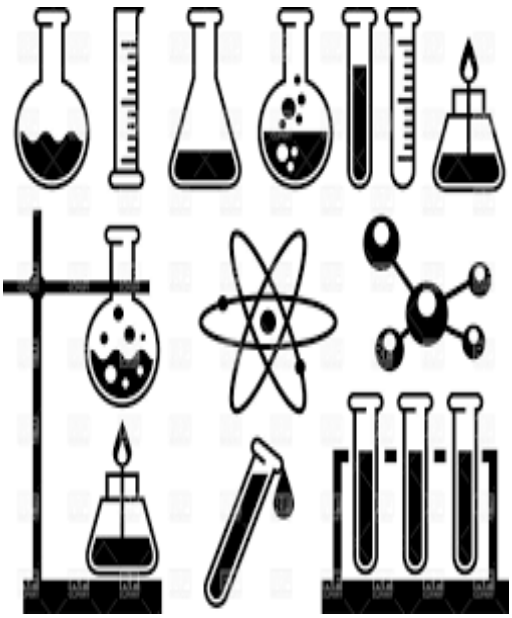
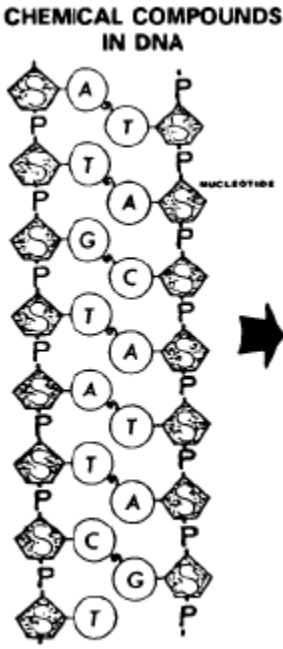
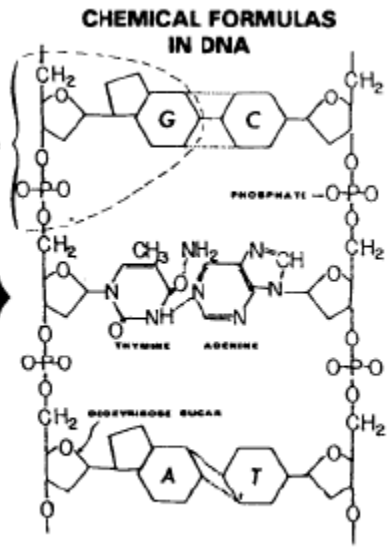
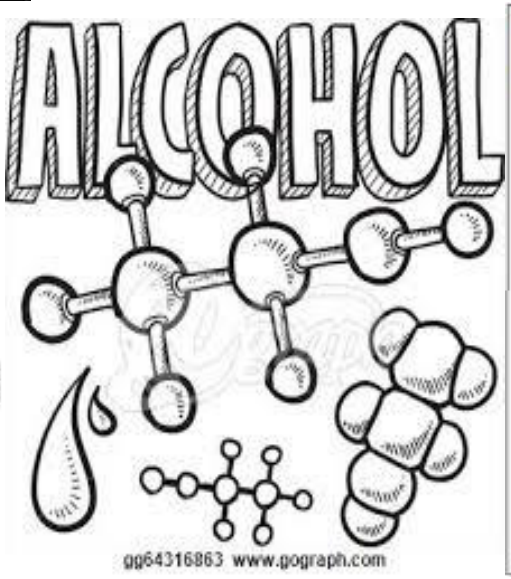
Name: _____ Section: _____

