

#5 Reactions: Chemical reactions are processes in which atoms are rearranged into different combinations of molecules.

- Reactant atoms & molecules interact to form _____ with different chemical properties.
- The idea of atoms explains the conservation of matter: In chemical reactions the _____ of atoms stays the same no matter how they are arranged, so their total mass stays the same.
- Chemical reactions usually _____ heat or _____ heat.
- _____ processes include freezing & boiling, in which a material changes form with no chemical reaction.
- Know how to determine whether a solution is acidic, basic, or neutral.

½ pt each: ___/4

Vocabulary - Write the definitions for the following terms:

- Chemical Reaction _____
- Reactants _____
- products: _____
- 4 phases of matter:
 - _____ the state in which matter has a definite volume and shape
 - _____ the state in which matter has a definite volume but takes the shape of its container
 - _____ a state in which matter changes in volume and shape
 - _____ a state that does not have a definite volume and shape, but whose particles have broken apart
- physical property: _____
- chemical property _____
- physical change: _____
- chemical change: _____

Are state changes (ie freezing, melting) examples of chemical or physical change? **Any state change is a PHYSICAL CHANGE!** This is because the substance is still the same before and after, it has just changed its shape. For example, ice and water vapor are two different states (solid and gas), but they are still water. Sublimation, condensation, freezing, melting, evaporation.... all are physical changes.

Physical versus Chemical PROPERTIES: Elements, substances, & compounds have both physical & chemical properties. **Physical properties** are those that can be described using the senses & can be determined without destroying the object. **Chemical properties** describe how a substance reacts with another substance & the original is changed into something else. Classify each term as a physical (**P**) or chemical (**C**) property

_____ density	_____ reacts with acid	_____ hardness	_____ flammability
_____ taste	_____ reacts with oxygen	_____ odor	_____ melting point
_____ color	_____ reacts with a base	_____ luster	_____ neutralizes a base
	_____ Water boils at 100° Celcius		_____ Vinegar will react with baking soda.

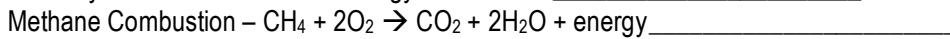
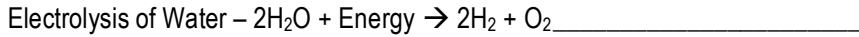
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Physical versus Chemical CHANGES: In a **physical change**, the original substance still exists, it has only changed form. These include all state changes. In a **chemical change**, a new substance is produced. Chem. changes always includes a change in energy & a phys. change. Chemical reactions involve chemical changes. Write **P** for physical change or **C** for chemical change.

_____ glass breaking	_____ cutting grass	_____ separating sand from gravel
_____ corroding metal	_____ burning leaves	_____ fireworks exploding
_____ burning toast	_____ dying your hair	_____ water evaporating from a pond
_____ whipping cream	_____ dry ice sublimating	_____ freezing a Capri Sun to make it a slushie
_____ spoiling/rotting food		

½ pt each: ____/6

Chemical Reactions Involve Energy Change: In a chemical reaction, energy is usually liberated (released) or absorbed in the form of **HEAT**. State whether each of the following equations is an endothermic change or exothermic.



What does “liberate” heat mean? To liberate heat means _____ heat.

This would be an _____ reaction (heat leaves) This reaction would feel _____

What does “absorb” heat mean? To absorb heat means to _____ heat.

This would be an _____ (heat in) reaction. This reaction would feel _____

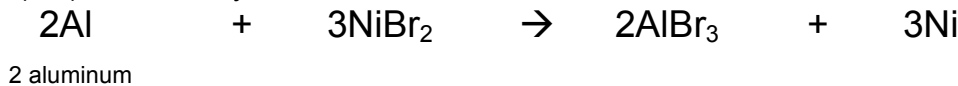
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 3 pts

Definitions

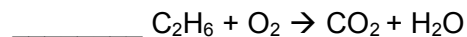
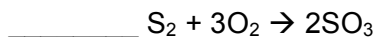
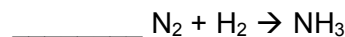
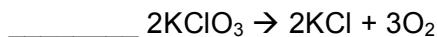
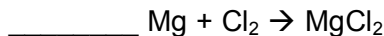
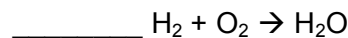
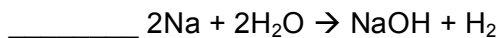
- What is an ion? _____
- What is a covalent bond? _____
- What is an ionic bond? _____

Define: What is the law of conservation of mass (matter)? _____

The left and right sides of the equations have the same stuff...just in different combinations!!!!
 Below is an example of a *balanced* equation. Write the name & number of each element below the molecule.
 The first one (2Al) is done for you.



