

NAME: _____

DATE: _____

Concentration, Acid/Base, Neutralization and pH review packet

$$M = \frac{\text{mol}}{\text{L}}$$

1. How many moles of NaCl are in 725 ml of 0.8 M solution?

$$\text{mol} = M \times \text{L} = 0.8 \text{ M} \times 0.725 \text{ L} = 0.58 \text{ mol}$$

2. How many moles of $\text{Ca}(\text{OH})_2$ are in 125 ml of 2.5 M solution?

$$0.125 \text{ L} \times 2.5 \text{ M} = 0.313 \text{ mol}$$

3. How many moles of MgSO_4 are in 505 ml of 1.42 M solution?

$$0.505 \text{ L} \times 1.42 \text{ M} = 0.717 \text{ mol}$$

4. How many moles of NaHCO_3 are in 1.1 L of 0.7 M solution?

$$1.1 \text{ L} \times 0.7 \text{ M} = 0.77 \text{ mol}$$

5. What concentration would you get in moles per liter if you dissolved 30.6g of salt (NaCl) in 1.5 liters of water?

$$\frac{30.6 \text{ g}}{58.5 \text{ g/mol}} = 0.52 \text{ mol} / 1.5 \text{ L} = 0.35 \text{ M}$$

6. What concentration would you get in moles per liter if you dissolved 2.5g of HCl in 0.25 liters of water?

$$\frac{2.5 \text{ g}}{36.5 \text{ g/mol}} = 0.068 \text{ mol} / 0.25 \text{ L} = 0.27 \text{ M}$$

7. What concentration would you get in moles per liter if you dissolved 12.5g of sodium hydroxide (NaOH) in 0.25 liters of water?

$$\frac{12.5g}{40g/mol} = 0.3125 \text{ mol} / 0.25L = 1.25 \text{ M}$$

8. What concentration would you get in moles per liter if you dissolved 300g of KOH in 2.2 liters of water?

$$\frac{300g}{56.1g/mol} = 5.35 \text{ mol} / 2.2L = 2.43 \text{ M}$$

9. How many moles of dissolved H⁺ are in 1.2 liters of 3.5M hydrochloric acid and water solution?

$$3.5 \text{ M} \times 1.2 \text{ L} = 4.2 \text{ mol H}^+$$

10. How many moles of dissolved H⁺ are in 0.275 liters of 2.25M HNO₃ and water solution?

$$2.25 \text{ M} \times 0.275 \text{ L} = 0.62 \text{ mol H}^+$$

11. How many moles of dissolved OH⁻ are in 0.75 liters of 4M sodium hydroxide (NaOH) and water solution?

$$0.75 \text{ L} \times \frac{4 \text{ mol}}{\text{L}} = 3 \text{ moles}$$

12. How many moles of dissolved OH⁻ are in 1750 milliliters of 0.57M KOH and water solution?

$$1.750 \text{ L} \times \frac{0.57 \text{ mol}}{\text{L}} = 0.998 \text{ moles}$$

mole NaOH →

M_{NaOH} →

13. How many grams of NaOH would neutralize 75 milliliters of 3.5M H₃COOH water if this chemical (acetic acid) only gives off one H⁺?

$$\begin{array}{l} \text{Acid} \\ 0.075 \text{ L} \\ 3.5 \text{ M} \end{array}$$

$$0.075 \text{ L} \times 3.5 \frac{\text{mol}}{\text{L}} = 0.263 \text{ moles} \times 40 \frac{\text{g}}{\text{mol}} = 10.5 \text{ g}$$

14. How many grams of NaOH would neutralize 340 milliliters of 0.725M HNO₃ and water solution?

$$0.340 \text{ L} \times 0.725 \frac{\text{mol}}{\text{L}} = 0.247 \text{ mol} \times 40 \frac{\text{g}}{\text{mol}} = 9.86 \text{ g}$$

15. How many grams of H₂SO₄ (notice 2H⁺) would neutralize 800 milliliters of 2.25M KOH and water solution?

$$0.8 \text{ L} \times 2.25 \frac{\text{mol}}{\text{L base}} = 1.8 \text{ moles} \div 2 = 0.9 \text{ moles H}_2\text{SO}_4$$

$$0.9 \times 98 \frac{\text{g}}{\text{mol}} = \underline{88.2 \text{ g}}$$

16. How many grams of HCl would neutralize 0.725 liters of 3M sodium hydroxide (NaOH) and water solution?

$$0.725 \text{ L} \times 3 \text{ M} = 2.175 \text{ mol NaOH}$$

$$\times 36.5 \frac{\text{g}}{\text{mol HCl}}$$

$$79.39 \text{ g HCl}$$

17. How many milliliters of a 0.2 M solution of NaOH do you need to neutralize 240 milliliters of a .55 M HCl solution?

$$0.24 \text{ L} \times 0.55 \frac{\text{mol}}{\text{L}} = 0.132 \text{ mol} \div 0.2 \frac{\text{mol}}{\text{L}} = 0.66 \text{ L} \\ = 660 \text{ mL}$$

18. How many milliliters of a 0.5 M solution of NaOH do you need to neutralize 750 milliliters of a 2.0 M HI solution?

$$0.75 \text{ L} \times 2.0 \frac{\text{mol}}{\text{L}} \text{ HI} = 1.5 \text{ mol} \div 0.5 \text{ M} = 3 \text{ L} \\ = 3000 \text{ mL}$$

19. What is the pH of a solution with a $[\text{H}^+]$ of 2.7×10^{-3} M?

$$-\log(2.7 \times 10^{-3}) = 2.57$$

20. What is the pH of a solution with a $[\text{H}^+]$ of 3.5×10^{-8} M?

$$-\log(3.5 \times 10^{-8}) = 7.46$$

21. What is the pH of a solution with a $[\text{H}^+]$ of 1.3×10^{-4} M?

$$-\log(1.3 \times 10^{-4}) = 3.89$$

22. What is the pH of a solution with a $[\text{H}^+]$ of 9.2×10^{-2} M?

$$-\log(9.2 \times 10^{-2}) = 1.04$$

23. What is the concentration of a solution with a pH of 0.65?

$$10^{-0.65} = 0.224 \text{ M/L}$$

24. What is the concentration of a solution with a pH of 3.23?

$$10^{-3.23} = 5.89 \times 10^{-4}$$

25. What is the concentration of a solution with a pH of 2.8?

$$10^{-2.8} = 1.58 \times 10^{-3}$$

26. What is the concentration of a solution with a pH of 6.5?

$$10^{-6.5} = 3.16 \times 10^{-7}$$