Chemical Reactions





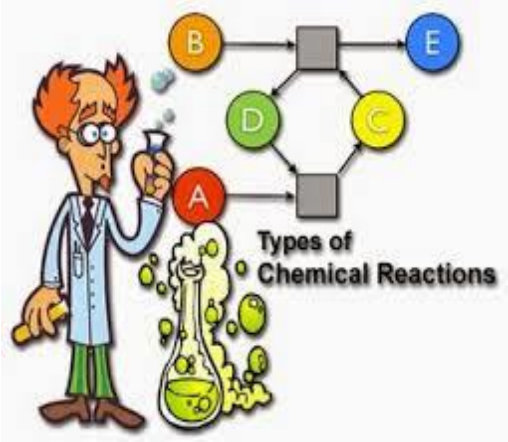




Chapter 21

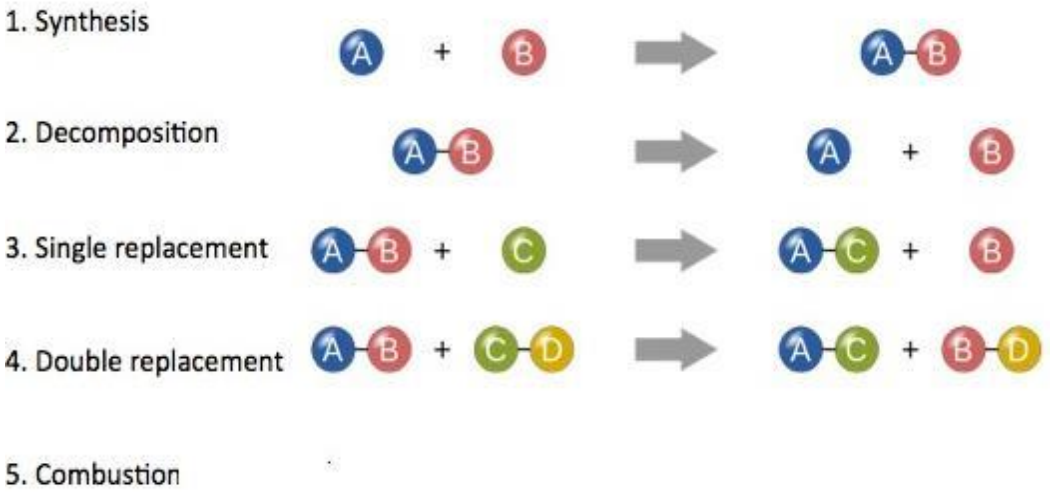
Chapter 21– Chemical Reactions Vocabulary Words

1. Balanced Chemical Reactions	
2. Catalyst	
3. Chemical Equation	
4. Chemical Reaction	
5. Coefficient	
6. Combustion Reaction	
7. Decomposition Reaction	
8. Double-Displacement Reaction	
9. Endergonic Reaction	
10. Endothermic Reaction	
11. Synthesis Reaction	
12. Oxidation	
13. Precipitate	
14. Product	
15. Reactant	
16. Reduction	
17. Single-displacement Reaction	



5 Types of Chemical Reactions

1. **Synthesis Reaction:** Two or more elements/compounds combine to form a more complex product
   Example: Synthesis Reaction - A + B ----> AB
2. **Decomposition Reaction:** One chemical species breaks down to simpler elements/compounds.
   Example: Decomposition Reaction - AB ----> A + B
3. **Single Replacement Reaction:** An uncombined element replaces a less reactive element in a compound, creating a new compound and a single element.
   Example: Single Replacement Reaction - A + BC ----> B + AC
4. **Double Replacement Reaction:** Involves two ionic compounds (in solution) that trade cations, creating two new compounds.
   Example: Double Replacement Reaction - AB + CD ----> AD + CB
5. **Combustion Reaction:** A hydrocarbon (or other organic molecule) burning in oxygen, producing carbon dioxide and water.
   Example: Combustion Reaction - $CH_4 + 2O_2$ $CO_2 + 2H_2O$ + energy



CHEMICAL REACTIONS

Name _____ # _____
Date _____ Hour _____ Chemistry

Types of Rxns 2

Five Types of Chemical Reaction Worksheet

Balance the following reactions and indicate which of the five types of chemical reaction are being represented:

1) _____ NaBr + _____ $Ca(OH)_2$ → ___ $CaBr_2$ + _____ NaOH

Type of reaction: _____

2) _____ NH_3+ _____ H_2SO_4 → _____ $(NH_4)_2SO_4$

Type of reaction: _____

3) _____ C_5H_9O + _____ O_2 → _____ CO_2 + _____ H_2O

Type of reaction: _____

4) _____ Pb + _____ H_3PO_4 → _____ H_2 + _____ $Pb_3(PO_4)_2$

Type of reaction: _____

5) _____ Li_3N + _____ NH_4NO_3 → ___ $LiNO_3$ + ___ $(NH_4)_3N$

Type of reaction: _____

6) _____ HBr + ___ $Al(OH)_3$ → ___ H_2O + ___ $AlBr_3$

Type of reaction: _____

7) _____ $CaCO_3$ → ___ CaO + ___ CO_2

Type of reaction: _____

8) What's the main difference between a double replacement reaction and an acid-base reaction?

