

Name: _____

Unit 6 - Topic 5

Properties of Acids & Bases

The properties of acids and bases are caused by the ions they form in water. Due to the presence of ions, aqueous solutions of both acids and bases are electrolytes. Acids and bases react with each other to form a salt and water. The reaction is a double replacement reaction known as neutralization.

(Example: $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$) Since acid characteristics are caused by hydronium ions and base characteristics are caused by hydroxide ions, there are some differences as well.

Acids increase the hydronium ion concentration of water. Hydronium ion concentration is measured on the pH scale. Acids have a pH below (less than) 7. They also taste sour, the taste of hydronium. Since acids are polar molecules with metallic hydrogen, they react with active metals to release hydrogen gas. This single replacement reaction is responsible for the fact that acids corrode metals. Acids can be used to clean metals.

Bases on the other hand increase the hydroxide ion concentration of water and reduce the hydronium ion concentration in water. As a result they have a pH above (greater than) 7. Hydroxide ions taste bitter. Bases don't react with metals, but they are not so kind to skin. Bases feel slippery because they dissolve skin. (Dissolved skin makes a great lubricant.) Substances that dissolve skin are called caustic. Bases can be used to unclog drains or to make soap.

Aqueous solutions of acids and bases look identical. Indicators, substances that react with acids or bases to show a definite color change, are used to distinguish between them. See the table to the right.

Salts are ionic compounds formed during the neutralization reaction between acids and bases. Salts tend not to have the characteristics of either acids or bases because they are generally neutral like water. Salts do dissolve in water, however, to form electrolyte solutions.

After reading the above passage, determine whether each of the following is an ACID, BASE, SALT or NONE OF THESE. More than one answer may be described by the statement.

1. _____ Has a pH less than 7.
2. _____ Feels slippery to the touch
3. _____ Increases the hydronium ion concentration of water
4. _____ Turns litmus red.
5. _____ Used in the production of soap.
6. _____ Can be neutralized to form a salt and water.
7. _____ Turns phenolphthalein pink
8. _____ $\text{C}_2\text{H}_5\text{OH}$ [HINT: what kind of bonds are in this compound?]
9. _____ CH_3COOH [HINT: Which element is the most metallic in this compound?]
10. _____ Contains hydroxide ions.

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More Practice with pH

What is the pH when given the following $[\text{H}_3\text{O}^+]$?

11. _____ $[\text{H}_3\text{O}^+] = 10^{-12} \text{ M}$

12. _____ $[\text{H}_3\text{O}^+] = 10^{-5} \text{ M}$

13. _____ $[\text{H}_3\text{O}^+] = 10^{-14} \text{ M}$

What is the **hydronium ion** concentration when given the following $[\text{OH}^-]$ concentrations?

14. _____ $[\text{OH}^-] = 10^{-12} \text{ M}$

15. _____ $[\text{OH}^-] = 10^{-5} \text{ M}$

16. _____ $[\text{OH}^-] = 10^{-7} \text{ M}$

17. _____ $[\text{OH}^-] = 10^{-3} \text{ M}$

What is the **pH** in each of the following cases?

18. _____ $[\text{OH}^-] = 10^{-12} \text{ M}$

19. _____ $[\text{OH}^-] = 10^{-5} \text{ M}$

20. _____ $[\text{OH}^-] = 10^{-7} \text{ M}$