To get the most out of this Practice Exam, you should work alone and you should not use your textbook or lecture notes.
Feel free to use a periodic table, scrap paper, and a non-programmable calculator.
Time yourself and allow yourself 50 minutes to finish.
When you are done with 50 min, use the answer key on the last page to grade yourself.
Each question is worth 5 points.
If you earn < 73% (less than C) you are not yet ready to pass Exam #3.
If you didn’t finish in 50 minutes, go back and finish.
Use your mistakes to identify the topics/areas on which you need to focus. Be sure to put in plenty of study time and get help as needed.

**Soluble salts include:**
- All Li⁺, Na⁺, K⁺, NH₄⁺, NO₃⁻ and C₂H₃O₂⁻
- All SO₄²⁻ except: Ca²⁺, Sr²⁺, Ba²⁺, Pb²⁺
- All Cl⁻, Br⁻, and I⁻ except: Ag⁺, Pb²⁺, Hg²⁺

**Insoluble salts include:**
- All PO₄³⁻ and CO₃²⁻ except: Li⁺, Na⁺, K⁺, and NH₄⁺
- All OH⁻ and S²⁻ except: Li⁺, Na⁺, K⁺, NH₄⁺, Ca²⁺, Sr²⁺, and Ba²⁺

1) What is the molar mass of lead(IV) sulfate?
   - A) 399.34 g/mol
   - B) 399.3 g/mol
   - C) 399 g/mol
   - D) 390 g/mol
   - E) 400 g/mol
   - F) 4.0 x 10² g/mol

2) Which of the following has the greatest mass percent of N? You should be able to do this problem without using your calculator.
   - A) HNO₂
   - B) NO
   - C) NO₃
   - D) NH₃
   - E) HNO₃
   - F) NO₂

3) Decane (C₁₀H₂₂) is a flammable liquid. Write the balanced combustion reaction for decane using only whole numbers. What is the coefficient in front of the O₂ in the balanced reaction?
   - A) 16.5
   - B) 21
   - C) 10.5
   - D) 8
   - E) 31
   - F) 16

4) What pair of descriptions correctly applies to the reaction: 2 Rb(s) + Br₂(g) → 2 RbBr(s)
   - A) precipitation and synthesis
   - B) combustion and decomposition
   - C) acid-base and decomposition
   - D) redox and synthesis

5) How many atoms are there in a 15.0-g sample of KBr? Note: 1 mol = 6.022 x 10²³
   - A) 1.52 x 10²³
   - B) 9.90 x 10²²
   - C) 3.80 x 10²²
   - D) 2.15 x 10²⁷
   - E) 7.59 x 10²²
   - F) 4.18 x 10²⁵

6) What is the coefficient in front of the N₂ when the following reaction is balanced?
   □ N₂H₄(g) + □ N₂O₄(g) → □ N₂(g) + □ H₂O(g)
   - A) 4
   - B) 2
   - C) 1
   - D) 6
   - E) 5
   - F) 3
7) Write the net ionic equation for the reaction between HNO₃(aq) and NaOH(aq). Note that HNO₃(aq) is a strong acid.
   A) HNO₃(aq) + NaOH(aq) → H₂O(l) + NaNO₃(aq)
   B) H⁺(aq) + NO₃⁻(aq) + Na⁺(aq) + OH⁻(aq) → H₂O(l) + Na⁺(aq) + NO₃⁻(aq)
   C) H⁺(aq) + NO₃⁻(aq) + Na⁺(aq) + OH⁻(aq) → H⁺(aq) + OH⁻(aq) + NaNO₃(s)
   D) H⁺(aq) + OH⁻(aq) → H₂O(l)
   E) H⁺(aq) + NO₃⁻(aq) + Na⁺(aq) + OH⁻(aq) → H₂O(l) + NaNO₃(s)
   F) No reaction: everything is a spectator ion

8) What is the mass of 8.5 mol of Li?
   A) 0.50 g   B) 5.1 x 10²⁴ g   C) 1.2 g
   D) 1.4 x 10⁻²³ g   E) 59 g   F) 82 g