Notice how there is the *exact same number & type* of atom on BOTH sides of the equation. This means the total mass stayed the same. Below, next to each chemical equation, write **Yes** if the equation is balanced (the total mass stayed the same) or **No** if the equation is unbalanced. ½ pt ea = ____/4



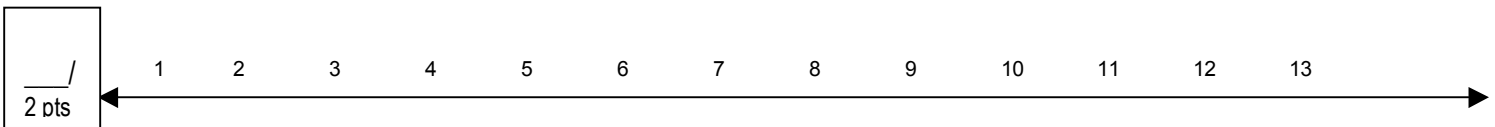
Acids, Bases, Neutrals & the pH Scale Definitions:

acid: _____

base: _____

neutral: _____

Label the pH scale with the following terms: strong acid, weak acid, neutral, weak base, strong base.



State whether each of the following is an Acid (**A**), Base (**B**) or Neutral (**N**). ½ pt each: ____/9

- | | | |
|------------------------------|---|-----------------------------|
| _____ tastes bitter | _____ react with baking soda to produce CO_2 | _____ sodium chloride |
| _____ may be corrosive | _____ excess hydroxide ions (OH^-) | _____ found in vinegar |
| _____ used to de-ice roads | _____ changes red litmus blue | _____ slippery |
| _____ used to make soap | _____ changes blue litmus red | _____ tastes sour |
| _____ pH less than 7 | _____ produces hydronium ions (H^+) | _____ pH greater than 7 |
| _____ found in drain cleaner | _____ formed from a neutralization reaction | _____ found in orange juice |

State Exam Examples: Circle the answer

1. Copper (Cu) reacts with oxygen (O) to form copper oxide (CuO). The properties of CuO are *most likely*

Properties of Some Compounds			
Compound	Melting Point	Solubility	Electrical Conductivity in Solution
A	801°C	high	yes
B	398°C	low	yes
C	20°C	low	no
D	1,200°C	high	yes

- different from copper or oxygen
- similar to both copper and oxygen
- similar only to copper
- similar only to oxygen

Chemical Reactions

1	$2\text{Na} + 2\text{H}_2\text{O} \rightarrow \text{NaOH} + \text{H}_2$
2	$\text{H}_2 + \text{O}_2 \rightarrow \text{H}_2\text{O}$
3	$\text{Mg} + \text{Cl}_2 \rightarrow \text{MgCl}_2$
4	$\text{NaOH} + \text{MgCl}_2 \rightarrow \text{NaCl} + \text{MgOH}$

2. The following equations represent chemical reactions. Which equation shows that the total mass during a chemical reaction stays the same?
a. 1 b. 2 c. 3 d. 4

3. Which of the following forms of energy is released or absorbed in most chemical reactions?
a. light energy b. electrical energy
c. sound energy d. heat energy

4. Which of the following describes signs that a chemical change is occurring?
a) A substance changes shape or state.
b) A substance gives off or absorbs heat.
c) A substance is dense and malleable.
d) A substance is flammable and reactive.

5. As a sample of water turns to ice,
a. new molecules are formed.
b. the mass of the sample is increased
c. the arrangement of the molecules changes
d. energy is absorbed by the molecules

6. The table below shows the pH and reaction to litmus of four body fluids. These data indicate that gastric juice is
a. very acidic b. very basic
c. positively charged d. negatively charged

Body Fluid	pH	red litmus	blue litmus
Blood	7.4	turns blue	no change
Bile	8.2	turns blue	no change
Saliva	6.8	no change	turns red
Gastric Juice	1.7	no change	turns red

7. Which of the compounds in the table is most likely a covalent compound?
a. compound A b. compound B
c. compound C d. compound D

