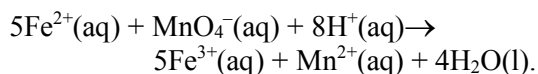


Chapter 4 Multiple Choice Review

- Which of these compounds is a strong electrolyte?
A. H_2O
B. N_2
C. CH_3COOH (acetic acid)
D. $\text{C}_2\text{H}_6\text{O}$ (ethanol)
E. **KOH – only ionic compound listed**
- Which of these compounds is a weak electrolyte?
A. HCl
B. **CH_3COOH (acetic acid) – weak acid**
C. $\text{C}_6\text{H}_{12}\text{O}_6$ (glucose)
D. O_2
E. NaCl
- Identify the major ionic species present in an aqueous solution of Na_2CO_3 .
A. Na_2^+ , CO_3^{2-}
B. Na_2^+ , C^{2-} , O_3
C. Na^+ , C^{4+} , O_3^{2-}
D. Na^+ , C^+ , O^{2-}
E. **Na^+ , CO_3^{2-} – ions in Na_2CO_3**
- The distinguishing characteristic of all electrolyte solutions is that they
A. contain molecules.
B. **conduct electricity. – mobile ions**
C. react with other solutions.
D. always contain acids.
E. conduct heat.
- Based on the solubility rules, which one of these compounds should be insoluble in water?
A. Na_2SO_4
B. **BaSO_4 – Ba^{2+} & SO_4^{2-} form insoluble salt**
C. CuSO_4
D. MgSO_4
E. Rb_2SO_4
- Based on the solubility rules, which one of these compounds should be soluble in water?
A. Hg_2Cl_2
B. **Na_2S – all salts of Na^+ are soluble**
C. Ag_2CO_3
D. Ag_2S
E. BaSO_4
- Which of these choices is the correct net ionic equation for the reaction that occurs when solutions of $\text{Pb}(\text{NO}_3)_2$ and NH_4Cl are mixed?
A. $\text{Pb}(\text{NO}_3)_2(\text{aq}) + 2\text{NH}_4\text{Cl}(\text{aq}) \rightarrow \text{NH}_4\text{NO}_3(\text{aq}) + \text{PbCl}_2(\text{s})$
B. **$\text{Pb}^{2+}(\text{aq}) + 2\text{Cl}^-(\text{aq}) \rightarrow \text{PbCl}_2(\text{s})$**
C. $\text{Pb}^{2+}(\text{aq}) + 2\text{NO}_3^-(\text{aq}) + 2\text{NH}_4^+(\text{aq}) + 2\text{Cl}^-(\text{aq}) \rightarrow 2\text{NH}_4^+(\text{aq}) + 2\text{NO}_3^-(\text{aq}) + \text{PbCl}_2(\text{s})$
D. $\text{NH}_4^+(\text{aq}) + \text{NO}_3^-(\text{aq}) \rightarrow 2\text{NH}_4\text{NO}_3(\text{s})$
E. No reaction occurs.
 NH_4^+ and NO_3^- form soluble compound, so are spectator ions
- What is the chemical formula of the salt produced by the neutralization of hydrobromic acid with magnesium hydroxide?
A. MgBr
B. Mg_2Br_3
C. Mg_3Br_2
D. Mg_2Br
E. **MgBr_2 – $\text{Mg}^{2+} + \text{Br}^-$**
- What is the chemical formula of the salt produced by the neutralization of potassium hydroxide with sulfuric acid?
A. KSO_3
B. $\text{K}_2(\text{SO}_4)_3$
C. **K_2SO_4 – $\text{K}^+ + \text{SO}_4^{2-}$**
D. $\text{K}(\text{SO}_4)_2$
E. KSO_4
- The oxidation number of S in K_2SO_4 is
A. **+6. – K is +1, O is –2, so S must be +6**
B. +4.
C. +2.
D. –1.
E. none of these.
- The highest possible oxidation number of nitrogen is
A. +8.
B. **+5. – N has 5 valence e**
C. +3.
D. +1.
E. –3.
- Which of these equations does not represent an oxidation–reduction reaction?
A. $3\text{Al} + 6\text{HCl} \rightarrow 3\text{H}_2 + 4\text{AlCl}_3$
B. $2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$
C. **$2\text{NaCl} + \text{Pb}(\text{NO}_3)_2 \rightarrow \text{PbCl}_2 + 3\text{NaNO}_3$**
D. $2\text{NaI} + \text{Br}_2 \rightarrow 2\text{NaBr} + \text{I}_2$
E. $\text{Cu}(\text{NO}_3)_2 + \text{Zn} \rightarrow \text{Zn}(\text{NO}_3)_2 + \text{Cu}$
In DR rxn, ions recombine but no change in ox #
- In the chemical reaction
 $5\text{H}_2\text{O}_2 + 2\text{MnO}_4^- + 6\text{H}^+ \rightarrow 2\text{Mn}^{2+} + 8\text{H}_2\text{O} + 5\text{O}_2$,
the species being reduced is
A. H_2O_2 .
B. **MnO_4^- . – Mn goes from +7 to +2**
C. H^+ .
D. Mn^{2+} .
E. O_2 .

