**Guided Notes: Kinetic and Thermal Energy**

**Big Idea:**

In this lesson, you will explain the relationship between the energy resulting from motion and heat energy.

**Key Concepts:**

• Kinetic energy is the energy of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

• Thermal energy describes the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy of a group of particles.

• The particles in a cup of liquid water have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy.

• Thermal energy includes the kinetic energy of all the particles in a group on a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ level.

• Thermal energy also includes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy, which relates to the distances between particles and their ability to move around.

• Liquid water has greater \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy because its particles have more freedom to move around.

• The liquid water particles have greater \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy than the solid water particles.



**Real World Examples:**

1. Hot chocolate has a higher temperature, so the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy of its particles is higher. Lemonade has a lower temperature, so the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy of its particles is lower.

2. When a piece of candy melts in your hand, the liquid part has greater \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy because its particles have more freedom to move around.

**Guided Notes: Matter and Temperature**

**Big Idea:**

In this lesson, you will identify and describe properties of matter in relation to energy resulting from motion and heat energy as measured by temperature.

**Key Concepts:**

• Matter is composed of small particles: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

• These particles are constantly in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

• Because these particles are in motion, they have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy.

• The energy that weakens or strengthens the bond causing a change of state is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy.

• Temperature is a measure of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ kinetic energy of particles.

• As kinetic energy increases, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ also increases.

• An increase in thermal energy leads to an increase in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy.

• Once a substance reaches its melting or boiling point, a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of state occurs.



**Real World Examples:**

1. As water boils, both \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (steam) exist at the same temperature. The water vapor has greater \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy because its particles have more freedom to move around.

2. Baking at a higher temperature means the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy of the cookie dough is higher. Baking at a lower temperature means the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy of the cookie dough is lower.

**Guided Notes: Energy Transfer and Temperature**

**Big Idea:**

In this lesson, you will analyze data collected about how the transfer of energy resulting from motion affects the matter in relation to the temperature of a sample of the matter.

**Key Concepts:**

• Molecules in substances are always in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

• Molecules with more kinetic energy will move at a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ rate.

• Temperature is a measurement of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ kinetic energy of all the particles in a substance.

• The higher the temperature, the greater the amount of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy in the substance.

• Heat is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of thermal energy from one substance to another.

• Heat always flows from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ areas to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ areas.

• As a substance's kinetic energy increases, its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ also increases.

• Temperature is a measure of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ kinetic energy of particles in a substance.

**Real World Examples:**

1. Hot coffee has a higher temperature, so the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy of its molecules is higher. Iced coffee has a lower temperature, so the kinetic energy of its molecules is \_\_\_\_\_\_\_\_\_\_.

2. A warm blanket has a higher temperature, so the kinetic energy of its particles is \_\_\_\_\_\_\_\_\_\_. A cold floor has a lower temperature, so the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy of its particles is lower.

**Guided Notes: Kinetic Energy Transfer**

**Big Idea:**

In this lesson, you will analyze data from an investigation about how the energy that results from motion affects matter in relation to the temperature of the sample.

**Key Concepts:**

• Kinetic energy is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of motion.

• Kinetic energy directly influences the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of matter.

• When thermal energy is absorbed or lost, it affects the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy of a substance.

• Potential energy is the energy based on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ position.

• As thermal energy increases, the kinetic energy of particles increases, resulting in increased \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

• Solid particles have low \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy since they are close together.

• Liquids and gases have higher \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy since particles have more space.

• An increase in a substance's kinetic energy causes its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to increase.

• Temperature is a measure of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ kinetic energy of particles.



**Real World Examples:**

1. When running, your body has a higher temperature, so the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy of your particles is higher. When sitting still, your body has a lower temperature, so the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy of your particles is lower.

2. Boiling water has a higher temperature, so the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy of its molecules is higher. Ice water has a lower temperature, so the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy of its molecules is lower.

**Guided Notes: Thermal Energy Transfer**

**Big Idea:**

In this lesson, you will explain with the aid of a model how heat energy is transferred within fluids from hotter regions into colder ones.

**Key Concepts:**

• Convection is a type of heat transfer that occurs within \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (liquids or gases).

• Convection creates a cycle where energy is transferred between \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ particles.

• As particles gain thermal energy, their \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy increases.

• Particles with more kinetic energy are less \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (compacted together).

• Warmer, less dense particles \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ towards the top.

• Cooler, denser particles with less kinetic energy \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ towards the bottom.

• This rising and sinking of particles creates a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ current.

• Convection currents happen in both \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.



**Real World Examples:**

1. On a sunny beach, the air has a higher temperature, so the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy of air particles is higher. In a shaded forest, the air has a lower temperature, so the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy of air particles is lower.

2. In boiling soup, the liquid has a higher temperature, so the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy of molecules is higher. In a refrigerated drink, the liquid has a lower temperature, so the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy of molecules is lower.