	$[Ca]^{+2} [:\ddot{O}:]^{-2}$
Sodium	1	+1	Sulfur	6	-2	Na_2S	$2[Na]^+ [:\ddot{S}:]^{-2}$
Magnesium	2	+2	Chlorine	7	-1	$MgCl_2$	$[Mg]^+ 2[:\ddot{Cl}:]^-$

Covalent Bonds
http://hyperphysics.phy-astr.gsu.edu/hbase/Chemical/bond.html

16. How is a covalent bond formed?

sharing of e^-

17. Ionic compounds are formed by a metal and a nonmetal. What types of elements form covalent bonds?

nonmetal & nonmetal

Diatomic elements
http://study.com/academy/lesson/what-is-a-diatomic-element-definition-examples.html

18. Draw Lewis Structures and tell the number of electrons shared by each diatomic element

H_2 H–H 2

N_2 :N≡N: 6

O_2 :O=O: 4

F_2 :F–F: 2

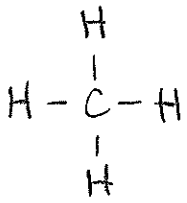
Lewis Structures for some covalent molecules
http://www.chemguide.co.uk/atoms/bonding/covalent.html

19. Draw Lewis Structures for the following compounds

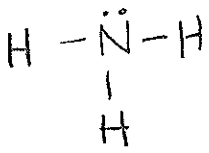
Hydrogen chloride HCl

H–Cl:

Methane CH_4



Ammonia NH_3



Water H_2O