1. A 3.00 L bottle has a mass of 1.13 kg. When filled with a liquid its mass increases to 3.38 kg. What is the density of the liquid in g/mL?

(a) 75.0 (b) 0.000750 (c) 1.99 (d) 0.666 (e) 0.750

\[ \text{density} = \frac{3.38 - 1.13}{3.00} = 0.750 \]

2. Consider the fictitious element, lubine (Lb). It forms four oxoanions: \( \text{LbO}_2^-, \text{LbO}_3^-, \text{LbO}_4^-, \text{LbO}_5^- \). From your knowledge of naming compounds containing oxoanions, what would be the name for NaLbO_2? 

(a) sodium perlubate (b) sodium lubate (c) sodium lubite (d) sodium hypolubite

3. In the compound \( \text{Cu}_2(\text{OH})_2\text{CO}_3 \), which element is present in the largest percent by mass?

(a) C (b) H (c) O (d) Cu

2 Cu atoms have a larger mass than any of the other atoms in the compound so Cu will have the largest percent by mass.

4. Which statement is incorrect?

(a) \(^{18}\text{O}\) has the same number of protons and neutrons 8 p, 10 n, 8 e
(b) \(^{41}\text{K}\) has the same number of protons and electrons 19 p, 22 n, 19 e
(c) \(^{60}\text{Zn}\) has the same number of protons and neutrons 30 p, 30 n, 30 e
(d) \(^{238}\text{U}\) contains 146 neutrons 92 p, 146 n, 92 e
(e) \(^{50}\text{Mn}\) has the same number of electrons and neutrons 25 p, 25 n, 25 e

5. The following diagram shows A (closed circles) reacting with B (open circles). Which equation best describes the stoichiometry of the reaction depicted in the diagram?

(a) \(3 \text{A}_2 + 3 \text{B}_2 \rightarrow 6 \text{AB}\) 
(b) \(3 \text{A}_2 + 6 \text{B} \rightarrow 6 \text{AB}\) 
(c) \(2 \text{A} + \text{B}_2 \rightarrow 2 \text{AB}\) 
(d) \(2 \text{A} + \text{B} \rightarrow \text{AB}\)

6. In the following reaction, how many moles of the non-limiting reactant are in excess if 3.50 mol Al are combined with 3.20 mol HCl?

\[ \text{Al (s)} + 3 \text{HCl (aq)} \rightarrow \text{AlCl}_3 (s) + \frac{3}{2} \text{H}_2 (g) \]
(a) 0.300 mol
(b) 2.03 mol
(c) 2.43 mol
(d) 2.70 mol
(e) 2.97 mol

7. When the following equation is balanced, what is the mole ratio of H₂O to Be₃N₂?

\[ \text{Be}_3\text{N}_2 + 6 \text{H}_2\text{O} \rightarrow 3 \text{Be(OH)}_2 + 2 \text{NH}_3 \]

(a) 1 : 3  (b) 6 : 1  (c) 3 : 1  (d) 3 : 2  (e) 2 : 3

8. Which of the following has the greatest number of atoms?

(a) 20 g potassium \( \quad 3.1 \times 10^{23} \) atoms
(b) 22.6 g KMnO₄ \( \quad 5.2 \times 10^{23} \) atoms
(c) 8.5 mL H₂O (density = 1.00 g/mL) \( \quad 8.5 \times 10^{23} \) atoms
(d) 0.60 mol H₂ \( \quad 7.2 \times 10^{23} \) atoms
(e) 1.0 mol He \( \quad 6.0 \times 10^{23} \) atoms

9. What is the formula for a compound containing fluorine and potassium?

(a) K₃F₃  (b) K₂F₃  (c) KF₂  (d) K₂F₂  (e) KF

10. Mr. Marek has done a number of demonstrations in our class. One of these demos involved the combustion of what metal that burns with a bright white flame, is used in flares and caused a fire in a Chicago warehouse because a worker tried to dry the wet metal with a blowtorch?

(a) Mg  (b) Au  (c) Fe  (d) Al

Questions 11 – 12 refer to the following unbalanced equation:

\[ \text{CS}_2 + 3\text{Cl}_2 \rightarrow \text{CCl}_4 + \text{S}_2\text{Cl}_2 \]

\( \text{76.143 g/mol} \quad 70.906 \text{ g/mol} \quad 153.823 \text{ g/mol} \quad 135.038 \text{ g/mol} \)

11. What mass of S₂Cl₂ can be produced from the reaction of 0.0600 mol CS₂ and 0.140 mol Cl₂?

(a) 6.30 g  (b) 8.10 g  (c) 9.45 g  (d) 16.2 g  (e) 56.7 g

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(0.0600 mol CS₂) \left( \frac{1 \text{ mol } S₂Cl₂}{1 \text{ mol } CS₂} \right) = 0.0600 \text{ mol } S₂Cl₂

(0.140 mol Cl₂) \left( \frac{1 \text{ mol } S₂Cl₂}{3 \text{ mol } Cl₂} \right) = 0.0467 \text{ mol } S₂Cl₂

Cl₂ is limiting reactant

mass of S₂Cl₂ that can be produced = (0.0467 mol) \left( \frac{135.0385 \text{ g}}{1 \text{ mol}} \right) = 6.30 \text{ g } S₂Cl₂

12. What is the actual yield of the reaction if the percentage yield is 78% and the theoretical yield is calculated to be 6.35 g?

(a) 4.95 g  (b) 5.0 g  (c) 8.1 g  (d) 8.14 g  (e) 8.3 g

78\% = \frac{\text{actual yield}}{6.35 \text{ g}} \times 100\%

actual yield = 5.0 g

13. How many significant figures should there be in the answer to the following?

(3.15 \times 1.06) + (21 \times 1.773) = 

(a) 5  (b) 2  (c) 1  (d) 3  (d) 4

14. Balance the following word equation, then answer the question that follows.

Sodium carbonate reacts with calcium nitrate to form sodium nitrate and calcium carbonate.

Na₂CO₃ + Ca(NO₃)₂ → 2 NaNO₃ + CaCO₃

The coefficient of the sodium nitrate in the balanced equation is

(a) 4  (b) 3  (c) 2  (d) 1

15. Lab 3 involved a number of reactions with copper-containing compounds. These reactions were (1) copper(II) nitrate plus sodium hydroxide to give copper(II) hydroxide, (2) copper(II) hydroxide plus sulfuric acid to give copper(II) sulfate, (3) copper(II) sulfate plus sodium phosphate to give copper(II) phosphate, (4) copper(II) phosphate plus hydrochloric acid to give copper(II) chloride and (5) copper(II) chloride plus magnesium metal to give copper metal. In step 3 you added phosphate ion in the reaction sequence. Where did this phosphate ion end up?

(a) it reacted to form phosphite ion

(b) it evaporated

(c) it was weighed with the copper in the end

(d) it remained in the solution that was removed after step 4