Sample Exam #3

1. In a solution, the solvent
   a. is always a liquid.
   b. can be a liquid or a gas.
   c. can be a solid, liquid, or a gas.
   d. is the substance in the least amount.
   e. is always water.

2. As a strong electrolyte, dissolved Al(NO$_3$)$_3$ exists in solution as
   a. Al(NO$_3$)$_3$(aq)
   b. Al$^{3+}$(aq) + (NO$_3$)$_3^-$(aq)
   c. Al$^{3+}$(aq) + 3 NO$_3^-$(aq)
   d. Al$^{3+}$(aq) + 3 N$^-$(aq) + 9 O$_2^-$(aq)
   e. Al$^{3+}$(aq) + 9 NO$^-$(aq)

3. How many equivalents are present in 2.0g of Ca$^{2+}$?
   a. 4.0eq   b. 0.10eq   c. 0.050eq   d. 2.0eq   e. 0.40eq

4. A solution prepared from 40.0 g of NaCl and 160.0 g of water has a mass/mass percent concentration of
   a. 0.200 %   b. 4.00 %   c. 20.0 %   d. 25.0 %   e. 40.0 %

5. What volume of a 25% (m/v) KCl solution contains 120 g KCl?
   a. 4.8 mL   b. 30. mL   c. 210 mL   d. 480 mL   e. 3000 mL

6. A 2.0 M solution of NaOH will contain how many grams in 0.25 L of solution?
   a. 20. g   b. 40. g   c. 0.50 g   d. 8.0 g   e. 320 g

7. A mixture that settles out upon standing is
   a. a solution.
   b. a colloid.
   c. a suspension.
   d. homogenous.
   e. hydrated.

Consider a 4% starch solution and a 10% starch solution separated by a semipermeable membrane for the next two questions.

8. Which starch solution has the higher osmotic pressure?
   a. 4%
   b. 10%
   c. they both have the same osmotic pressure.
   d. neither exerts an osmotic pressure.
   e. it depends on the atmospheric pressure.
9. What process initially will occur?
   a. water will flow equally in both directions.
   b. water will flow from the 4% solution to the 10% solution.
   c. water will flow from the 10% solution to the 4% solution.
   d. starch will flow from the 4% solution to the 10% solution.
   e. starch will flow from the 10% solution to the 4% solution.

10. In the following reaction, which statement would be true?
    \[
    \text{HCN}_{(aq)} + \text{F}^-_{(aq)} \leftrightarrow \text{HF}_{(aq)} + \text{CN}^-_{(aq)}
    \]
    a. HCN and HF are Bronsted-Lowery acids
    b. F\(^-\) and CN\(^-\) are a conjugate pair of bases
    c. HCN is a base and CN\(^-\) is its conjugate acid
    d. F\(^-\) is a base and HCN is its conjugate acid
    e. HF is a base and CN\(^-\) is its conjugate acid

11. The concentration of \text{OH}^- is 4.8 x 10\(^{-3}\) M. What is the pH?
    a. 2.32  b. 7.00  c. 11.68  d. 3.00  e. 12.00

12. When the following neutralization reaction is balanced, the coefficient of H\(_2\)O will be
    \[
    \text{H}_3\text{PO}_4 + \text{LiOH} \rightarrow \_\_ \text{H}_2\text{O} + \text{Li}_3\text{PO}_4
    \]
    a. 1  b. 2  c. 3  d. 4  e. 6

13. Which of the following could be used to make up a buffer?
    a. NaCl + KCl
    b. HCl + NaCl
    c. HF + H\(_2\)O
    d. H\(_2\)CO\(_3\) + NaHCO\(_3\)
    e. NaHCO\(_3\) + NaCl

14. A 25.0mL sample of H\(_2\)SO\(_4\) requires 46.9mL of 0.215M KOH for complete neutralization. What is the molarity of the acid? The balanced reaction is:
    \[
    \text{H}_2\text{SO}_4 + 2 \text{KOH} \rightarrow 2 \text{H}_2\text{O} + \text{K}_2\text{SO}_4
    \]
    a. 0.215M  b. 0.0101M  c. 0.403M  d. 0.807M  e. 0.202M

15. An alpha particle is
    a. the most penetrating of all types of radiation.
    b. the equivalent to an electron produced from the nucleus.
    c. only dangerous when inhaled or ingested.
    d. the only non-ionizing type of radiation.
    e. the release of pure energy only.

16. The product from the decay of \(^{222}_{86}\text{Rn}\) by an alpha particle is
    a. \(^{220}_{82}\text{Pb}\)  b. \(^{218}_{84}\text{Po}\)  c. \(^{222}_{87}\text{Fr}\)  d. \(^{222}_{86}\text{Rn}\)  e. \(^{222}_{85}\text{At}\)
17. Identify the missing particle in the following nuclear reaction.

\[ {}^{40}_{18} \text{Ar} + {}^{4}_{2} \text{He} \rightarrow {}^{1}_{1} \text{H} + ? \]

a. \( {}^{44}_{20} \text{Ca} \)  
b. \( {}^{43}_{19} \text{K} \)  
c. \( {}^{35}_{15} \text{P} \)  
d. \( {}^{40}_{19} \text{K} \)  
e. \( {}^{43}_{20} \text{Ca} \)

18. The unit that measures the biological damage caused by various kinds of radiation is the

a. Rad    
b. RBE    
c. Rem    
d. Ci    
e. Dose

19. An I-131 source produces a 50. millicurie reading on a Geiger counter. How many beta particles are produced in 1.0 minute? Note: 1000 mCi = 1 Ci and 1 Ci = 3.7 x 10^{10} dis./s.

a. 1.1 x 10^{11} beta particles  
b. 1.9 x 10^{9} beta particles  
c. 1.1 x 10^{14} beta particles  
d. 3.1 x 10^{7} beta particles  
e. 3 beta particles

20. Iodine-131 has a half-life of 8 days. How much of a 100. g sample of \(^{131}\text{I}\) remains after 24 days?

a. 50.0 g  
b. 25.0 g  
c. 12.5 g  
d. 6.25 g  
e. 0.00 g

Answer Key