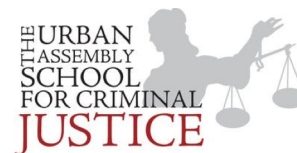


Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Chemistry** ~ Ms. Hart

**Class:**

Anions or Cations



<b>1. What is a chemical bond?</b>	<b>2. What is the octet rule? Why do atoms in bonding follow it?</b>
<b>3. What are oxidation numbers? How do we find them?</b>	<b>4. What are polyatomic ions? How do we find them? Name 3 examples.</b>
<b>5. How do we name ionic compounds? (Basic rules).</b>	<b>6. What does the Roman numeral represent? Do we use Roman numerals in covalent compounds?</b>
<b>7. How do we name covalent compounds? (Basic rules).</b>	<b>8. What are ionic bonds? Describe essential characteristics.</b>

<p><b>9. What are polar covalent bonds? Describe essential characteristics.</b></p>	<p><b>10. What are non-polar covalent bonds? Describe essential characteristics.</b></p>
<p><b>11. What does the term polar mean?</b></p>	<p><b>12. What does the term dipole mean?</b></p>
<p><b>13. How do we know if a bond is polar?</b></p>	<p><b>14. How do we know if a molecule has a dipole? (If the molecule is polar)</b></p>
<p><b>15. What are metallic bonds? Describe essential characteristics.</b></p>	<p><b>16. What are intermolecular forces? Why are they important?</b></p>
<p><b>17. What are hydrogen bonds? What 3 common atoms do they occur in?</b></p>	<p><b>18. What are dipole dipole forces? How are they different from hydrogen bonds?</b></p>

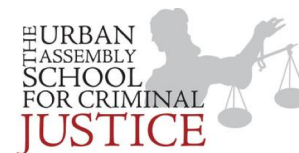
<p><b>19. What are London dispersion forces? (Van der Waals forces). What molecules/atoms do they occur in?</b></p>	<p><b>20. Rank the 3 intermolecular forces from least to greatest.</b></p>
<p><b>21. Draw the hydrogen bond water makes with another water molecule.</b></p>	<p><b>22. Draw the hydrogen bond <math>\text{NH}_3</math> makes with ammonia.</b></p>
<p><b>23. What type of substance conducts electricity in the solid phase, liquid phase, and aqueous?</b></p>	<p><b>24. What type of substance does not conduct electricity as a solid, but conducts as a liquid and aqueous?</b></p>
<p><b>25. What type of compound does the term "molecule" describe?</b></p>	<p><b>26. What are the 3 different types of molecular shapes? Name and draw an example for each.</b></p>
<p><b>27. Draw <math>\text{CBr}_4</math>. What is the shape of <math>\text{CBr}_4</math>? Are the bonds polar and why? Is the molecule polar and why?</b></p>	<p><b>28. Draw <math>\text{NH}_3</math>. What is the shape of <math>\text{NH}_3</math>? Are the bonds polar and why? Is the molecule polar and why?</b></p>

<p><b>29. Draw H<sub>2</sub>O. What is the shape of H<sub>2</sub>O? Are the bonds polar and why? Is the molecule polar and why?</b></p>	<p><b>30. Name the following compounds: a) Ag<sub>2</sub>SO<sub>4</sub> b) Fe(OH)<sub>2</sub> c) P<sub>4</sub>S<sub>5</sub></b></p>
<p><b>31. Write the formula of: a) Dinitrogen Trioxide b) Chromium III Carbonate c) Ammonium nitrate.</b></p>	<p><b>32. Draw the structures and determine the shape and polarity of the molecule: a) F<sub>2</sub> b) O<sub>2</sub> c) CH<sub>2</sub>Br<sub>2</sub> d) N<sub>2</sub></b></p>
<p><b>33. Why is CO<sub>2</sub> non-polar even though the bonds are polar?</b></p>	<p><b>34. Which compound contains both ionic and covalent bonds? a) CO<sub>2</sub> b) HCl c) NH<sub>4</sub>Br d) Cl<sub>4</sub></b></p>
<p><b>35. What type of bond is present in steel?</b></p>	<p><b>36. What happens to the energy when a bond is broken?</b></p>
<p><b>37. What is an electrolyte?</b></p>	

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### Unit 5 Key Questions – Chemical Bonding – Answers!

