Intoduction to Acids & Bases

Name_____ **Date** _____

Part 1: Basic Information about Acids and Bases

http://www.mcwdn.org/chemist/acidbase.html

Classify as an acid or a base

1. Taste bitter _____
2. Taste Sour _____
3. Feels slimy or slippery_____
4. Turns litmus paper blue_____
5. Turns litmus paper red _____
6. Gives off hydrogen gas when it reacts with some metals _____

Part 2: Acids and Bases in everyday use
Complete these paragraphs by filling in or circling the appropriate information based on the information that you know about acids and bases. You may have to use google to find the answers.

When most people think of chemistry the first terms that come to mind are acids and bases. Many of the chemicals that people run across have some connection to acids and bases. For instance many people take medicine every day to cure heart burn. These medicines are **(acids/bases).** One of these comes in a blue bottle and is known as "Dr. MOM". The common name for this is ***M****ilk* ***O****f* ***M****agnesia* the chemical name is _____ and the chemical formula is _____. Another product claims that it is better for us to use because it contains calcium. So in addition to helping relieve the heartburn, it also provides us with needed calcium. This product is called *Tums* and its chemical name is _____ and its chemical formula is _____.

Another product that is used all the time is *Draino*. Draino is a(n) **(acid/base)** and it has the common name of "lye" the chemical name is _____, and the chemical formula is _____. This chemical is more dangerous than the ones used for heartburn and can cause blindness or burns. **(Acids/Bases)** are also commonly used to produce soaps and have a **(bitter/sour)** taste.

Seltzer water and all sodas contain a very mild **(acid/base)** known as _____. This is formed by dissolving carbon dioxide in water. The chemical formula for this substance is _____. Vinegar is a(n) **(acid/base)** finds its way into our diet in ketchup and most salad dressings. The chemical name for vinegar is _____, the chemical formula for this substance is _____.

Part 3: Arrhenius definition of an acid or base
http://facultyfp.salisbury.edu/dfrieck/htdocs/212/rev/acidbase/arrhenius.htm

The Arrhenius definition of acids and bases is one of the oldest. An **Arrhenius acid** is a substance that when added to water increases the concentration of H^+ ions present. The chemical formulas of Arrhenius acids are written with the acidic hydrogens first. An **Arrhenius base** is a substance that when added to water increases the concentration of OH^- ions present. HCl is an example of an Arrhenius acid and NaOH is an example of an Arrhenius base.

$$HCl \rightarrow H^+ + Cl^- \qquad\qquad NaOH \rightarrow Na^+ + OH^-$$

Classify the following as an acid or base using the Arrhenius definition of an acid or base.

7. HNO_3 is an Arrhenius _____ and increases the concentration of _____ when added to water.

8. KOH is an Arrhenius _____ and increases the concentration of _____ when added to water.

9. $Ca(OH)_2$ is an Arrhenius _____ and increases the concentration of _____ when added to water.

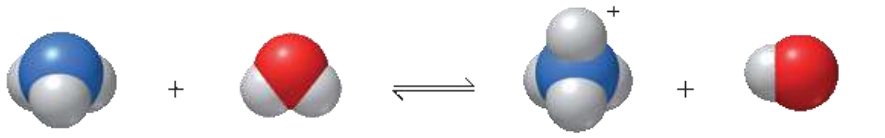
10. H_2SO_4 is an Arrhenius _____ and increases the concentration of _____ when added to water.

Part 4: **Brønsted -Lowry** Definition of an acid or base

http://facultyfp.salisbury.edu/dfrieck/htdocs/212/rev/acidbase/Bronst.htm

A **Brønsted -Lowry acid** is defined as anything that donates H^+ ions; a **Brønsted -Lowry base** is defined as anything that accepts H^+ ions. This definition includes all Arrhenius acids and bases but, as you will soon see, it is a bit more general. The Brønsted -Lowry concept is based on *the transfer of a proton* (H^+) from one substance to another.

Look at the example below: $NH_3 + H_2O \rightarrow NH_4^+ + OH^-$



NH_3 accepts a proton or H^+ so it is classified as a base.
H_2O donates a proton or H^+ so it is classified as an acid.

Brønsted -Lowery is different than Arrhenius because an acid or a base does not have to form a H^+ or OH^- ion. An acid has to donate a proton and a base has to accept a proton.

11. A proton is also known as this ion _____.

Look at the following reactions and answer the questions below:

$H_2SO_4 + NH_3 \rightarrow HSO_4^- + NH_4^+$

12. H_2SO_4 goes to HSO_4^-
a) Did it gain or lose a proton? _____

b) Is it a Brønsted -Lowery acid or base? _____

13. NH_3 goes to NH_4^+
a) Did it gain or lose a proton? _____

b) Is it a Brønsted -Lowery acid or base? _____

$HC_2H_3O_2 + H_2O \rightarrow H_3O^+ + C_2H_3O_2^-$

14. $HC_2H_3O_2$ goes to $C_2H_3O_2^-$
a) Did it gain or lose a proton? _____

b) Is it a Brønsted -Lowery acid or base? _____

15. H_2O goes to H_3O^+
a) Did it gain or lose a proton? _____

b) Is it a Brønsted -Lowery acid or base? _____

$HCO_3^{-1} + HCl \rightarrow Cl^{-1} + H_2CO_3$

16. HCO_3^{-1} goes to H_2CO_3

a) Did it gain or lose a proton? _____

b) Is it a Brønsted -Lowery acid or base? _____

17. HCl goes to Cl^{-1}
a) Did it gain or lose a proton? _____

b) Is it a Brønsted -Lowery acid or base? _____

The following are Brønsted -Lowery acids. Determine what will form when each donates a proton

18. HI _____

19. H_2O _____

20. NH_4^+ _____

21. HNO_3 _____

The following are Brønsted-Lowry bases. Determine what will form when each accepts a proton.

22. CN^-

23. O^{-2}

24. HSO_4^{-1}

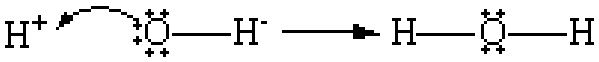
25. PO_4^{-3}

Part 5: Lewis Acids & Bases

https://www.youtube.com/watch?v=u2Bd_U8YoO8

A Lewis acid is a substance that can _____ a pair of _____ to form a covalent bond. While a Lewis base is a substance that can _____ a pair of _____ to form a covalent bond. All Bronsted-Lowry acids and bases are also Lewis acids and bases, but not necessarily the other way around.

$H^+ + OH^- \rightarrow H_2O$



Hydroxide donates the pair of electrons - Lewis base

Hydrogen ion accepts the pair of electrons – Lewis acid

Identify the Lewis acid and Lewis Base in the following reaction: Draw a lewis dot structure for each to decide which is donating electrons and which one is receiving electrons.

26. $CO_3 + H_2O \rightarrow H_2CO_3$ acid _____ base _____