Heat Is Energy

The **1st Law of Thermodynamics** states that the energy of a system is conserved. To change the energy of a system, energy must be **transferred** to or from the system.

Heat energy is a form of energy transferred among particles in a substance (or system) by means of the **kinetic energy** of the particles. Originally, people believed that heat was a substance, but after further investigations and observations – scientists decided that heat was not a substance, but a form of energy, that comes from the movement of tiny particles. The faster the particles move, the more energy is generated. According to the kinetic theory, heat is transferred by particles bouncing into each other.

In physics and thermodynamics, heat is the process of energy transfer from one body or system due to contact. Heat is also referred to as **thermal energy**, although many definitions require this thermal energy to actually be in the process of movement between one body and another to be technically called *heat*. Heat is a means of energy transfer, rather than a form of energy. Energy is transferred, not heat.

Heat energy that we use to supply our basic needs is essential for our survival. An understanding of heat and the technologies that use heat will help us make sure that the energy available to us will sustain our planet now and in the future.

Early Theories of Heat

Prior to 1600 - people thought that heat was a combination of fire and air. 1600 – Scientists decided that heat was an invisible fluid called *caloric*, because it seemed to flow from a hot object to a cold one. This was called the **Caloric Theory**.

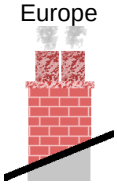
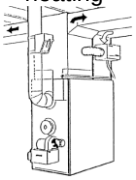
Humans Using Heat

As technology advances, so does our culture. New technologies create more demands for even better technology. The cold climate in many northern states creates pressures on science and technology to meet the heating needs of these Americans. By understanding the concept of heat, we will better satisfy our needs to improve our cultural activities by adapting better to the climate.

Heat and Human Needs

The importance of heat is linked to our basic **needs** of shelter, clothing, food, water, and physical activity. The human range of tolerance for temperature is between **0°C and 45°C**. By improving our shelters, clothing and other basic needs, by making advancements in heat technologies, we can increase that range of tolerance to meet our **wants** as well.

Early Heating Technology Timeline

7000 B.C.	100 B.C.	A.D. 1200	1300's	1700's	Late 1700's	1800's	1906
Humans create fire 	Romans develop central heating – heat travels from one source to different areas of a building	Chimneys first appear in Europe 	Fireplaces with chimneys are built into the walls of buildings 	Cast-iron stoves heat rooms evenly: heat does not escape up the chimney 	Central heating reappears – using coal	Forced-air heating 	Electric heaters 

Heat Technologies

In addition to being able to produce heat to meet human **needs** and **wants**. It is also important to be able to control that heat. As technologies develop to generate heat, ways to direct and manage that heat have also been created.

Heat-Related Materials and Technologies

Open fires

Pioneer stoves

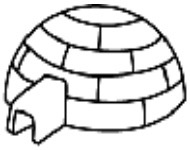
Modern stoves

Wood-burning fireplaces

Sod House

Solar heating

Igloo



Modern building House

Personal and Societal Choices

North Americans have a high standard of living, and as a result, *take for granted* the many tools and technologies that make their living easier, like the microwave oven.

This is an example of a **want** that many people in North America consider to be a **need**.

Making Sustainable Choices

Both the personal and societal choices we make in using heat energy are important, because they affect our sustainability. We must use our heat energy resources wisely and be careful of the consequences to the environment when we use them. By looking for, and using, a wide variety of heat energy sources and developing technologies that will sustain this energy, we will be making ourselves a better future.