14. Identify the species being oxidized in the chemical reaction



A. Fe^{2+} -- Fe goes from +2 to +3

B. MnO_4^{-}

C. H^{+}

D. Mn^{2+}

E. Fe^{3+}

15. Predict the products of the single replacement reaction



A. $\text{Cu}(\text{s}) + \text{FeSO}_4(\text{aq})$

B. $\text{Fe}(\text{s}) + \text{Cu}(\text{s}) + \text{SO}_4(\text{aq})$

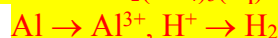
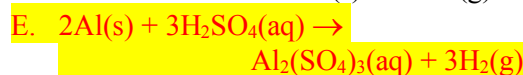
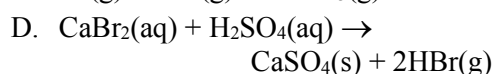
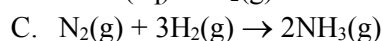
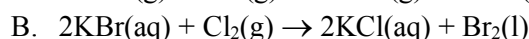
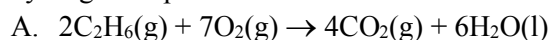
C. $\text{CuS}(\text{s}) + \text{Fe}_2\text{SO}_4(\text{aq})$

D. $\text{FeCuSO}_4(\text{aq})$

E. $\text{FeO}(\text{s}) + \text{CuSO}_3(\text{aq})$

Fe reduces Cu^{2+} to Cu and Cu^{2+} oxidizes Fe to Fe^{2+}

16. Which of these chemical equations describes a hydrogen displacement reaction?



17. 25.0 mL of a 0.2450 M NH_4Cl solution is added to 55.5 mL of 0.1655 M FeCl_3 . What is the concentration of chloride ion in the final solution?

A. 0.607 M

B. 0.419 M – see below

C. 1.35 M

D. 0.190 M

E. 0.276 M

$$\text{mol Cl}^{-}_{\text{NH}_4\text{Cl}} = 25.0 \text{ mL} \times \frac{0.2450 \text{ mol Cl}^{-}}{1000 \text{ mL}} = 6.13 \times 10^{-3} \text{ mol}; \text{mol Cl}^{-}_{\text{FeCl}_3} = 55.5 \text{ mL} \times \frac{3 \times 0.1655 \text{ mol Cl}^{-}}{1000 \text{ mL}} = 2.76 \times 10^{-2} \text{ mol}$$

$$? M_{\text{Cl}^{-}} = \frac{(6.13 \times 10^{-3} + 2.76 \times 10^{-2}) \text{ mol}}{(25.0 + 55.5) \text{ mL}} \times \frac{1000 \text{ mL}}{1 \text{ L}} = 0.419 \text{ M}$$

18. When 50.0 mL of a 0.3000 M AgNO_3 solution is added to 50.0 mL of a solution of MgCl_2 , an AgCl precipitate forms immediately. The precipitate is then filtered from the solution, dried, and weighed. If the recovered AgCl is found to have a mass of 0.1183 g, what was the concentration of magnesium ions in the original MgCl_2 solution?
- A. 0.300 M B. $8.25 \times 10^{-3} \text{ M}$ C. $1.65 \times 10^{-2} \text{ M}$ D. $2.06 \times 10^{-5} \text{ M}$ E. $4.13 \times 10^{-3} \text{ M}$

$$M_{\text{Mg}^{2+}} = 0.1183 \text{ g AgCl} \times \frac{1 \text{ mol AgCl}}{143.32 \text{ g AgCl}} \times \frac{1 \text{ mol MgCl}_2}{2 \text{ mol AgCl}} \times \frac{1 \text{ mol Mg}^{2+}}{1 \text{ mol MgCl}_2} \times \frac{1}{0.0500 \text{ L}} = 8.25 \times 10^{-3} \text{ M}$$

19. One method of determining the concentration of hydrogen peroxide (H_2O_2) in a solution is through titration with iodide ion. The net ionic equation for this reaction is



A 50.00 mL sample of a hydrogen peroxide solution is found to react completely with 37.12 mL of a 0.1500 M KI solution. What is the concentration of hydrogen peroxide in the sample?

A. $5.568 \times 10^{-2} \text{ M}$

B. 0.2227 M

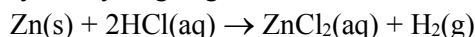
C. 0.1010 M

D. 0.4041 M

E. 0.1114 M

$$M \text{ H}_2\text{O}_2 = 37.12 \text{ mL I}^{-} \times \frac{0.1500 \text{ M I}^{-}}{1000 \text{ mL}} \times \frac{1 \text{ mol H}_2\text{O}_2}{2 \text{ mol I}^{-}} \times \frac{1}{0.05000 \text{ L}} = 5.568 \times 10^{-2} \text{ M}$$

20. Zinc dissolves in hydrochloric acid to yield hydrogen gas:



When a 12.7 g chunk of zinc dissolves in 500. mL of 1.450 M HCl, what is the concentration of hydrogen ions remaining in the final solution?

A. 0.776 M

B. 0.388 M

C. 0.674 M

D. 1.06 M

E. 0 M

$$? \text{ mol H}^{+} \text{ used} = 12.7 \text{ g Zn} \times \frac{1 \text{ mol Zn}}{65.39 \text{ g Zn}} \times \frac{2 \text{ mol H}^{+}}{1 \text{ mol Zn}} = 0.388 \text{ mol H}^{+}$$

$$? \text{ mol H}^{+} \text{ left} = 500. \text{ mL HCl} \times \frac{1.450 \text{ M HCl}}{1000 \text{ mL}} \times \frac{1 \text{ mol H}^{+}}{1 \text{ mol HCl}} - 0.388 \text{ mol H}^{+} = 0.377 \text{ mol H}^{+}$$

$\underbrace{\hspace{10em}}_{0.725 \text{ mol H}^{+}}$

$$? M \text{ H}^{+} = \frac{0.377 \text{ mol H}^{+}}{0.500 \text{ L}} = 0.674 \text{ M}$$