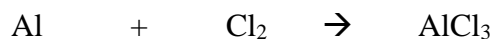


- **BASIC REACTION TYPES**

SYNTHESIS

Two reactants produce one product

Examples:

**DECOMPOSITION**

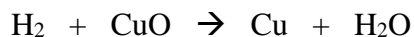
One reactant produces two products

Examples

**SINGLE DISPLACEMENT**

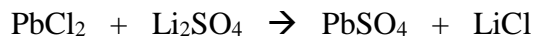
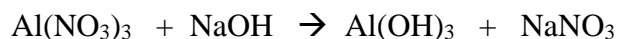
One element and one compound producing a different element and compound

Examples

**DOUBLE DISPLACEMENT**

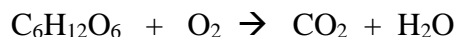
Two compounds producing two different compounds

Examples:

**COMBUSTION**

A hydrocarbon reacts with oxygen to produce carbon dioxide and water

Examples:

**REDOX**

Reactions in which electrons are transferred (ox. # changes)

OTHER HINTS:

Remember solubility rules!

Metals react with water –

Produce a base and hydrogen gas

Nonmetals react with water –

Produce an acids and hydrogen gas

Metals reacting with oxygen (burned in air) -

produces a metal oxide

If you see elements reacting with ions –

think redox

If you see transition metals –

think redox

manganese – think redox

MnO_4^- to Mn^{2+}

Mn^{4+} to Mn^{2+}

chromium – think redox

$\text{Cr}_2\text{O}_7^{2-}$ to Cr^{3+}

Combustion (burned in air) -

produces carbon dioxide and water

A metal oxide with carbon dioxide-

Carbonate

A single reactant –

Must be decomposed

A metal carbonate heated –

Metal oxide and carbon dioxide

A metal oxide with water-

Base

Two uncombined elements-

Synthesis

Acid with base –

Salt and water

Acid with metal-

Salt and hydrogen|

Acid with carbonate –

Salt, carbon dioxide and water

PRACTICE PROBLEMS

Write **balanced**, net ionic equations and answer the questions for the following, noting that;

- None are "no reaction"
- Write the **balanced**, net ionic equation, i.e. show significantly ionized species as separate ions and cancel out spectators
- Do **NOT** include state symbols

1. A solution containing iodide ions is added to a solution containing iron(III) ions.



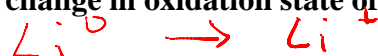
Which halogen is the best oxidizing agent? Explain.

Fluorine since it accepts electrons most readily

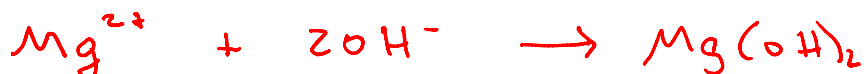
2. Lithium metal is burned in air.



What is the change in oxidation state of the Li?



3. A solution of calcium hydroxide is added to a solution of magnesium chloride.



What are the spectator ions in this reaction?



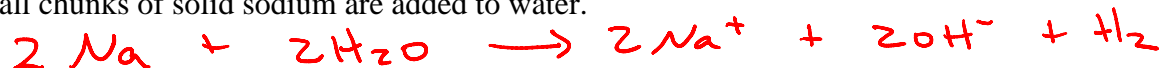
4. Propane is burned completely in air.



Which homologous series (family) of organic compounds does propane belong to?

alkanes

5. Small chunks of solid sodium are added to water.



What might one observe in this reaction?

sodium floats
bubbles
gas may ignite

6. Calcium metal is added to a dilute solution of hydrochloric acid.



Describe a simple laboratory test for the gas produced in this reaction?

squeaky pop noise with a lighted splint

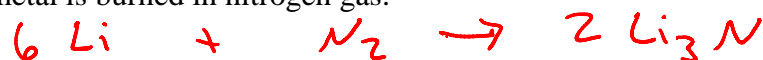
7. A solution containing chloride ions is added to a solution containing iron(III) ions.



Why is Fe^{3+} generally considered to be more stable than Fe^{2+} ?

Fe^{3+} has a half filled d orbital with no paired electrons

8. Lithium metal is burned in nitrogen gas.



What type of bonding would be expected in the product?

ionic bonding
metal and non-metal

9. Solutions of sodium sulfate and barium chloride are mixed.



What are the spectator ions in the reaction?

Na^+ and Cl^-

10. A solution of sodium iodide is added to a solution containing lead(II) ions.



What might you expect to observe in this reaction?

a yellow ppt

11. Zinc pellets are added to dilute sulfuric acid.



Name another reactant that could be added to zinc in order to produce the same gas?

any acid

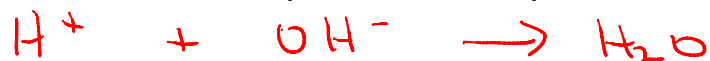
12. Small chunks of solid potassium are added to water.



