

MOLAR CONCENTRATION

1. Calculate the volume of 0.100mol/L solution that can be prepared from 3.60mmol of copper(II)sulfate pentahydrate.

$$V = 0.036L \text{ or } \underline{3.6 \times 10^{-2} L}$$

MAKING A STANDARD SOLUTION

2. Describe how to prepare 250mL of a 0.821mol/L solution of sodium hydrogen carbonate.

- $m = 17.2g$.
- 125mL H_2O
- volumetric flask
- 250mL H_2O

DILUTION

3. What volume of 14.8mol/L ammonia is required to prepare 2.0L of a 1.0mol/L solution?

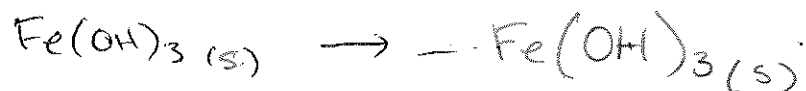
$$\underline{V_1 = 0.14L}$$

4. What is the molar concentration of household ammonia solution if 7.5mL are diluted to 0.250L to make a 0.021mol/L solution?

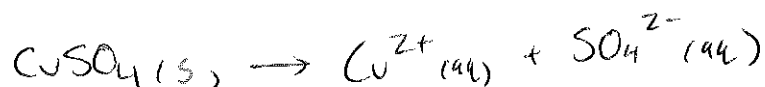
$$\underline{C_1 = 0.70 \text{ mol/L}}$$

DISSOCIATION

5. Write the dissociation equation for: iron(III) hydroxide

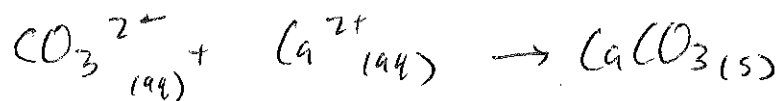


6. Write the dissociation equation for: copper(II) sulphate pentahydrate



NET IONIC EQUATION: Write your non-ionic equation, total ionic equation, and net ionic equation for each reaction.

7. Solutions of sodium carbonate and calcium nitrate are mixed

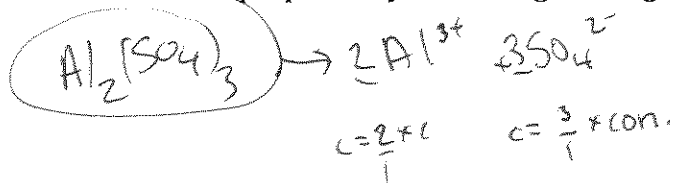


CONCENTRATION OF IONS IN SOLUTION

8. Calculate the ion concentrations in a 2.50 mol/L solution of sodium hydroxide.

$$\begin{array}{l} c_{\text{OH}^-} = 2.50 \text{ mol/L} \\ c_{\text{Na}^+} = 2.50 \text{ mol/L} \end{array}$$

9. Calculate the ion concentrations in a solution prepared by dissolving 7.50 mg of aluminum sulphate in 1.00 L of water.



$$c = 2.19 \times 10^{-5} \text{ mol/L}$$

QUALITATIVE ANALYSIS

10. What solution could you choose in each case to distinguish between each of the pairs of solutions given by using precipitation? Explain your reasoning clearly.

a) aluminum nitrate and potassium nitrate

one option: solution with OH^- in it: NaOH



precipitate forms

b) silver chlorate and sodium chlorate



one option: solution with Cl^- , Br^- or I^-



KCl

DISSOLVING

Salt is dissolved into water. Enter the blanks as either endothermic or exothermic.

11. When bonds are **broken** between sodium and chlorine in a NaCl bond the reaction is:

endothermic

Explain your reasoning: bonds broken require energy.

12. When bonds are **formed** between a sodium ion and a water molecule the reaction is:

exothermic

Explain your reasoning: forming bonds releases energy.

13. Explain the three steps involved with dissolving:

1. break bonds solute

2. break bonds solvent

3. form bonds solute + solvent.

14. Calculating Concentration from Moles and Volume:

What is the concentration of acid when 0.384 moles of hydrobromic acid, $\text{HBr}(\text{aq})$, are dissolved in 350 mL of water?

$$\underline{C_{\text{HBr}} = 1.10 \text{ mol/L}}$$

15. Calculating Concentration from Mass and Volume:

Calculate the concentration of hydrochloric acid, $\text{HCl}(\text{aq})$ if 5.67 g of acid are dissolved in 3.5 L of water.

$$\underline{C_{\text{HCl}} = 4.4 \times 10^{-2} \text{ mol/L}}$$

16. Calculating Concentration from Dilutions:

What is the concentration of perchloric acid, $\text{HClO}_4(\text{aq})$, if 50.0 mL of a 2.00 mol/L solution is used to make 1.50 L of a new solution?

$$\underline{C_{\text{HClO}_4} = 6.67 \times 10^{-2} \text{ mol/L}}$$

17. Calculating Ion Concentrations from Known Acid/Base Concentrations:

What is the concentration of hydronium ions, $\text{H}_3\text{O}^+(\text{aq})$, in a 0.35 mol/L solution of hydroiodic acid?

$$\underline{[\text{H}_3\text{O}^+] = 0.35 \text{ mol/L}}$$

18. Calculation Ion Concentrations from Mixed Question Types:

What is the concentration of hydronium ions, $\text{H}_3\text{O}^+(\text{aq})$, in a solution made by dissolving 4.5 g of gaseous hydrochloric acid, $\text{HCl}(\text{g})$, into 3.0 L of water?

$$\underline{[\text{H}_3\text{O}^+] = 4.1 \times 10^{-2} \text{ mol/L}}$$

19. pH/pOH calculations

A) A 35.0 mL volume of a 0.489 mol/L solution of hydrochloric acid is diluted to a volume of 300 mL.

i. What is the pH of the concentrated solution?

$$\underline{\text{pH} = 0.311}$$

ii. What is the concentration of the diluted solution?

$$\underline{c = 5.70 \times 10^{-2} \text{ mol/L}}$$

iii. What is the pH of the diluted solution?

$$\underline{\text{pH} = 1.244}$$

B) A 20 mL volume of a 3.52×10^{-3} mol/L solution of nitric acid is diluted to a volume of 25 L. What is the pH of the diluted solution?

$$\underline{\text{pH} = 5.55}$$

