1. How many protons, electrons, and neutrons are in an atom of the isotope 63Cu?

2. Write the chemical formula for the compound formed from Cr3+ and SO42- ions.

3. Name the following compounds: PbO Li2SO3 Cl2O7

4. The atomic masses of the two stable isotopes of boron are 10B (19.78% abundance and mass = 10.0129 amu) and 11B (80.22% abundance and mass = 11.0093 amu). Calculate the average atomic mass of boron.

5. How many moles of magnesium (Mg) are there in 87.3 g of Mg?

6. Calculate the number of atoms in 0.551 g of potassium (K).
7. What is the molar mass of sucrose (C12H22O11)?

8. Calculate the moles of chloroform (CHCl3) in 198 g of chloroform.

9. Calculate the percentage mass composition of each element in ammonia (NH3).

10. A compound containing boron and hydrogen contains 6.444 g of boron and 1.803 g of hydrogen. The molar mass of the compound is about 28 g/mol. What is (a) the empirical formula of the compound and (b) the molecular formula of the compound?

11. Write and balance the following equation using the smallest whole numbers possible: Solid iron (Fe) reacts with oxygen gas (O2) to form solid iron (III) oxide (Fe2O3).

12. Consider the following chemical reaction: 2CH3OH + 3O2 → 2CO2 + 4H2O
If 4.5 mol of methanol (CH3OH) react with excess oxygen (O2) how many moles of water (H2O) are produced?

13. Consider the following chemical reaction: 2NO + O2 → 2NO2
If 1.25 moles of nitric oxide (NO) react with 0.55 moles of oxygen (O2) how many moles of NO2 are produced?
14. Consider the following chemical reaction: \(3\text{H}_2 + \text{N}_2 \rightarrow 2\text{NH}_3\)
If 3.30 mol of H\(_2\) react with excess nitrogen (N\(_2\)) how many grams of ammonia (NH\(_3\)) should be produced? Suppose the actual amount of nitrogen produced is 21.50 g. Calculate the reaction yield.

15. Write in your bluebook the compound(s) that is/are soluble in water (more than one compound may be soluble).
CuS Ca(OH)\(_2\) Zn(NO\(_3\))\(_2\) Ag\(_2\)SO\(_4\) CaCO\(_3\)

16. Write the ionic equation and the net ionic equation for the reaction shown:
\[\text{Al(NO}_3\text{)}_3(\text{aq}) + 3\text{NaOH (aq)} \rightarrow \text{Al(OH)}_3(\text{s}) + 3\text{NaNO}_3(\text{aq})\]

17. Complete the (a) balanced molecular, (b) ionic, and (c) net ionic equations for the following acid-base reaction:
Incomplete Molecular Equation: HBr (aq) + LiOH (aq) →

18. Assign an oxidation number to each element in PF\(_3\) and in MnO\(_4\)\(^{−}\).

19. What is the molarity of a 1.18 L ethanol (C\(_2\)H\(_6\)O) solution containing 1.77 g of ethanol?

20. A 5.00 M stock solution of NaOH is diluted to 0.500 M with a volume of 250.0 mL. What volume of stock solution is needed?
**EXAM 1 REFERENCE MATERIALS**

**SOLUBILITY RULES**

1. Salts containing Group I elements are soluble (Li+, Na+, K+, Cs+, Rb+). Exceptions to this rule are rare. Salts containing the ammonium ion (NH4+) are also soluble.

2. Salts containing nitrate ion (NO3-) are generally soluble.

3. Salts containing Cl–, Br–, I– are generally soluble. Important exceptions to this rule are halide salts of Ag+, Pb2+, and (Hg2)2+.

4. Most silver salts are insoluble. AgNO3 and Ag(C2H3O2) are common soluble salts of silver; virtually anything else is insoluble.

5. Most sulfate salts are soluble. Important exceptions to this rule include BaSO4, PbSO4, Ag2SO4 and SrSO4.

6. Most hydroxide salts are only slightly soluble. Hydroxide salts of Group II elements (Ca, Sr, and Ba) are slightly soluble.

7. Most sulfides of transition metals are highly insoluble.

8. Carbonates are frequently insoluble.

9. Chromates are frequently insoluble.

10. Phosphates are frequently insoluble.

11. Fluorides are frequently insoluble.

<table>
<thead>
<tr>
<th><strong>POLYATOMIC IONS</strong></th>
<th>NO2-</th>
<th>ammonium</th>
<th>NH4+</th>
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<tbody>
<tr>
<td>nitrite</td>
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<tr>
<td>nitrate</td>
<td>NO3-</td>
<td>hydronium</td>
<td>H3O+</td>
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<td>perchlorate</td>
<td>ClO4-</td>
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<td>hydrogen carbonate</td>
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<td>mercury (I)</td>
<td>Hg22+</td>
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