9) Combustion reactions always result in the formation of water. What other types of chemical reaction may result in the formation of water? Write examples of these reactions on the opposite side of this paper.

Five Types of Chemical Reaction Worksheet

Section 1: *Balance the following reactions and indicate which of the six types of chemical reaction are being represented:*

1. ____ $NaBr$ + ____ $Ca(OH)_2$ → ___ $CaBr_2$ + ____ $NaOH$ Type of reaction: _____
2. ____ NH_3+ ____ H_2SO_4 → ____ $(NH_4)_2SO_4$ Type of reaction: _____
3. ____ C_5H_9O + ____ O_2 → ____ CO_2 + ____ H_2O Type of reaction: _____
4. ____ Pb + ____ H_3PO_4 → ____ H_2 + ____ $Pb_3(PO_4)_2$ Type of reaction: _____
5. ____ Li_3N + ____ NH_4NO_3 → ___ $LiNO_3$ + ___ $(NH_4)_3N$ Type of reaction: _____
6. ____ HBr + ___ $Al(OH)_3$ → ___ H_2O + ___ $AlBr_3$ Type of reaction: _____
7. ____ N_2 + ____ H_2 → ____ NH_3 Type of reaction: _____
8. ____ $KClO_3$ → ____ KCl + ____ O_2 Type of reaction: _____
9. ____ $NaCl$ + ____ F_2 → ____ NaF + ____ Cl_2 Type of reaction: _____
10. ____ H_2 + ____ O_2 → ____ H_2O Type of reaction: _____
11. ____ $Pb(OH)_2$ + ____ HCl → ____ H_2O + ____ $PbCl_2$ Type of reaction: _____
12. ____ $AlBr_3$ + ____ K_2SO_4 → ____ KBr + ____ $Al_2(SO_4)_3$ Type of reaction: _____
13. ____ CH_4 + ____ O_2 → ____ CO_2 + ____ H_2O Type of reaction: _____
14. ____ C_3H_8 + ____ O_2 → ____ CO_2 + ____ H_2O Type of reaction: _____
15. ____ C_8H_{18} + ____ O_2 → ____ CO_2 + ____ H_2O Type of reaction: _____

Five Types of Chemical Reaction Worksheet

16. ____ $FeCl_3$ + ____ NaOH → ____ $Fe(OH)_3$ + ____NaCl Type of reaction: _____

17. ____ P + ____O_2 → ____P_2O_5 Type of reaction: _____

18. ____ Na + ____ H_2O → ____ NaOH + ____H_2 Type of reaction: _____

19. ____ Ag_2O → ____ Ag + ____O_2 Type of reaction: _____

20. ____ S_8 + ____O_2 → ____ SO_3 Type of reaction: _____

21. ____ CO_2 + ____ H_2O → ____ $C_6H_{12}O_6$ + ____O_2 Type of reaction: _____

22. ____ K + ____ MgBr → ____ KBr + ____ Mg Type of reaction: _____

23. ____ HCl + ____ $CaCO_3$ → ____ $CaCl_2$ + ____H_2O + ____ CO_2 Type of reaction: _____

24. ____ HNO_3 + ____ $NaHCO_3$ → ____ $NaNO_3$ + ____ H_2O + ____ CO_2 Type of reaction: _____

25. ____ H_2O + ____ O_2 → ____ H_2O_2 Type of reaction: _____

26. ____ NaBr + ____ CaF_2 → ____ NaF + ____ $CaBr_2$ Type of reaction: _____

27. ____ H_2SO_4 + ____ $NaNO_2$ → ____ HNO_2 + ____ Na_2SO_4 Type of reaction: _____

28. What's the main difference between a double displacement reaction and an acid-base reaction?

29. Combustion reactions always result in the formation of water. What other types of chemical reaction may result in the formation of water? Write examples of these reactions.

