1. A scientist obtains the number 0.045006700 on a calculator. If this number actually has four (4) significant figures, how should it be written?
A) 0.4567
B) 0.4501
C) 0.045
D) 0.04500
E) 0.04501

2. Using the rules of significant figures, calculate the following:

\[ \frac{6.167 + 8.1}{5.10 - 0.17} \]
A) 17.1
B) 18
C) 17
D) 98
E) 17.09

3. In 1928, 34.0 g of a new element was isolated from 660 kg of the ore molybdenite. The percent by mass of this element in the ore was:
A) 52%
B) 6.6%
C) 34.0%
D) 5.2e-3%
E) 22.4%

4. A 20.0 mL sample of glycerol has a mass of 25.2 grams. What is the mass of a 67-mL sample of glycerol?
A) 7.5 g
B) 53 g
C) 3.4e4 g
D) 84 g
E) 84.4 g
5. The beakers shown below have different precisions as shown.

Suppose you pour the water from these three beakers into one container. What would be the volume in the container reported to the correct number of significant figures?

A) 78.817 mL
B) 78.82 mL
C) 78.8 mL
D) 90 mL
E) 79 mL

6. Which of the following pairs of compounds can be used to illustrate the law of multiple proportions?

A) NH₄ and NH₄Cl
B) ZnO₂ and ZnCl₂
C) H₂O and HCl
D) NO and NO₂
E) CH₄ and CO₂

7. Which of the following atomic symbols is incorrect?

A) \(^{14}\)C
B) \(^{37}\)Cl
C) \(^{32}\)P
D) \(^{29}\)K
E) \(^{15}\)N

8. Which of the following are incorrectly paired?

A) K, alkali metal
B) Ba, alkaline earth metal
C) O, halogen
D) Ne, noble gas
E) Ni, transition metal
9. Write the names of the following compounds:
   a) FeSO₄  Iron(II)Sulfate
   b) NaC₂H₃O₂  Sodium Acetate
   c) KNO₂  Potassium Nitrite
   d) Ca(OH)₂  Calcium Hydroxide
   e) NiCO₃  Nickel Carbonate

10. Write the chemical formulas for the following compounds or ions.
    a) nitrate ion  NO₃⁻
    b) aluminum oxide  Al₂O₃
    c) ammonium ion  NH₄⁺
    d) perchloric acid  ClO₄⁻
    e) copper(II) bromide  CuBr₂

11. Which metals form cations with varying positive charges?
    A) transition metals
    B) Group 1 metals
    C) Group 2 metals
    D) Group 3 metals
    E) metalloids

12. All of the following are in aqueous solution. Which is incorrectly named?
    A) H₃C₆H₅O₂, acetic acid
    B) HBr, bromic acid
    C) H₂SO₃, sulfurous acid
    D) HNO₂, nitrous acid
    E) HClO₃, chloric acid

13. Bromine exists naturally as a mixture of bromine-79 and bromine-81 isotopes. An atom of bromine-79 contains
    A) 35 protons, 44 neutrons, 35 electrons.
    B) 34 protons and 35 electrons, only.
    C) 44 protons, 44 electrons, and 35 neutrons.
    D) 35 protons, 79 neutrons, and 35 electrons.
    E) 79 protons, 79 electrons, and 35 neutrons.

14. Gallium consists of two isotopes of masses 68.95 amu and 70.95 amu with abundances of 60.16% and 39.84%, respectively. What is the average atomic mass of gallium?
    A) 69.95
    B) 70.15
    C) 71.95
    D) 69.75
    E) 69.55
15. How many moles of hydrogen sulfide are contained in a 78.7-g sample of this gas?

\[
\text{mol H}_2\text{S} = \frac{78.7 \text{ g H}_2\text{S}}{34.081 \text{ g mol}^{-1}} = 2.31 \text{ mol}
\]

16. If all of the chloride in a 4.755-g sample of an unknown metal chloride is precipitated as \( \text{AgCl} \) with 70.90 mL of 0.2010 M \( \text{AgNO}_3 \), what is the percentage of chloride in the sample?

