

4 • Classifying Chemicals

1 • pH and pOH

Fill in the missing information:

[H ⁺]	pH	pOH
1 x 10 ⁻⁵	5	9
1 x 10⁻³	3	12
1 x 10⁻¹²	12	2
* 2.5 x 10 ⁻³	2.6	11.4
1 x 10⁻⁶	6	8
1 x 10⁻¹³	13	1

***use your calculator pH = -log(2.5 x 10⁻³)**

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2 • [H⁺] and [OH⁻]

Fill in the missing information:

[H ⁺]	[OH ⁻]
1 x 10 ⁻⁴	1 x 10⁻¹⁰
1 x 10⁻⁶	1 x 10 ⁻⁸
1 x 10 ⁻¹⁰	1 x 10⁻⁴
1 x 10⁻¹²	1 x 10 ⁻²
2 x 10 ⁻⁶	5 x 10⁻⁹
3 x 10⁻⁸	3.3 x 10 ⁻⁷
4.8 x 10 ⁻³	2.1 x 10⁻¹²
6.25 x 10⁻¹⁴	1.6 x 10 ⁻¹

Remember: [H⁺] x [OH⁻] = 1 x 10⁻¹⁴

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3 • ACIDS, BASES, and SALTS

State whether each chemical is an acid, a base, or a salt.

If it is an acid or a base, state whether it is strong or weak:

- | | | |
|--|-------------|---------------|
| 1. H ₂ SO ₄ | <u>acid</u> | <u>strong</u> |
| 2. Mg(OH) ₂ | <u>base</u> | <u>weak</u> |
| 3. KBr | <u>salt</u> | |
| 4. HI | <u>acid</u> | <u>strong</u> |
| 5. HC ₂ H ₃ O ₂ | <u>acid</u> | <u>weak</u> |
| 6. NH ₄ OH | <u>base</u> | <u>weak</u> |
| 7. HNO ₃ | <u>acid</u> | <u>strong</u> |
| 8. Li ₂ CO ₃ | <u>salt</u> | |
| 9. NaOH | <u>base</u> | <u>strong</u> |
| 10. HF | <u>acid</u> | <u>weak</u> |

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4 • MOLARITY

Calculate the concentration of each of these mixtures:

$$\text{KOH} = 56.1 \text{ g/mole}$$

$$\text{NaOH} = 40.0 \text{ g/mol}$$

- 4 moles KOH in enough water to make 2 L of solution. $\frac{4 \text{ mol}}{2 \text{ L}} = \underline{2 \text{ M}}$
- 0.1 mole NaOH in enough water to make 0.05 L of solution. $\frac{.1 \text{ mol}}{.05 \text{ L}} = \underline{2 \text{ M}}$
- 0.25 mole KOH in enough water to make 500 mL of solution. $\frac{.25 \text{ mol}}{.5 \text{ L}} = \underline{.5 \text{ M}}$
- 60 grams of NaOH in enough water to make 800 mL of solution. $\frac{1.5 \text{ mol}}{.8 \text{ L}} = \underline{1.875 \text{ M}}$

Convert 60 g NaOH to moles using molar mass.

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5 • DILUTION PROBLEMS

Answer the following problems about diluting solutions:

$$V \cdot \underline{M} = V \cdot \underline{M}$$

1. A 50 mL sample of 6 M HCl is diluted to a volume of 250 mL. What is the new concentration?

$$(50 \text{ mL})(6 \underline{M}) = (250 \text{ mL})(x) \quad x = 1.2 \underline{M}$$

2. What volume of 18.0 M H₂SO₄ is needed to make 100 mL of a 1.5 M H₂SO₄ solution?

$$(x)(18 \underline{M}) = (100 \text{ mL})(1.5 \underline{M}) \quad x = 8.3 \text{ mL}$$

3. Calculate the concentration of a solution made by diluting 30 mL of 12 M HCl to a volume of 900 mL.

$$(30 \text{ mL})(12 \underline{M}) = (900 \text{ mL})(x) \quad x = 0.4 \underline{M}$$

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6 • PROPERTIES OF ACIDS & BASES

Use the following key:

- a) Acid
- b) Base
- c) Both Acid and Base

B_1. tastes bitter

A_6. increases [H⁺]

B_11. turns cabbage blue/green

C_2. electrolyte

A_7. tastes sour

A_12. proton donor

B_3. increases [OH⁻]

B_8. neutralizes HCl

B_13. decreases [H⁺]

A_4. turns cabbage pink

B_9. feels slippery

C_14. corrosive

A_5. neutralizes NaOH

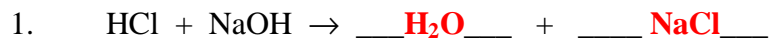
A_10. decreases [OH⁻]

B_15. proton acceptor

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7 • ACID-BASE NEUTRALIZATION

Write balanced equations showing how the following acids and bases neutralize each other:

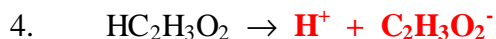
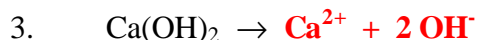
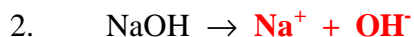
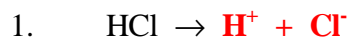


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8 • DISSOCIATION EQUATIONS

Consider the following dissociation equation: $\text{H}_2\text{SO}_4 \rightarrow 2\text{H}^+ + \text{SO}_4^{2-}$

Write the ions into which the following compounds dissociate:



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9 • COMMON CHEMICALS

Match these substances with their chemical formulas:

- | | |
|----------------------------------|--|
| <u>l</u> 1. table salt | a) HCl |
| <u>c</u> 2. milk of magnesia | b) CaCO_3 |
| <u>f</u> 3. water | c) Mg(OH)_2 |
| <u>a</u> 4. stomach acid | d) H_2O_2 |
| <u>h</u> 5. sugar | e) $\text{HC}_2\text{H}_3\text{O}_2$ |
| <u>i</u> 6. limewater | f) H_2O |
| <u>g</u> 7. household ammonia | g) NH_4OH |
| <u>d</u> 8. hydrogen peroxide | h) $\text{C}_{12}\text{H}_{22}\text{O}_{11}$ |
| <u>b</u> 9. chalk | i) Ca(OH)_2 |
| <u>k</u> 10. drain cleaner (lye) | j) H_2SO_4 |
| <u>e</u> 11. vinegar | k) NaOH |
| <u>j</u> 12. battery acid | l) NaCl |