Types of Reactions

Directions: **Balance** each equation & **identify** the Reactions type:

S= synthesis D= Decomposition SR= Single Replacement DR= Double Replacement

_____ 1) ___ Fe + ____ O_2 → ____ Fe_2O_3

_____ 2) ___ Cl_2 + ____ KBr → ____ KCl + ____ Br_2

_____ 3) ____ Fe + ____ $Cu(NO_3)_2$ → ____ $Fe(NO_3)_3$ + ____ Cu

_____ 4) ____ NaCl → ____ Na + ____ Cl_2

_____ 5) ____ $FeCl_3$ + ____ KOH → ____ KCl + ____ $Fe(OH)_3$

_____ 6) ____ $KClO_3$ + *heat* → ____ KCl + ____ O_2

_____ 7) ____ Al + ____ O_2 → ____ Al_2O_3

_____ 8) ____ Na_2S + ____ $AgNO_3$ → ____ Ag_2S + ____ $NaNO_3$

_____ 9) ____ $CaCO_3$ + *heat* → ____ CaO + ____ CO_2

_____ 10) ____ Mg + ____ HCl → ____ $MgCl_2$ + ____ H_2 + *heat*

_____ 11) ____ $Mg(OH)_2$ + ____ HCl → ____ $MgCl_2$ + ____ H_2O + *heat*

_____ 12) ____ Na_2SO_4 + _____ $BaCl_2$ → _____ $BaSO_4$ + _____ NaCl

_____ 13) _____ CaI_2 + _____ F_2 → ____ CaF_2 + ____ I_2

_____ 14) _____ NaOH → ____ Na_2O + ____ H_2O

_____ 15) _____ $ZnBr_2$ + ____ $AgNO_3$ → ____ $Zn(NO_3)_2$ + ____ AgBr

_____ 16) _____ K + ____ Br_2 → _____ KBr

_____ 17) _____ $NaHCO_3$ + *heat* → ____ Na_2CO_3 + ____ H_2O + ____ CO_2

_____ 18) ____ $AgNO_3$ + ____ Cu → ____ Ag + ____ $Cu(NO_3)_2$

_____ 19) _____ $CuSO_4$ + _____ NaOH → ____ $Cu(OH)_2$ + _____ Na_2SO_4

_____ 20) _____ $Ca(ClO_3)_2$ + *heat* → _____ $CaCl_2$ + _____ O_2

21) Which reactions above have a GAS, like **CO_2 or O_2 or H_2**, as a product? _____

22) Some decomposition reactions require HEAT in order to occur. Which of the reactions above requires heat in order for the reaction to proceed? _____

23) What do we call it when heat is "taken in" or absorbed as a reaction occurs? _____

24) Many of the <u>double replacement</u> reactions above produce a ***precipitate***. What is a precipitate?

_____

25) Compounds that usually form precipitates have **$(OH)^-$, Ag^+, or $(SO4)^{-2}$** in them. Identify the number of <u>5 reactions</u> above that are double replacement AND form a precipitate with these ions.

_____

26) What do we call the numbers that are used to balance a chemical equation? _____

27) Reaction #11 above is performed in a test tube and the tube becomes hot as the reaction progresses. What kind of reaction gives off heat? _____ Name another similar reaction. ____

Reaction type	Explanation	General formula
Combination	Two or more compounds combine to form one compound.	$A + B \rightarrow AB$
Decomposition	The opposite of a combination reaction – a complex molecule breaks down to make simpler ones.	$AB \rightarrow A + B$
Precipitation	Two solutions of soluble salts are mixed, resulting in an insoluble solid (precipitate) forming.	A + soluble salt B → precipitate + soluble salt C
Neutralisation	An acid and a base reaction with each other. Generally, the product of this reaction is a salt and water.	acid + salt → salt + water
Combustion	Oxygen combines with a compound to form carbon dioxide and water. These reactions are exothermic, meaning they give off heat.	$A + O_2 \rightarrow H_2O + CO_2$
Displacement	One element trades places with another element in the compound.	$A + BC \rightarrow AC + B$

