

Solutions Practice

Choose one of the following labels for numbers 1-10:

- element
- compound
- homogeneous mixture
- heterogeneous mixture

- 1) copper _____
- 2) potato salad _____
- 3) chocolate milk _____
- 4) sugar _____
- 5) iron _____
- 6) blue berry muffin _____
- 7) muddy water _____
- 8) kool-aid _____
- 9) water _____
- 10) sodium _____

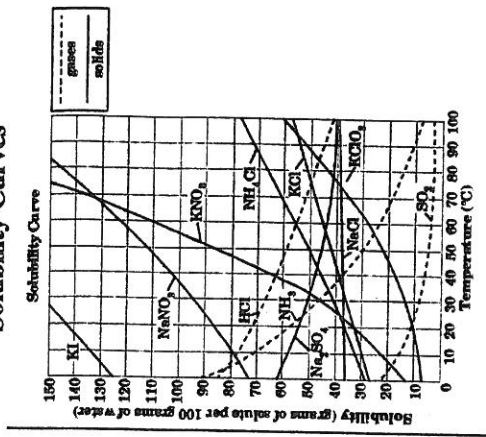
Decide if each of the following is polar or nonpolar. (Hint, you have to do the Lewis dot diagram first!)

- 11) PH_3
- 12) SiO_2
- 13) CH_4
- 14) H_2S
- 15) CFH_3
- 16) HCN

Decide if each of the following would or would not dissolve in water. (Hint: Decide if it's covalent or ionic first!)

- 17) KBr
- 18) CO_2
- 19) AgCl
- 20) CaSO_4
- 21) CH_3Cl
- 22) Na_2CO_3
- 23) NH_3
- 24) SiH_4
- 25) Cu(OH)_2
- 26) LiNO_3

Solubility Curves



1. Which SALT is least soluble in water at 20°C?
2. How many grams of KCl can be dissolved in 200g of water at 80°C?
3. At 40°C, how much KNO₃ can be dissolved in 300g of water?
4. At 30°C, 90g of NaNO₃ is dissolved in 100g of water. Is this solution saturated, unsaturated or super saturated?
5. Which salt is most soluble at 10°C?
6. If a saturated solution of NH₄Cl (at 70°C) is cooled until it is at 50°C. How much would precipitate out of the solution?
7. Which substance shows the least change in solubility from 0°C to 100°C?

Molarity

Solve the following problems using this equation: $\text{molarity} = \frac{\text{(moles of solute)}}{\text{liters of solution}}$

1. What is the molarity of a solution in which 58g of NaCl are dissolved in 1.0L of solution?
2. What is the molarity of a solution in which 10.0g of AgNO₃ is dissolved in 500mL of solution?
3. How many grams of KNO₃ should be used to prepare 2.00L of a 0.500 M solution?

4. To what volume should 5.0 g of KCl be diluted in order to prepare a 0.25 M solution?

5. How many grams of CuSO₄ are needed to prepare 100.0 mL of a 0.10 M solution?

Answers: 1) 1.0 M 2) 0.12 M 3) 101.1 g 4) 0.27 L 5) 1.6 g

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Molarity by Dilution

Solve the following problems using this equation: $M_1V_1 = M_2V_2$ (M is molarity, V is volume)

1. How much concentrated 18 M sulfuric acid is needed to prepare 250 mL of a 6.0 M solution?
2. How much concentrated 12 M hydrochloric acid is needed to prepare 100 mL of a 2.0 M solution?
3. To what volume should 25 mL of 15 M nitric acid be diluted to prepare a 3.0 M solution?

4. To how much water should 50.0 mL of 12 M hydrochloric acid be added to produce a 4.0 M solution?

5. To how much water should 100.0 mL of 18 M sulfuric acid be added to prepare a 1.5 M solution?

Answers: 1) 0.08 L 2) 0.02 L 3) 0.13 L 4) 0.15 L 5) 1.2 L

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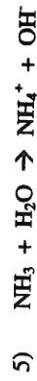
Neutralization Worksheet

A neutralization reaction occurs when an acid and a base react to form a salt and water. For each reaction below, fill in the missing compound. Then balance the reaction.



