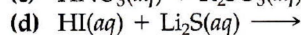
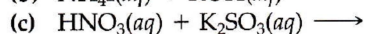
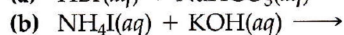
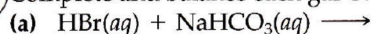
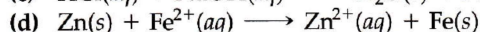
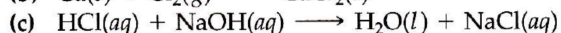
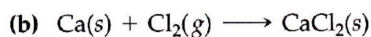
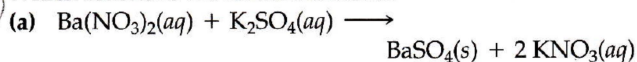


10. Explain what happens to an ionic substance when it dissolves in water.
11. Do polyatomic ions dissociate when they dissolve in water, or do they remain intact?
15. Is the precipitate in a precipitation reaction always a compound that is soluble or insoluble? Explain.
17. What is an acid–base reaction? List an example and identify the acid and the base.
21. What is a combustion reaction? Give an example.
23. Explain the difference between a synthesis reaction and a decomposition reaction and provide an example of each.
24. Explain the difference between a single-displacement reaction and a double-displacement reaction and provide an example of each.
25. Which observation is consistent with a chemical reaction occurring? Why?
- Solid copper deposits on a piece of aluminum foil when the foil is placed in a blue copper nitrate solution. The blue color of the solution fades.
 - Liquid ethyl alcohol turns into a solid when placed in a low-temperature freezer.
 - A white precipitate forms when solutions of barium nitrate and sodium sulfate are mixed.
 - A mixture of sugar and water bubbles when yeasts are added. After several days, the sugar is gone and ethyl alcohol is found in the water.
31. For each chemical equation (which may or may not be balanced), list the number of each type of atom on each side of the equation, and determine if the equation is balanced.
- $\text{Pb}(\text{NO}_3)_2(\text{aq}) + 2 \text{NaCl}(\text{aq}) \longrightarrow \text{PbCl}_2(\text{s}) + 2 \text{NaNO}_3(\text{aq})$
 - $\text{C}_3\text{H}_8(\text{g}) + \text{O}_2(\text{g}) \longrightarrow 3 \text{CO}_2(\text{g}) + 4 \text{H}_2\text{O}(\text{g})$
35. Write a balanced chemical equation for each chemical reaction.
- Solid lead(II) sulfide reacts with aqueous hydrochloric acid to form solid lead(II) chloride and dihydrogen sulfide gas.
 - Gaseous carbon monoxide reacts with hydrogen gas to form gaseous methane (CH_4) and liquid water.
 - Solid iron(III) oxide reacts with hydrogen gas to form solid iron and liquid water.
 - Gaseous ammonia (NH_3) reacts with gaseous oxygen to form gaseous nitrogen monoxide and gaseous water.
38. Write a balanced chemical equation for each chemical reaction.
- Gaseous acetylene (C_2H_2) reacts with oxygen gas to form gaseous carbon dioxide and gaseous water.
 - Chlorine gas reacts with aqueous potassium iodide to form solid iodine and aqueous potassium chloride.
 - Solid lithium oxide reacts with liquid water to form aqueous lithium hydroxide.
 - Gaseous carbon monoxide reacts with oxygen gas to form carbon dioxide gas.
49. Balance each chemical equation.
- $\text{Na}_2\text{S}(\text{aq}) + \text{Cu}(\text{NO}_3)_2(\text{aq}) \longrightarrow \text{NaNO}_3(\text{aq}) + \text{CuS}(\text{s})$
 - $\text{HCl}(\text{aq}) + \text{O}_2(\text{g}) \longrightarrow \text{H}_2\text{O}(\text{l}) + \text{Cl}_2(\text{g})$
 - $\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \longrightarrow \text{H}_2\text{O}(\text{l})$
 - $\text{FeS}(\text{s}) + \text{HCl}(\text{aq}) \longrightarrow \text{FeCl}_2(\text{aq}) + \text{H}_2\text{S}(\text{g})$
51. Balance each chemical equation.
- $\text{BaO}_2(\text{s}) + \text{H}_2\text{SO}_4(\text{aq}) \longrightarrow \text{BaSO}_4(\text{s}) + \text{H}_2\text{O}_2(\text{aq})$
 - $\text{Co}(\text{NO}_3)_3(\text{aq}) + (\text{NH}_4)_2\text{S}(\text{aq}) \longrightarrow \text{Co}_2\text{S}_3(\text{s}) + \text{NH}_4\text{NO}_3(\text{aq})$
 - $\text{Li}_2\text{O}(\text{s}) + \text{H}_2\text{O}(\text{l}) \longrightarrow \text{LiOH}(\text{aq})$
 - $\text{Hg}_2(\text{C}_2\text{H}_3\text{O}_2)_2(\text{aq}) + \text{KCl}(\text{aq}) \longrightarrow \text{Hg}_2\text{Cl}_2(\text{s}) + \text{KC}_2\text{H}_3\text{O}_2(\text{aq})$
59. Is each compound soluble or insoluble? For the soluble compounds, identify the ions present in solution.
- $\text{NaC}_2\text{H}_3\text{O}_2$
 - $\text{Sn}(\text{NO}_3)_2$
 - AgI
 - $\text{Na}_3(\text{PO}_4)$
61. Pair each cation on the left with an anion on the right that will form an *insoluble* compound with it and write a formula for the insoluble compound. Use each anion only once.
- | | |
|------------------|--------------------|
| Ag^+ | SO_4^{2-} |
| Ba^{2+} | Cl^- |
| Cu^{2+} | CO_3^{2-} |
| Fe^{3+} | S^{2-} |
65. Complete and balance each equation. If no reaction occurs, write *NO REACTION*.
- $\text{KI}(\text{aq}) + \text{BaS}(\text{aq}) \longrightarrow$
 - $\text{K}_2\text{SO}_4(\text{aq}) + \text{BaBr}_2(\text{aq}) \longrightarrow$
 - $\text{NaCl}(\text{aq}) + \text{Hg}_2(\text{C}_2\text{H}_3\text{O}_2)_2(\text{aq}) \longrightarrow$
 - $\text{NaC}_2\text{H}_3\text{O}_2(\text{aq}) + \text{Pb}(\text{NO}_3)_2(\text{aq}) \longrightarrow$
67. Write a molecular equation for the precipitation reaction that occurs (if any) when each pair of solutions is mixed. If no reaction occurs, write *NO REACTION*.
- sodium carbonate and lead(II) nitrate
 - potassium sulfate and lead(II) acetate
 - copper(II) nitrate and barium sulfide
 - calcium nitrate and sodium iodide
71. Identify the spectator ions in the complete ionic equation.
- $$2 \text{K}^+(\text{aq}) + \text{S}^{2-}(\text{aq}) + \text{Pb}^{2+}(\text{aq}) + 2 \text{NO}_3^-(\text{aq}) \longrightarrow \text{PbS}(\text{s}) + 2 \text{K}^+(\text{aq}) + 2 \text{NO}_3^-(\text{aq})$$
73. Write balanced complete ionic and net ionic equations for each reaction.
- $\text{AgNO}_3(\text{aq}) + \text{KCl}(\text{aq}) \longrightarrow \text{AgCl}(\text{s}) + \text{KNO}_3(\text{aq})$
 - $\text{CaS}(\text{aq}) + \text{CuCl}_2(\text{aq}) \longrightarrow \text{CuS}(\text{s}) + \text{CaCl}_2(\text{aq})$
 - $\text{NaOH}(\text{aq}) + \text{HNO}_3(\text{aq}) \longrightarrow \text{H}_2\text{O}(\text{l}) + \text{NaNO}_3(\text{aq})$
 - $2 \text{K}_3\text{PO}_4(\text{aq}) + 3 \text{NiCl}_2(\text{aq}) \longrightarrow \text{Ni}_3(\text{PO}_4)_2(\text{s}) + 6 \text{KCl}(\text{aq})$
81. Complete and balance each acid–base reaction.
- $\text{HCl}(\text{aq}) + \text{Ba}(\text{OH})_2(\text{aq}) \longrightarrow$
 - $\text{H}_2\text{SO}_4(\text{aq}) + \text{KOH}(\text{aq}) \longrightarrow$
 - $\text{HClO}_4(\text{aq}) + \text{NaOH}(\text{aq}) \longrightarrow$