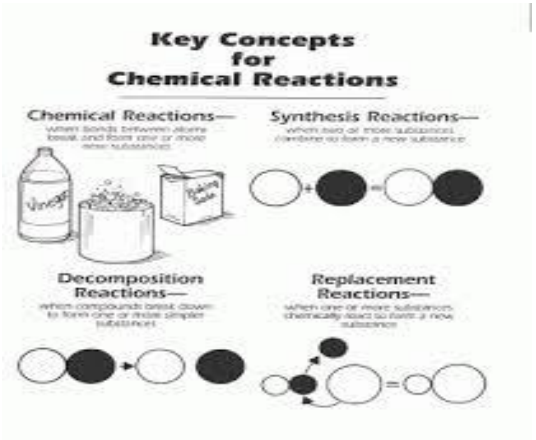
5 Types of Chemical Equations

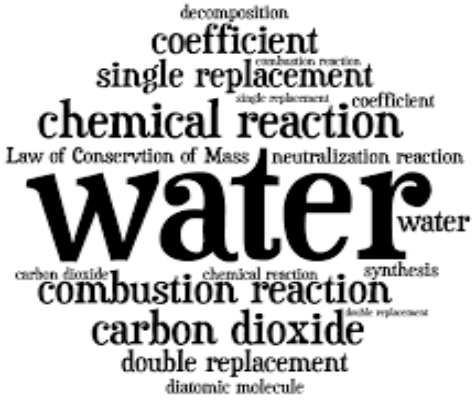
Chemical Equations

A + B → AB		ABC→ AB + C	M+XY → MY+X	AB + CD → AD + CB Positive element goes 1st	$C_xH_y + O_2 \rightarrow CO_2 + H_2O$

Chemical Equations

Synthesis	Decomposition	Single Replacement	Double Replacement	Combustion
A + B → AB	ABC→ AB + C	M+XY → MY+X	AB + CD → AD + CB Positive element goes 1st	$C_xH_y + O_2 \rightarrow CO_2 + H_2O$
Ex: $2Fe(s)+3O_{2(g)} \rightarrow Fe_2O_{3(s)}$	Ex: $2H_2O_{2(aq)} \rightarrow 2H_2O(l) + O_{2(g)}$	Ex: $Zn(s)+HCl(aq) \rightarrow ZnCl_{2(aq)}+H_{2(g)}$	Ex: $Pb(NO_3)_{2(aq)}+KI(aq) \rightarrow PbI_{2(s)}+KNO_{3(aq)}$	Ex: $C_2H_4(g) + 3\ O_2(g) \rightarrow 2\ CO_2(g)+2\ H_2O(l)$
NOTE: Only one Product-- but it can have 2 or more reactants	NOTE: Only one reactant But 2 or more products	NOTE: A single element Reacts with a Compound the single element can be a metal or a nonmetal	NOTE: Usually produces a precipitate, a gas, or liquid water Precipitate=solid formed From the reaction of 2 Solutions.	NOTE: Always forms CO_2 and Water Burning a hydrocarbon with formula C_xH_y in air causes it to react with oxygen





Factors that Affect Reaction Rate

1. **Temperature**
   - **Collision Theory:** When two chemicals react, their molecules have to collide with each other with sufficient energy for the reaction to take place.
   - **Kinetic Theory:** Increasing temperature means the molecules move faster.
2. **Concentrations of reactants**
   - More reactants mean more collisions if enough energy is present
3. **Catalysts**
   - Speed up reactions by lowering activation energy
4. **Surface area of a solid reactant**
   - Bread and Butter theory: more area for reactants to be in contact
5. **Pressure of gaseous reactants or products**
   - Increased number of collisions

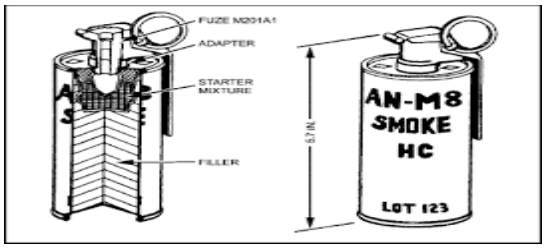
Radioactivity

Toxic

Chapter 18

Chapter 18– Radioactivity and Nuclear Reactions Vocabulary Words

1. Alpha Particle	
2. Beta Particle	
3. Bubble Chamber	
4. Chain Reaction	
5. Cloud Chamber	
6. Critical Mass	
7. Gamma Ray	
8. Geiger Counter	
9. Half-Life	
10. Nuclear Fission	
11. Nuclear Fission	
12. Radioactivity	
13. Strong Force	
14. Tracer	
15. Transmutation	



Radioactive Decay