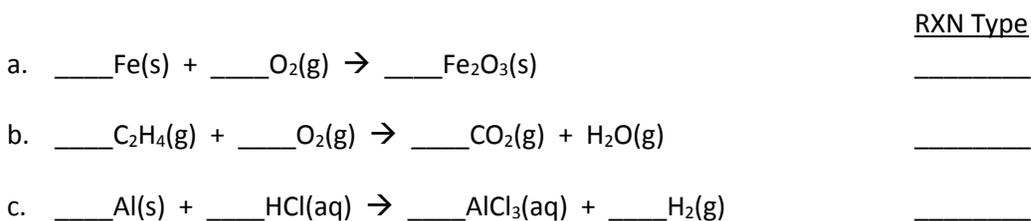


Unit 1 Test Review

1. Balance the following equations by providing the missing coefficients and identify the type of reaction.



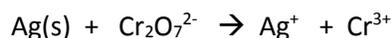
2. Calculate the percentage of nitrogen, by mass, in $\text{Ca(NO}_3)_2$.
3. How many oxygen atoms are in 0.25 mol $\text{Ca(NO}_3)_2$?
4. How many oxygen atoms are in 1.50 grams of sodium carbonate?
5. How many moles of sodium bicarbonate (NaHCO_3) are in 508 g of NaHCO_3 ?
6. How many nitric acid molecules are in 4.20 g of HNO_3 ?
7. A compound contains 37.51% C, 3.15% H, and 59.34% F by mass. The compound has a molar mass of 96.052 g/mol.
- Determine the empirical formula of the compound.
 - Determine the molecular formula of the compound.
8. Caproic acid, which is responsible for the foul odor of dirty socks, is composed of C, H, and O atoms. Combustion of a 0.225 g sample of this compound produces 0.512 g CO_2 and 0.209 g H_2O .
- What is the empirical formula of caproic acid?
 - Caproic acid has a molar mass of 116 g/mol. What is its molecular formula?
9. Zinc metal reacts with hydrochloric acid to produce hydrogen gas and zinc chloride.
- Write the balanced equation for this reaction.
 - Identify the type of reaction.
 - If 5.00 g of zinc and 5.00 g of hydrochloric acid are mixed and allowed to react, which is the limiting reactant?
 - What is the theoretical yield in grams of hydrogen gas?
 - How much grams of excess reactant remain?
10. Imagine that you are working on ways to improve the process by which iron ore containing Fe_2O_3 is converted into iron. In your tests you carry out the following reaction on a small scale:
- $$\text{Fe}_2\text{O}_3\text{(s)} + 3\text{CO(g)} \rightarrow 2\text{Fe(s)} + 3\text{CO}_2\text{(g)}$$
- If you start with 150 g of Fe_2O_3 as the limiting reagent, what is the theoretical yield of Fe?
 - If the actual yield of Fe in your test was 87.9 g, what was the percent yield?
 - What was the percent error?

11. A student is to determine the formula of a hydrate of ZnSO_4 . He heats the hydrate in a crucible driving off all the water in the hydrate. His results are recorded in the data table below.

Mass of Empty Crucible	15.013 g
Mass of Hydrate and Crucible	17.580 g
Mass of Anhydrous Salt and Crucible	16.454 g

- Determine the mass of the hydrate before heating.
 - Determine the mass of water in the hydrate.
 - Determine the percent composition of water in the hydrate.
 - Determine the formula and name of the hydrate.
12. How many grams of HClO_4 are in 3.00L of a 5.00 M HClO_4 solution?
13. What mass of FeCl_2 is needed to make 2.00 L of a 0.500 M FeCl_2 solution?
14. What volume of a 3.00 M HCl solution is needed to make 50.0 mL of a 1.00 M HCl solution?
15. Solubility:
- Which cations are always soluble?
 - Which anions are always soluble?
 - Which cations make chlorides, bromides, and iodides insoluble?
16. Acids and Bases
- List the formulas and names of the six strong acids.
 - List the formulas and names of the eight strong bases.
17. What volume of a 0.400 M hydrobromic acid solution is needed to react completely with 20.0 mL of a 0.100 M calcium hydroxide solution?
18. What mass of precipitate is made when 20.0 mL of a 1.00 M potassium chloride solution is mixed with 40.0 mL of a 2.00 M lead (II) nitrate solution?
19. Write net ionic equations for the following:
- Hydrochloric acid and sodium hydroxide
 - Hydrobromic acid and ammonia
 - Hydroiodic acid and sodium carbonate
 - Calcium nitrate and sodium carbonate
 - Silver nitrate and hydroiodic acid
 - Hydrofluoric acid and barium hydroxide

20. What is the concentration of iodide ions in a 0.60 M of cobalt (III) iodide?
21. How many moles of iodide ions are there in 125 mL of 0.40 M of calcium iodide?
22. Balance the following skeletal redox reaction in acidic solution and then answer the questions that follows:



- a. What species is being oxidized? Reduced?
- b. What volume of a 0.200 M sodium dichromate solution is needed to react completely with 10.0 g of silver solid?
23. What are the oxidation numbers for each element in K_3PO_4 ?
24. Identify each as a strong electrolyte, weak electrolyte, or nonelectrolyte.
- | | |
|-------------------|---------------------------------|
| a. KNO_3 | d. LiOH |
| b. HBr | e. SO_2 |
| c. CH_4 | f. $(\text{NH}_4)_2\text{SO}_4$ |
25. Which solution will have the highest concentration of nitrate ion?
- | | |
|----------------------------|-----------------------------|
| a. 4.0 M potassium nitrate | c. 1.0 M iron (III) nitrate |
| b. 1.5 M tin (IV) nitrate | d. 2.0 M calcium nitrate |
26. The permanganate ion (MnO_4^-) produces a purple color in solution. Which solution below will absorb the most light in a colorimeter?
- | |
|--------------------------------------|
| a. 1.0 M KMnO_4 |
| b. 1.0 M $\text{Zn}(\text{MnO}_4)_2$ |
| c. 1.5 M LiMnO_4 |
| d. 1.5 M NaMnO_4 |
27. Know how to reduce a molecular formula to an empirical formula.
28. Know the polyatomic ions.
29. Know how to name and write formulas of ionic compounds, molecular compounds, and acids.
30. Know how to determine the number of protons and electrons in a given atom or ion.
31. Know how to determine the charge of an ion using the periodic table.
32. Know the location of the alkali metals, alkaline earth metals, transition metals, halogens, and noble gases on the periodic table.
33. Know the charge of the Zn ion, Cd ion, and Ag ion.
34. Review significant figures.