If Cesium were used instead of potassium, what difference would be observed? Explain.

more vigorous reaction since Cs is more reactive

13. Equal volumes of 1M sodium hydroxide and 1M hydrochloric acid are mixed.



What type of reaction is this?

neutralization

Acid / Base

double displacement

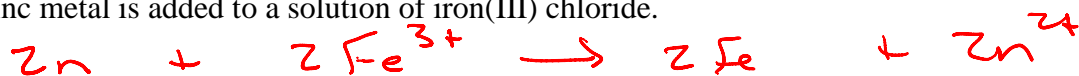
14. Solid ammonium carbonate is heated.



Describe how one of the products can act as a Lewis Base?

NH_3 and H_2O have lone pairs of electrons to donate

15. Zinc metal is added to a solution of iron(III) chloride.



Describe the color change that one might expect to observe.

yellow/brown Fe^{3+} to green Fe^{2+}

16. Chlorine gas is bubbled into a solution of potassium iodide.



Which reactant is the oxidizing agent?

Cl_2 gains electrons

17. Zinc metal is heated in air.



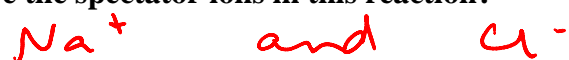
Write a half equation to show the change in oxygen in this reaction?



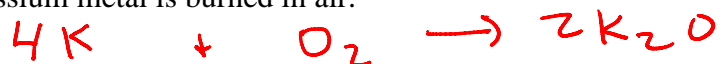
18. A solution of sodium hydroxide reacts with a solution of hydrochloric acid.



What are the spectator ions in this reaction?



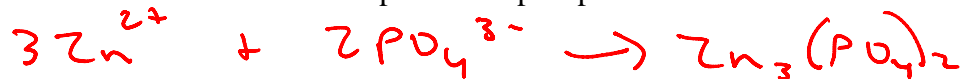
19. Potassium metal is burned in air.



Which species is oxidized in the reaction?



20. Solutions of zinc chloride and potassium phosphate are mixed.



If a flame test were conducted on the result solution, what might one expect to observe?

purple/lilac from K^+

21. Magnesium metal is heated strongly in a stream of nitrogen gas.



What is the final oxidation state of N?

-3

22. Sodium metal is heated in a stream of chlorine gas.



What type of reaction is this?

Redox / synthesis / combination

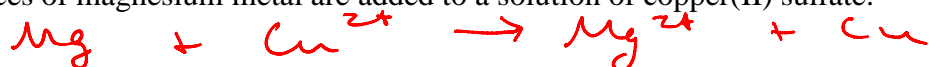
23. Solid magnesium carbonate is heated strongly.



What type of reaction is this?

decomposition

24. Pieces of magnesium metal are added to a solution of copper(II) sulfate.



What color change might one expect to observe?

blue to colorless

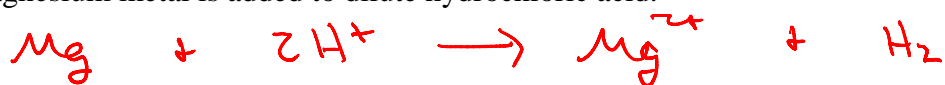
25. Iron(III) ions are reduced by chloride ions.



Is this a REDOX reaction?

yes, iron is reduced
chlorine is oxidized

26. Magnesium metal is added to dilute hydrochloric acid.



What might one expect to observe?

bubbles of gas
disappearance of Mg

27. Cesium metal is burned in air.



If the product of this reaction were to be dissolved in water, what would the pH be, acidic or basic? Explain

basic
metal oxides + water \rightarrow base

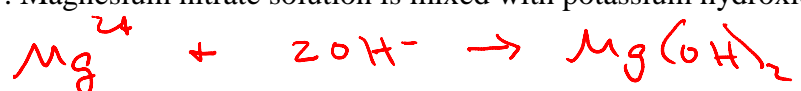
28. Aluminum metal is added to a solution of copper(II) nitrate.



What color change might one observe?

solution will lose blue color
"copper" colored ppt will form

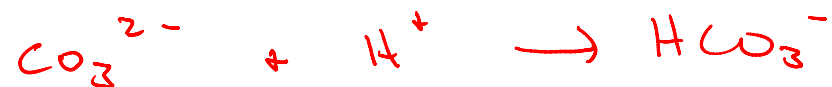
29. Magnesium nitrate solution is mixed with potassium hydroxide solution.



What might one observe?

Formation of ppt

30. Equal volumes of dilute, equimolar solutions of sodium carbonate and hydrochloric acid are mixed.



What does the term equimolar mean?

Same molarity