

5 • Reactions In Aqueous Solution

PRACTICE TEST

- On the basis of the solubility rules, which of the following is insoluble?
 - K_2O
 - Na_2CO_3
 - PbS
 - $(NH_4)_2SO_4$
 - $Ba(C_2H_3O_2)_2$
- In a double replacement reaction, formation of which of the following does not necessarily lead to a chemical change?
 - $HC_2H_3O_2$
 - $AgCl$
 - CO_2
 - H_2S
 - $NaCl$
- Reaction of an acid with a carbonate (such as $CaCO_3$) always results in the formation of
 - O_2
 - $C_{(diamond)}$
 - CH_4
 - O_3
 - CO_2
- Which of the following is incorrect?
 - all salts containing NH_4^+ are soluble.
 - all salts containing NO_3^- are soluble.
 - all fluorides are soluble.
 - all sulfates (except those of Ca^{2+} , Sr^{2+} , Ba^{2+} , and Pb^{2+}) are soluble.
 - most hydroxides are insoluble, except those of Ca^{2+} , Sr^{2+} , Ba^{2+} , the alkali metals and NH_4^+ .
- One of the gases shown below is NOT usually formed in a double replacement reaction. Which one?
 - N_2
 - CO_2
 - SO_2
 - NH_3
 - H_2S
- Write the balanced molecular equation for the reaction of washing soda, Na_2CO_3 and vinegar, $HC_2H_3O_2$.
- The net ionic equation for the above reaction is:
- How many moles of H^+ are associated with the acid, H_2SO_3 , during neutralization?
 - 0
 - 1
 - 2
 - 3
- How many moles Al_2O_3 are needed to neutralize 1 mole of HCl ?
 - $\frac{1}{3}$
 - $\frac{2}{3}$
 - 2
 - 6
 - 12
 - $\frac{1}{6}$
- Write the net reaction that will occur when solid ammonium carbonate is added to a solution of hydrosulfuric acid.

11. When H_2SO_4 and $\text{Ba}(\text{OH})_2$ are reacted in a double replacement reaction, one of the products of the reaction is...
- a) H_2 d) BaH_2
 b) H_2O e) SO_2
 c) BaS
12. In the double replacement reaction between the weak acid, $\text{HC}_2\text{H}_3\text{O}_2$ and strong base, NaOH , which ion(s) are spectator ions?
- a) Na^+ , $\text{C}_2\text{H}_3\text{O}_2^-$ d) H^+ , $\text{C}_2\text{H}_3\text{O}_2^-$
 b) Na^+ , OH^- e) Na^+ only
 c) OH^- only
13. Which of the following is a base?
- a) KOH d) CH_3OH
 b) $\text{C}_2\text{H}_5\text{OH}$ e) CO_2
 c) Br^-
14. Which of the following is a strong acid?
- a) H_2CO_3 d) HClO_3
 b) HF e) HNO_3
 c) H_3PO_4
15. Which of the following is an acid in aqueous solutions?
- a) H_2CO_3 d) H_2O
 b) Al_2O_3 e) BaO
 c) CH_4
16. SO_2 turns into which acid in solution?
- a) HNO_3 d) H_2S
 b) H_2SO_3 e) HNO_2
 c) H_2SO_4
17. What is the oxidation number of C in CO_3^{2-} ?
- a) +6 d) +1
 b) +4 e) -1
 c) +2
18. What is the oxidation number of Br in KBrO_4 ?
- a) +1 b) -1 c) +5 d) +7 e) +8
19. For each change below, label the change of the underlined element as **Oxidation**, **Reduction**, or **Neither**
- ___ $\underline{\text{Cu}}^{2+} \rightarrow \underline{\text{Cu}}^0$
 ___ $\underline{\text{C}}\text{H}_4 \rightarrow \underline{\text{C}}\text{O}_2$
 ___ $\text{H}_2\underline{\text{O}}_2 \rightarrow \text{H}_2\underline{\text{O}}$
 ___ $\underline{\text{C}}\text{O}_2 \rightarrow \text{H}_2\underline{\text{C}}\text{O}_3$
20. How many milliliters of 0.123 M NaOH solution contain 25.0 g of NaOH (molar mass = 40.00 g/mol)?
- a) 5.08 mL d) 625 mL
 b) 50.8 mL e) 5080 mL
 c) 508 mL
21. If you need 1.00 L of 0.125 M H_2SO_4 , how would you prepare this solution?
- a) Add 950. mL of water to 50.0 mL of 3.00 M H_2SO_4 .
 b) Add 500. mL of water to 500. mL of 0.500 M H_2SO_4 .
 c) Add 750 mL of water to 250 mL of 0.375 M H_2SO_4 .
 d) Dilute 36.0 mL of 1.25 M H_2SO_4 to a volume of 1.00 L.
 e) Dilute 20.8 mL of 6.00 M H_2SO_4 to a volume of 1.00 L.
22. What is the ion concentration in a 0.12 M solution of BaCl_2 ?
- a) $[\text{Ba}^{2+}] = 0.12 \text{ M}$ and $[\text{Cl}^-] = 0.12 \text{ M}$.
 b) $[\text{Ba}^{2+}] = 0.12 \text{ M}$ and $[\text{Cl}^-] = 0.060 \text{ M}$.
 c) $[\text{Ba}^{2+}] = 0.12 \text{ M}$ and $[\text{Cl}^-] = 0.24 \text{ M}$.
 d) $[\text{Ba}^{2+}] = 0.060 \text{ M}$ and $[\text{Cl}^-] = 0.060 \text{ M}$.
 e) $[\text{Ba}^+] = 0.12 \text{ M}$ and $[\text{Cl}_2^-] = 0.12 \text{ M}$.

23. What is the molarity of the solution that results when 60.0 g NaOH is added to enough water to make 500. mL solution?
- a) 1.33 M d) 8.0 M
b) 12.0 M e) 1.50 M
c) 3.00 M
24. What is the molarity of the solution that results when 45.0 g HCl is dissolved in enough water to make 250. mL solution?
- a) 4.94 M d) 1.80 M
b) 4.50 M e) 1.46 M
c) 3.24 M
25. What is the concentration of Cl⁻ ion in 0.60 M AlCl₃ solution?
- a) 1.8 M d) 0.30 M
b) 0.60 M e) 0.10 M
c) 0.20 M
26. How many grams of Na₂CO₃ (molar mass = 106.0 g/mol) are required for complete reaction with 25.0 mL of 0.155 M HNO₃?
- $$\text{Na}_2\text{CO}_3 + 2\text{HNO}_3 \rightarrow 2\text{NaNO}_3 + \text{CO}_2 + \text{H}_2\text{O}$$
- a) 0.122 g d) 20.5 g
b) 0.205 g e) 205 g
c) 0.410 g
27. What volume of 0.150 M NaOH is needed to react completely with 3.45 g iodine according to the equation:
- $$3 \text{I}_2 + 6 \text{NaOH} \rightarrow 5 \text{NaI} + \text{NaIO}_3 + 3 \text{H}_2\text{O}$$
- a) 181 mL d) 2.04 mL
b) 45.3 mL e) 1.02 mL
c) 4.08 mL
28. What is the concentration of an NaOH solution if it takes 16.25 mL of a 0.100 M HCl solution to titrate 25.00 mL of the NaOH solution?
- a) 0.0165 M d) 0.100 M
b) 0.151 M e) 0.413 M
c) 0.0650 M
29. A 4.00 M solution of H₃PO₄ will contain ____g of H₃PO₄ in 0.250 L of solution.
- a) 196 g d) 24.0 g
b) 98.0 g e) 12.0 g
c) 49.0 g