Chemical Reactions

California State Standards Review

Reactions

5. Chemical reactions are processes in which atoms are rearranged into different combinations of molecules. As a basis for understanding this concept:
   a. *Students know* reactant atoms and molecules interact to form products with different chemical properties.
   b. *Students know* the idea of atoms explains the conservation of matter: In chemical reactions the number of atoms stays the same no matter how they are arranged, so their total mass stays the same.
   c. *Students know* chemical reactions usually liberate heat or absorb heat.
   d. *Students know* physical processes include freezing and boiling, in which a material changes form with no chemical reaction.
   e. *Students know* how to determine whether a solution is acidic, basic, or neutral.

1. Define chemical reaction

- A reaction is a process in which **atoms rearrange into different combinations** of molecules.

2. What is a reactant? Product?

Reactants --> Products

Reactants are atoms (or molecules) that interact to form products with different chemical properties

3. Define: "conservation of mass"

- In chemical reactions, **the number of atoms stays the same** no matter how they are arranged.
- The total mass also stays the same.
- The left and right sides of the equations have the same stuff…just in different combinations!!!!

4. What does "liberate" heat mean?

- To liberate heat means **to release or give off** heat
- This would be an **exothermic** reaction (heat leaves)
- This reaction would feel **hot**.

5. What does "absorb" heat mean?

- To absorb heat means to **take in or use up** heat.
- This would be an **endothermic** (heat in) reaction.
- This reaction would feel **cold**.

6. What are the 4 phases of matter? Define each.

1. **Solid**: the state in which matter has a definite volume and shape
2. **Liquid**: the state in which matter has a definite volume but takes the shape of tis container
3. **Gas**: a state in which matter changes in volume and shape
4. **Plasma**: a state that goes not have a definite volume and shape, but whose particles have broken apart

7. What is a physical property? A chemical property?

Physical property: a property that can be observed or measured without changing the identity of the matter (color, temp, hardness…)

Chemical property: a property that describes a substance based on its ability to change until a new substance with different properties (flammability, combustibility…)

8. Define physical change and chemical change.

Physical change: a change that affects one or more physical properties of a substance (easy to undo, from one state to another)

Chemical change: a change into an entirely new substance (cannot be reversed) - often causes a color change, fizzing, heat…

9. 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.

10. Define: acidic, basic, neutral.

Acid: increases the # of Hydrogens when dissolved in water, **pH < 7**, Hydrochloric Acid, lemons, tastes sour…

Base: increases the # of OH (hydroxide) ions when dissolved in water, **pH > 7**, cleaners, Sodium Hydroxide, bitter & slippery

Neutrals: **pH of 7**, water

10. How can you determine if a chemical is an acid or base?

- Use an **indicator** - turns color when it is placed in an acid or base
- Example: Litmus paper, Bromythmol Blue, cabbage juice

Activation Energy

Complete this worksheet after you finish reading Chapter 15, Section 3.

Activation energy is the energy a reaction needs to get started. At the bottom of the page are two energy diagrams—one for an exothermic reaction and one for an endothermic reaction. Follow the directions below to label the energy diagrams.

Activation Energy

1. In an exothermic reaction, the chemical energy of the reactants is greater than the chemical energy of the products. Write *exothermic reaction* under the appropriate energy diagram.

3. Exothermic reactions give off energy. The energy given off is the difference between the energy of the reactants and the energy of the products. Label the energy given off on the exothermic-energy diagram by writing *energy given off* in the appropriate space.

Activation Energy

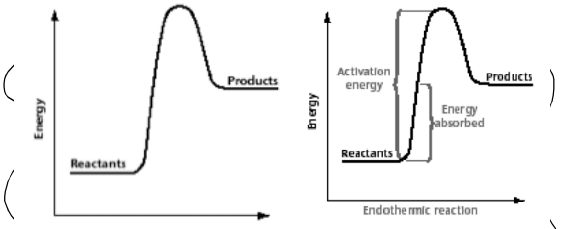
2. In an endothermic reaction, the chemical energy of the reactants is lower than the chemical energy of the products. Write *endothermic reaction* under the appropriate energy diagram.

4. Endothermic reactions absorb energy. The energy absorbed by a chemical reaction is the difference between the energy of the products and the energy of the reactants. Label the energy absorbed on the endothermic energy diagram by writing *energy absorbed* in the appropriate space.