Bronsted-Lowry Acids and Bases

According to the Bronsted-Lowry theory, an acid is a proton (H^+) donor and a base is a proton acceptor. For each reaction, label the acid, the base, the conjugate acid, and the conjugate base.



pH and pOH

Use the pH equations to fill in the missing parts of the chart:

	[H ⁺]	pH	[OH ⁻]	pOH	Acidic or Basic?
1	10 ⁻⁵ M	5	10 ⁻⁹ M	9	Acidic
2		7			
3			10 ⁻⁴ M		
4	10 ⁻² M				
5				11	
6		12			
7			10 ⁻³ M		
8	10 ⁻¹¹ M				
9				13	
10		6			

1. Calculate the pH of each solution:

- _____ a) 0.01 M HCl
- _____ b) 0.0010 M NaOH
- _____ c) 0.030 M HBr

2. Calculate the pOH of each solution:

- _____ a) 0.150 M KOH
- _____ b) 0.002 M HC₂H₃O₂
- _____ c) 0.004 M NH₄OH

3. Calculate the concentration of [H⁺] in each solution:

- _____ a) pH = 0.3
- _____ b) 0.1 M LiOH
- _____ c) pOH = 4

4. Calculate the concentration of [OH⁻] in each solution:

- _____ a) 10⁻¹⁰ M HF
- _____ b) pOH = 0.52
- _____ c) pH = 2

- Answers: 1) a) pH = 2 2) a) pOH = 0.82 3) a) [H⁺] = 0.5 M 4) a) [OH⁻] = 10⁻⁴ M
 b) pH = 11 b) pOH = 11.3 b) [H⁺] = 10⁻¹³ M b) [OH⁻] = 0.3 M
 c) pH = 1.5 c) pOH = 2.4 c) [H⁺] = 10⁻¹⁰ M c) [OH⁻] = 10⁻¹² M

pH Equations

For each problem, write out the equation (or equations) that you would use to solve for it.

1. You have pH and want pOH.
2. You have $[\text{OH}^-]$ and want pOH.
3. You have $[\text{H}^+]$ and want $[\text{OH}^-]$.
4. You have pH and want $[\text{H}^+]$.
5. You have pOH and want $[\text{H}^+]$.
6. You have $[\text{OH}^-]$ and want pH.
7. You have pOH and want $[\text{OH}^-]$.
8. You have $[\text{H}^+]$ and want pH.

Titration Practice

- 1) A solution of 12 mL of 0.100M NaOH is used to neutralize 20.0 mL of HCl. What is the molarity of HCl?
(Answer: 0.06 M HCl)
 $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$
- 2) A 0.5M $\text{Ca}(\text{OH})_2$ solution was used to titrate an HBr solution of unknown concentration. At the endpoint, 35.0 mL of $\text{Ca}(\text{OH})_2$ solution had neutralized 10.0 mL of HBr. What is the molarity of the HBr solution?
(Answer: 3.5 M HBr)
- 3) What is the molarity of an $\text{Al}(\text{OH})_3$ solution if 50.0 mL of the solution is neutralized by 53.2 mL of a 0.4 M H_2SO_4 solution?
(Ans: 0.3 M $\text{Al}(\text{OH})_3$)
- 4) A 0.6 M $\text{Mg}(\text{OH})_2$ solution was used to titrate an HF solution of unknown concentration. At the endpoint, 48.0 mL of $\text{Mg}(\text{OH})_2$ solution had neutralized 15.0 mL of HF. What is the molarity of the HF solution?
(Ans: 3.8 M HF)
- 5) When 78.2 mL of a 2.1M LiOH solution is added from a buret to 45.0 mL of a phosphoric acid solution that contains phenolphthalein, the solution changes from colorless to pink. What is the molarity of the phosphoric acid?
(Ans: 1.2 M H_3PO_4)

Titration Practice

Name: _____

- 1) A student used a neutralization reaction to find the concentration of HCl. She used 40mL of 1.5 M $\text{Sr}(\text{OH})_2$ and after titrating it, she saw that she had used 30 mL of HCl. What is the concentration of HCl? (Answer: 4.0 M HCl)
- 2) During a titration, a student used 20mL of NaOH. The standard solution was 200mL of 3.0 H_3PO_4 . What is the concentration of NaOH? (Answer: 90 M NaOH)
- 3) 25.0 mL of 0.500M $\text{Ca}(\text{OH})_2$ is used to neutralize 80.0 mL of HF. What is the molarity of HF? (Answer: 0.31 M HF)
- 4) A 0.8M $\text{Al}(\text{OH})_3$ solution was used to titrate an HBr solution of unknown concentration. At the endpoint, 75.0 mL of $\text{Al}(\text{OH})_3$ solution had neutralized 100.0 mL of HBr. What is the molarity of the HBr solution? (Answer: 1.8 M HBr)