9) Which of the following is not expected to react with HCl(aq) to form a gas?
   A) KHCO₃   B) K₂S   C) K₂CO₃
   D) K₂SO₄   E) K₂SO₃   F) they will all form gas

10) A sample of an unknown compound contains 66.62% C, 7.47% H, and 25.91% N. If the molar mass of the compound is roughly 110 g/mol, what is the molecular formula of this compound?
    A) C₃H₄N   B) C₆H₁₀N₂   C) C₇H₁₄N
    D) C₇H₁₀N   E) C₆H₁₂N₂   F) C₆H₆N₂

11) Which of the following statements is false?
    A) Compounds that are insoluble do not dissolve in water.
    B) All ionic compounds dissolve in water.
    C) A precipitation reaction is when two aqueous solutions mix to form a solid.
    D) A homogeneous mixture has the same composition throughout.
    E) Solubility rules can be used to predict if a compound will dissolve in water.
    F) Making an aqueous solution involves dissolving a substance in water.
    G) Solutions of strong electrolytes can conduct electricity.

12) What is the mass % (to 3 sig figs) of O in Na₂CO₃?
    A) 64.9%   B) 21.6%   C) 15.1%
    D) 45.3%   E) 41.8%   F) 32.4%

13) What is the formula of the solid that is formed when an aqueous solution of zinc bromide is added to an aqueous solution of potassium sulfide?
    A) KBr   B) ZnS   C) KS
    D) Zn₂S   E) ZnBr₂   F) K₂S

14) An aqueous solution of sodium phosphate reacts with an aqueous solution of nickel(II) chloride to produce aqueous sodium chloride and a precipitate of nickel(II) phosphate. What is the coefficient in front of the sodium chloride when this reaction is balanced?
    A) 2   B) 3   C) 5
    D) 6   E) 1   F) 4

15) A solution contains 1.50 g of dissolved Pb²⁺ ions. How many grams of NaI must be added to the solution to completely precipitate all of the dissolved Pb²⁺ as PbI₂?
    A) 2.17 g   B) 0.543 g   C) 3.82 g
    D) 1.09 g   E) 4.15 g   F) 0.981 g
16) Which of the following compounds is not expected to be soluble in water?
   A) \( \text{FeCl}_2 \)  B) \( \text{Co(NO}_3\text{)}_3 \)  C) \( \text{(NH}_4\text{)}_2\text{C}_2\text{O}_4 \)  D) \( \text{PbSO}_4 \)  E) \( \text{Ca(OH)}_2 \)

17) Hydrofluoric acid, HF(aq) is a weak acid. Which of the following drawings best represents the behavior of HF molecules in water?

   A) ![Image of drawing A]
   B) ![Image of drawing B]
   C) ![Image of drawing C]
   D) ![Image of drawing D]

18) A sample of \( \text{Ca(NO}_3\text{)}_2 \) has \( 5.00 \times 10^{23} \) N atoms. How much does the sample weigh?
   A) 273 g  B) 136 g  C) 2.53 \times 10^{-3} \text{ g}
   D) 1.36 \times 10^{48} \text{ g}  E) 66.0 g  F) 68.1 g

19) What pair of descriptions correctly applies to the reaction:
   \[ \text{HClO}_4\text{(aq)} + \text{KOH(aq)} \rightarrow \text{H}_2\text{O(l)} + \text{KClO}_4\text{(aq)} \]
   A) precipitation and synthesis  B) combustion and displacement
   C) acid-base and double displacement  D) redox and decomposition

20) An electric current can be used to break water into its constituent elements according to the following balanced reaction. Which statement about this reaction is false?
   \[ 2 \text{H}_2\text{O(l)} \rightarrow 2 \text{H}_2\text{(g)} + \text{O}_2\text{(g)} \]
   A) All of the products that are produced are gases.
   B) Writing “2 H\text{H}_2\text{O}” is different than writing “H\text{H}_4\text{O}_2”
   C) The total number of O atoms is the same before and after the reaction
   D) 2 molecules of products can be produced from every 2 water molecules.
   E) This reaction is balanced.

Answers:

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