Name: _____

Period: _____

Physical vs. Chemical Changes and "The Code"

Chemical Reactions

Chemical Reactions – when chemical react together they break apart and combine into new chemicals. When chemical changes occur, chemical bonds are broken and new ones are formed.

Physical vs. Chemical Changes

Physical change – a substance changes appearance, but it is still that substance.

Frozen water

Ice melting changes the appearance, but it is *still water.*

Liquid water

Types of physical changes: *melting; boiling; breaking; cutting; ripping; dissolving.*

Chemical change – a substance actually changes into something else.

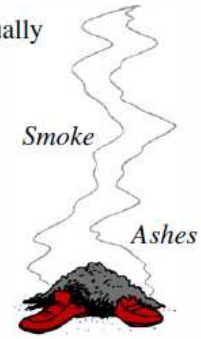
Oxygen

Wood

Fire turns wood and oxygen into smoke, ashes, and heat (energy). The wood is not wood anymore: *it has changed!*

Smoke

Ashes



Question: afterward is it still the same substance?

← **Yes — Physical Change**

→ **No — Chemical Change**

Evidence (Data) of a Chemical Change

Bubbles – a new gas formed. Soda pop fizzling is a physical change, though: the soda tastes the same.

Turns cloudy – a new solid (a precipitate) formed.

Temperature changes – chemical bonds broke or formed, creating or releasing energy.

Exothermic (exergonic) reactions get hot because energy is exiting.

Endothermic (endergonic) reactions get cold because energy is entering.

Color changes – a new substance formed.

Change in smell or taste – new substance formed. (SEE WARNING!) →

VERY IMPORTANT!

Chemical Reactions can be dangerous! Mixing **Ammonia and Chlorine bleach** (common cleaners) **make poisonous chlorine gas!** Also, **bleach and vinegar make poisonous mustard gas!**

If you mix chemicals and notice a chemical change: be safe, get out! You may have made something dangerous.

Your tongue and nose are VERY sensitive and accurate chemical detectors, **BUT BE VERY CAREFUL:** some chemicals can be harmful or even fatal.

Waft, Don't Smell! - Use your hand to waft (wave) some of the smell toward you, if you are instructed to smell a chemical by your teacher.

Reading the Chemical Reaction "Code"

Reactants are on the left side. Reactants "react" in a chemicals reaction.

Products are on the right side. Products are "produced" in a chemical reaction.

BEFORE **Reactants** AFTER **Products**

$$2H_2 + O_2 \rightarrow 2H_2O$$

A *coefficient* shows the number of molecules $2H_2$ means 2 hydrogen molecules for a total of 4 hydrogen atoms.

A *subscript* shows how many atoms (or ions) in a formula: in H_2O, the "2" says 2 atoms of hydrogen;

The *arrow* means "produces" or "yields" (or "turn into"). It always points *from reactants to products.*

$2Li_3N$ = $Li_3N + Li_3N$ = 2 Lithium Nitride molecules = 6 Li atoms + 2 N atoms

Reactants produce Products

$Be(NO_3)_2$ = $Be(NO_3)(NO_3)$ = 2 Be atoms + 2 N atoms + 6 O atoms

1. Physical change	A. When heat is produced in a chemical reaction.
2. Chemical reaction	B. The chemicals before the reaction.
3. Endothermic	C. When chemical bonds are broken and new substances are formed.
4. Exothermic	D. A chemical reaction that gets cold.
5. Reactants	E. The chemicals created in a reaction.
6. Products	F. Changes appearance only.

1. Precipitate	A. A safer way to smell chemicals.
2. Wafting	B. Tells you the number of molecules.
3. Ammonia	C. Will produce a poisonous gas when combined with Chlorine bleach.
4. Coefficient	D. Means "produces" or "creates".
5. Arrow	E. Tells the number of atoms of a particular element in a molecule.
6. Subscript	F. When a solid "falls out" of a liquid when a reaction occurs.

Evidence of a Chemical or Physical Change?

___ Bubbles are formed.
___ Melting wax
___ Gets cold
___ Color changes
___ Boiling water
___ Changes smell
___ Breaking glass
____ Changes temperature
____ Cutting up
____ Evaporating something
____ Ripping paper
____ Gets hot
____ Sugar dissolves
____ Burning gasoline

Evidence of a Chemical or Physical Change?

____ Chewing food into smaller pieces.
____ When acids in your stomach break down your food into nutrients your body can absorb.
____ When enzymes in your saliva pre-digest and soften your food in your mouth before you swallow.
____ Tearing food with your teeth.
____ The complete act of digestion (all of the above).

What two sets of household chemical must you NEVER mix together? Be sure to give what they create.

Why are smelling or tasting chemicals dangerous?

If you HAD to smell a chemical, how would do it?

Endothermic or Exothermic Reaction?

____ An activated heat pack?
____ Two chemicals are mixed and get hot?
____ Two chemicals are mixed and get cold?
____ Heat goes into the reaction?
____ An activated cold pack?
____ Heat comes out of a reaction?

Is dissolving salt into water a physical or chemical change? (Be sure to give proof one way or the other.)

How many total molecules are there?

____ $4H_2O$ ____ $3Be_2Br$ ____ $5CO_2$
____ 8NaCl ____ $2O_2$ ____ MgS

How many total atoms are there?

____ $4H_2O$ ____ $3Be_2Br$ ____ $5CO_2$
____ 8NaCl ____ $2O_2$ ____ MgS

$Li_2O + MgCl_2 \rightarrow 2LiCl + MgO$

Name the second reactant: _____

Name the first product: _____

How many Lithiums on the product side? _____

$2K_3N + 3CaCrO_4 \rightarrow Ca_3N_2 + 3K_2CrO_4$

Circle the second reactant. *Underline* the first product.

How many potassium atoms on the reactant side: _____

How many oxygen atoms on the product side? _____

$2AlCl_3 + 3Na_2CO_3 \rightarrow Al_2(CO_3)_3 + 6NaCl$

Circle the first reactant. *Underline* the second reactant.

How many Sodium atoms on the reactant side? _____

How many table salt molecules on the product side? _____

$Fe_2O_3 + 3C \rightarrow 2Fe + 3CO$

Circle and *Name* the second product: _____

How many total atoms on the reactant side: _____

How many total molecules on the product side: _____