\[
\text{AgCl} \quad \text{mole} \quad \text{mL} \quad \text{molarity} \quad \text{calculation}
\]
\[
\frac{4.755 \text{ g AgCl}}{\text{mole AgCl}} = \frac{70.90 \text{ mL}}{1.000 \text{ L}} = \frac{0.2010 \text{ M}}{\text{molarity AgNO}_3}
\]
\[
\text{calculation} = \frac{4.755 \text{ g AgCl} \times \text{mole AgCl}}{2.325 \text{ g AgCl}} = 2.010 \text{ mole AgNO}_3
\]

17. A hydrocarbon (a compound consisting solely of carbon and hydrogen) is found to be 85.6% carbon by mass. What is the empirical formula for this compound?

\[
\frac{85.6}{12.01} = 7.12 \quad \text{mol C}
\]
\[
\frac{14.4}{1.009} = 14.29 \quad \text{mol H}
\]

18. The empirical formula of styrene is \( \text{CH} \); its molar mass is 104.1. What is the molecular formula of styrene?

\[
\frac{85.6}{12.01} = 7.12 \quad \text{mol C}
\]
\[
\frac{14.4}{1.009} = 14.29 \quad \text{mol H}
\]

19. Determine the coefficient for \( \text{O}_2 \) when the following equation is balanced in standard form (smallest whole number integers)

\[
\text{C}_4\text{H}_8(\text{g}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{g})
\]

\[
\frac{4 \text{ C}_4\text{H}_8}{13 \text{ O}_2} = \frac{8 \text{ C}_4\text{H}_8}{26 \text{ O}_2}
\]

E) 20
20. A 23.3-g sample of HF is dissolved in water to give $2.0 \times 10^2$ mL of solution. The concentration of the solution is:

A) 1.16 M  
B) 0.23 M  
C) 0.12 M  
D) 5.8 M  
E) 11.7 M

\[
\text{M} = \frac{\text{mol}}{L} = \frac{23.3 \text{ g HF}}{1 \text{ mol}} = \frac{1 \text{ mol}}{20.008 \text{ g}} = \frac{1.16 \text{ mol}}{1000} = 5.8 \text{ M}
\]

21. Which of the following aqueous solutions contains the greatest number of ions?

A) 400.0 mL of 0.10 M NaCl
B) 300.0 mL of 0.10 M CaCl₂
C) 200.0 mL of 0.10 M FeCl₃
D) 200.0 mL of 0.10 M KBr
E) 800.0 mL of 0.10 M sucrose

22. Which of the following is a strong acid?

A) HF
B) KOH
C) HClO₄
D) HClO
E) HBrO

23. Aqueous solutions of sodium sulfide and copper(II) chloride are mixed together. Which statement is correct?

A) Both NaCl and CuS precipitate from solution.
B) No precipitate forms.
C) CuS will precipitate from solution.
D) NaCl will precipitate from solution.
E) No reaction will occur.

24. Which of the following ions is most likely to form an insoluble sulfate?

A) K⁺  
B) Li⁺  
C) Ca²⁺  
D) S²⁻  
E) Cl⁻

25. Equal masses (in grams) of hydrogen gas and oxygen gas are reacted to form water. Which substance is limiting?

A) Oxygen gas is limiting.
B) Hydrogen gas is limiting.
C) Water is limiting.
D) Nothing is limiting.
E) More information is needed to answer this question.
26. 1.00 mL of a $3.50 \times 10^{-4}$ M solution of oleic acid is diluted with 9.00 mL of petroleum ether, forming solution A. 2.00 mL of solution A is diluted with 8.00 mL of petroleum ether, forming solution B. How many grams of oleic acid are in 5.00 mL of solution B? (molar mass for oleic acid = 282 g/mol)

A) $4.94 \times 10^{-4}$ g  
B) $7.00 \times 10^{-4}$ g  
C) $4.94 \times 10^{-5}$ g  
D) $1.97 \times 10^{-5}$ g  
E) $9.87 \times 10^{-6}$ g