8. Under what conditions are particles of covalent compounds formed?
a. oppositely-charged ions transfer electrons and form a bond
b. two or more atoms share electrons
c. an atom of a noble gas bonds with an atom of a transition metal
d. two metal atoms form a bond

9. What type of compound increases the number of hydronium ions when dissolved in water?
a. an acid b. a base c. an indicator d. hydrogen gas

10. What factor does the pH scale measure?
a. the degree of neutralization between acids and bases
b. the concentration of hydroxide ions in a solution
c. the number of salt molecules present in a solution
d. the concentration of hydronium ions in a solution

11. Which solution listed in the table is the most acidic?

pH of Some Solutions	
Solution	pH
A	12.89
B	2.33
C	12.1
D	3.50

- solution A
- solution B
- solution C
- solution D

Chemical & Physical Properties & States of Matter QUIZ

Multiple Choice: Identify the letter of the choice that best completes the statement or answers the question AND fill in the blank.

___12. Which of the following is NOT a chemical property?

- a. reactivity with oxygen c. flammability
b. malleability d. reactivity with acid

___13. You accidentally break your pencil in half.

This is an example of

- a. a physical change. c. density.
b. a chemical change. d. volume.

___14. Which of the following is NOT a physical property of matter?

- a. ductility b. color c. thermal conductivity d. reactivity to water

___15. During physical changes, matter always retains its

- a. size. b. identity. c. state. d. texture.

___16. Which of the following is an example of a physical change?

- a. a silver spoon tarnishing c. a popsicle melting
b. a cake baking in an oven d. a car rusting

___17. Two substances that undergo a chemical change together are ___ with one another.

- a. ductile c. conductive
b. reactive d. soluble

___18. A favorable chemical property of iron is its

- a. malleability. c. high melting point.
b. strength. d. non-reactivity with oil and gasoline.

___19. You are given two samples and are told that one is plastic and the other is wax. If you had to distinguish between the two using ONLY chemical properties, you could

- a. hit the samples with a hammer.
b. burn the samples.
c. determine the densities of the samples.
d. All of the above

___20. As you clean the kitchen cupboards, you find an unlabeled container of white powder. As you set the container on the countertop, you accidentally spill some of the powder into a cup of vinegar. The mixture fizzes and bubbles, which means that the white powder is

- a. corn starch. b. baking soda. c. flour. d. powdered sugar.

___21. The melting of butter when it is left out in a warm room is an example of

- a. a physical change. c. a physical property.
b. a chemical change d. a chemical property.

___22. Although the Statue of Liberty is made of copper (originally an orange-brown color), it is green because the copper has interacted with substances in the air to form new substances with different properties. This is an example of a

- a. physical change. c. physical property.
b. chemical change. d. chemical property.

___23. Precious metals in catalytic converters on cars change harmful carbon monoxide exhaust fumes to harmless ones.

This is an example of a ___ change.

- a. physical b. chemical c. characteristic d. Both (a) and (c)

___24. Color, odor, mass, and volume are ___ of an object.

- a. chemical properties c. stationary properties
b. physical properties d. inertial properties

___25. Flammability, solubility, and reactivity are ___ of a substance.

- a. chemical properties c. stationary properties
b. physical properties d. gravitational properties

___26. Being able to burn wood is an example of wood's

- a. soluble properties. c. physical properties.
b. chemical properties. d. ductile properties.

___27. When you add bleach to the water while you are washing your clothes, you are encouraging

- a. conductivity. c. ductility.
b. a chemical change. d. a physical change.

___28. "Paper is white."

This is an example of WHAT PROPERTY?

- a. physical b. chemical c. personal d. real estate

___29. "Paper is flammable (can burn)."

This is an example of WHAT PROPERTY?

- a. physical b. chemical c. personal d. real estate

___30. "Water cannot burn."

This is an example of WHAT PROPERTY?

- a. physical b. chemical c. personal d. real estate

___31. "Water evaporates"

This is an example of WHAT KIND OF CHANGE?

- a. physical b. chemical c. personal d. real estate

___32. "Rubbing alcohol evaporates"

This is an example of WHAT KIND OF CHANGE?

- a. physical b. chemical c. personal d. real estate

___33. You accidentally drop your cell phone, and it breaks in half! This is an example of WHAT KIND OF CHANGE?

- a. physical b. chemical c. personal d. real estate

___34. What scale is used to measure how strong an ACID or a BASE is?

- a. gram scale b. a balance scale c. pH scale

$\frac{1}{2}$ pt each: ___/17