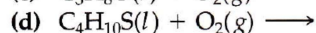
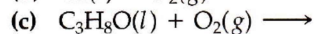
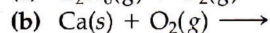
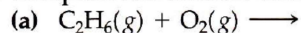
83.) Complete and balance each gas evolution reaction.



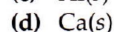
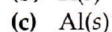
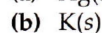
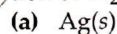
85.) Which reactions are redox reactions?



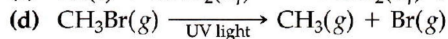
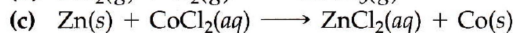
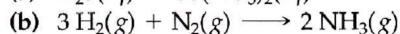
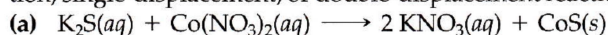
87.) Complete and balance each combustion reaction.



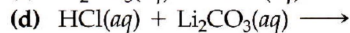
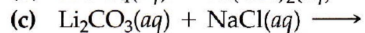
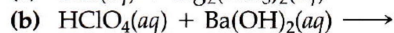
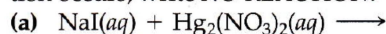
89.) Write a balanced chemical equation for the synthesis reaction of $\text{Br}_2(g)$ with each metal.



91.) Classify each chemical reaction as a synthesis, decomposition, single-displacement, or double-displacement reaction.



95.) Predict the products of each reaction and write balanced complete ionic and net ionic equations for each. If no reaction occurs, write *NO REACTION*.



105.) What solution can you add to each cation mixture to precipitate one cation while keeping the other cation in solution? Write a net ionic equation for the precipitation reaction that occurs.