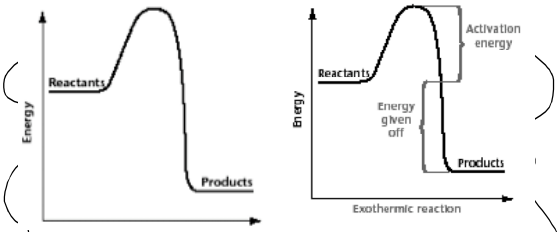
Activation Energy

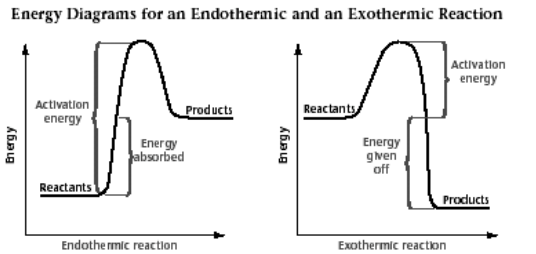
5. The activation energy is the energy needed to start a chemical reaction. On the diagrams below, the chemical reaction begins at the top of the peak. The activation energy is the difference between the top of the peak and the energy of the reactants. Label the activation energy of each graph by writing *activation energy* in the appropriate space.

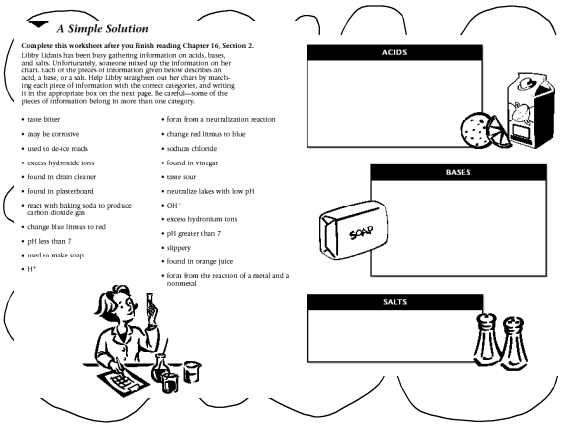
Activation Energy

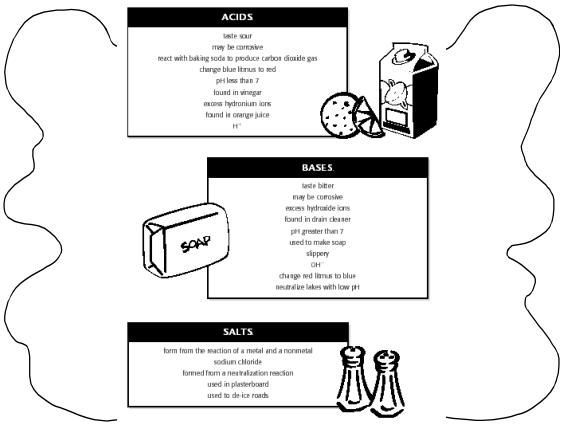


Activation Energy









Review of Chemical vs. Physical Properties and Changes

Chemical vs. Physical Properties.

- **Chemical properties** are properties of an element or compound in chemical reactions. For example, the fact that sodium reacts with water is a chemical property.
- **Physical properties** are properties of an element or compound that can be observed without a chemical reaction of the substance. A substance's color and density are physical properties.

Chemical vs. Physical Changes.

- In a **physical change**, the substances are not altered chemically, but merely changed to another phase (i.e. gas, liquid, solid) or separated or combined.
- In a **chemical change**, the substances are altered chemically and display different physical and chemical properties after the change.

Identify Chemical and Physical Properties

- Water boils at 100 degrees Celcius. **P**
- Diamonds are capable of cutting glass. **P**
- Water can be separated by electrolysis into hydrogen and oxygen. ***C***
- Sugar is capable of dissolving in water. **P**
- Vinegar will react with baking soda. ***C***

Identify Chemical and Physical Properties

- Yeast acts on sugar to form carbon dioxide and ethanol. ***C***
- Wood is flammable. ***C***
- Aluminum has a low density. **P**
- Ammonia is a gas at room temperature. **P**
- Bromine has a red color. **P**

Identify Chemical and Physical Changes

- Dry ice, solid carbon dioxide, is sublimed (goes from a solid directly into a gas) at room temperature. **P**
- Salt is dissolved in water. **P**
- Iron rusts in a damp environment. ***C***
- Gasoline burns in the presence of oxygen. ***C***
- Hydrogen peroxide decomposes to water and oxygen. ***C***