- What is a chemical bond?
  - “Glue” that holds atoms together.
- What is the octet rule? Why do atoms in bonding follow it?
  - Atoms need 8 electrons. In bonding, atoms will do whatever possible to fill their valence shell, which needs 8 to be filled.
- What are oxidation numbers? How do we find them?
  - Charge when an atom forms an ion. Upper right corner on the periodic table.
- What are polyatomic ions? How do we find them? Name 3 examples.
  - Polyatomic ions are covalently bonded ions. We find them in Table E on the reference table.  $\text{CN}^-$ ,  $\text{OH}^-$ , and  $\text{SCN}^-$  are all examples.
- How do we name ionic compounds? (Basic rules).
  - See HW and notes for complete naming. Essential Rules:
    - Use -ide at the end. Positive (cation) always written first.
    - Use roman numerals if transition metal is present.
    - Use names of polyatomic ions without adding ide.
- What does the Roman numeral represent? Do we use Roman numerals in covalent compounds?
  - Roman numerals represent the charge on a transition metal in an ionic compound name. We do not use them in covalent compounds.
- How do we name covalent compounds? (Basic rules).
  - See HW for more complete rules. Essential rules:
    - Use ide at the end
    - Use mono (sometimes), di, tri, etc. as prefixes.
- What are ionic bonds? Describe essential characteristics.
  - Ionic bonds are where electrons are transferred. Always between a metal and nonmetal. Bonds are formed by electrostatic interactions. High melting points. Do not conduct as solids, but conduct as liquids and aqueous.
- What are polar covalent bonds? Describe essential characteristics.
  - Bonds where electrons are shared unequally. Two nonmetals. More electronegative atom is partially negative (gets more electrons). 0.4 – 1.7 EN difference.
- What are non-polar covalent bonds? Describe essential characteristics.
  - See Table in Notes. Bond where electrons are shared equally. 0 – 0.4 EN difference.
- What does the term polar mean?
  - Unequal distribution of charge. A more electronegative atom will pull more electrons becoming more negative.
- What does the term dipole mean?
  - Same as polar.
- How do we know if a bond is polar?
  - If the EN difference is more than 0.4.
- How do we know if a molecule has a dipole? (If the molecule is polar)
  - If we can draw a line of symmetry for charge. (one side negative and the other side positive).
- What are metallic bonds? Describe essential characteristics.
  - Bonds between metals via a “sea of electrons.” The valence shell electrons separate from the atom and the electrons are used by all metals. Metals conduct electricity in the solid, liquid, and aqueous phases.
- What are intermolecular forces? Why are they important?
  - Intermolecular forces are forces between molecules. They are important because they hold molecules together. In water for example, intermolecular forces prevent water from becoming a gas, giving it a high boiling point.
- What are hydrogen bonds? What 3 common atoms do they occur in?

- a. Hydrogen bonds are an intermolecular represented by a dashed line between a hydrogen atom and N, O, or F.
18. What are dipole dipole forces? How are they different from hydrogen bonds?
  - a. Dipole dipole forces are where the slightly positive side of a molecule is attracted to the slightly negative side of another. Different because it is the whole molecule interacting, not just 2 atoms.
19. What are London dispersion forces? (Van der waals forces). What molecules/atoms do they occur in?
  - a. Where a dipole forms in a molecule due to electrons moving and creates a positive and negative side. This interacts with the positive/negative side of another molecule. They occur in ALL molecules/atoms, even noble gases and non-polar molecules.
20. Rank the 3 intermolecular forces from least to greatest.
  - a. London dispersion < dipole dipole < Hydrogen Bonds
21. Draw the hydrogen bond water makes with another water molecule.
  - a. See Notes.
22. Draw the hydrogen bond  $\text{NH}_3$  makes with ammonia.
  - a. See Notes.
23. What type of substance conducts electricity in the solid phase, liquid phase, and aqueous?
  - a. Metallic
24. What type of substance does not conduct electricity as a solid, but conducts as a liquid and aqueous?
  - a. Ionic, also called a salt.
25. What type of compound does the term "molecule" describe?
  - a. Covalent.
26. What are the 3 different types of molecular shapes? Name and draw an example for each.
  - a. Linear, tetrahedral, and bent. ( $\text{CO}_2$  is linear,  $\text{CH}_4$  is tetrahedral,  $\text{H}_2\text{O}$  is bent)
27. Draw  $\text{CBr}_4$ . What is the shape of  $\text{CBr}_4$ ? Are the bonds polar and why? Is the molecule polar and why?
  - a. Tetrahedral. Bonds are polar b/c of high EN difference. Molecule is non-polar because you cannot draw a line of symmetry for charges.
28. Draw  $\text{NH}_3$ . What is the shape of  $\text{NH}_3$ ? Are the bonds polar and why? Is the molecule polar and why?
  - a. Trigonal pyramidal (no need to know the term). Polar bonds b/c of high EN difference. Molecule is polar because you can draw a line of symmetry for charge.
29. Draw  $\text{H}_2\text{O}$ . What is the shape of  $\text{H}_2\text{O}$ ? Are the bonds polar and why? Is the molecule polar and why?
  - a. Bent. Polar bonds b/c of high EN difference. Molecule is polar because you can draw a line of symmetry for charge.
30. Name the following compounds: a)  $\text{Ag}_2\text{SO}_4$  b)  $\text{Fe}(\text{OH})_2$  c)  $\text{P}_4\text{S}_5$ 
  - a. A) silver sulfate B) Iron (II) hydroxide C) Tetraphosphorus pentasulfide
31. Write the formula of: a) Dinitrogen Trioxide b) Chromium III Carbonate c) Ammonium nitrate.
  - a. A)  $\text{N}_2\text{O}_3$  B)  $\text{Cr}_2(\text{CO}_3)_3$  C)  $\text{NH}_4\text{NO}_3$
32. Draw the structures and determine the shape and polarity of the molecule: a)  $\text{F}_2$  b)  $\text{O}_2$  c)  $\text{CH}_2\text{Br}_2$  d)  $\text{N}_2$ 
  - a. A) Linear, nonpolar B) Linear, nonpolar C) Tetrahedral, polar D) Linear, nonpolar
33. Why is  $\text{CO}_2$  non-polar even though the bonds are polar?
  - a. You cannot draw a line of symmetry for charge.
34. Which compound contains both ionic and covalent bonds? a)  $\text{CO}_2$  b)  $\text{HCl}$  c)  $\text{NH}_4\text{Br}$  d)  $\text{Cl}_4$ 
  - a. C
35. What type of bond is present in steel?
  - a. Metallic
36. What happens to energy when a bond is broken?
  - a. Energy is required for a bond to break. "Breaking up is hard to do"
37. What is an electrolyte?
  - a. An electrolyte is an ionic compound!