

Chapter 3

Thermal Energy and Heat

The Big Idea

**Thermal energy moves
from warmer to cooler
materials until the
materials have the same
temperature.**

Forms of Energy

- **Main Idea:** Energy exists in many forms.
- **Why it's important:** Energy is the cause of all the changes you observe in the world around you.
- **Define:**
 - Energy
 - Kinetic Energy - Thermal Energy
 - Potential Energy
 - Elastic Potential Energy

Energy: The ability to cause change

Kinetic Energy: Moving energy

Potential Energy: Stored energy

Elastic Potential Energy: Energy
stored when an object is stretched or squeezed

Thermal Energy: Moves from one
place to another due to changes in temp.

Gravity: Attractive force between two objects that depends on the masses of the objects and the distance between them.

Occur: To take place; to happen

*Energy is involved whenever change occurs.

Exploring: Energy

- <http://player.discoveryeducation.com/index.cfm?guidAssetId=635A8036-836F-4C3B-B7A4-50B6DD29CFB0>

What is Energy?

Energy is the ability to cause change

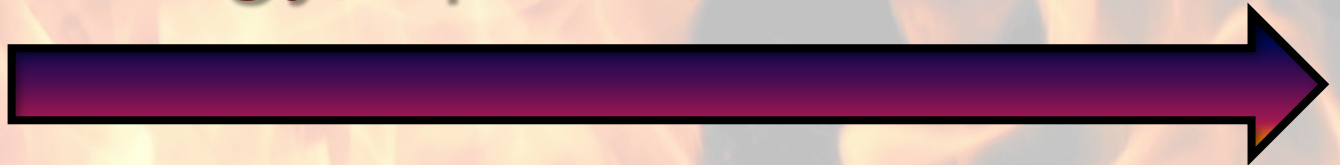
Example: Plants receive energy from the sun.



What is Energy?

Analyze the relationship between kinetic energy, speed, and mass.

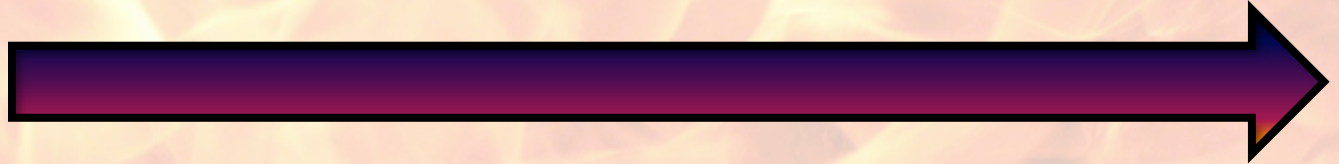
Mass



**Kinetic
Energy**



Speed



**Kinetic
Energy**



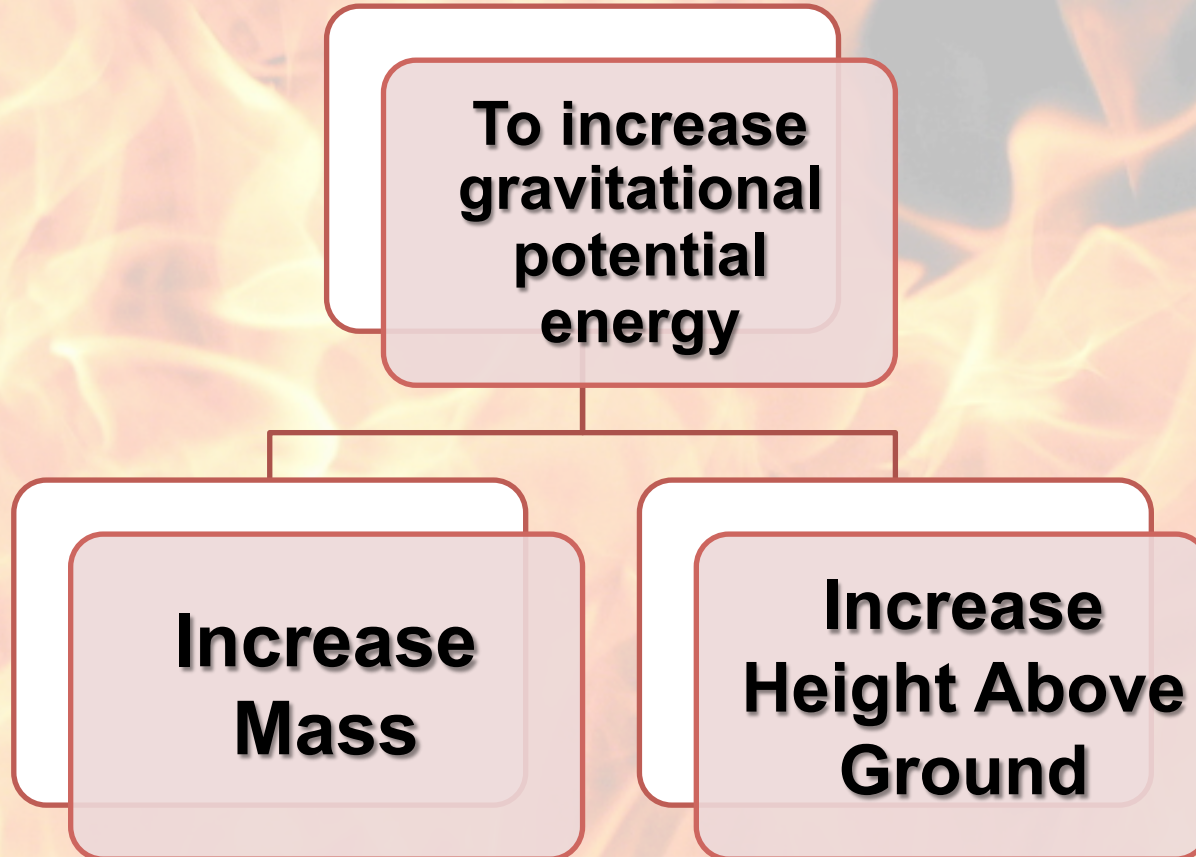
What is Energy?

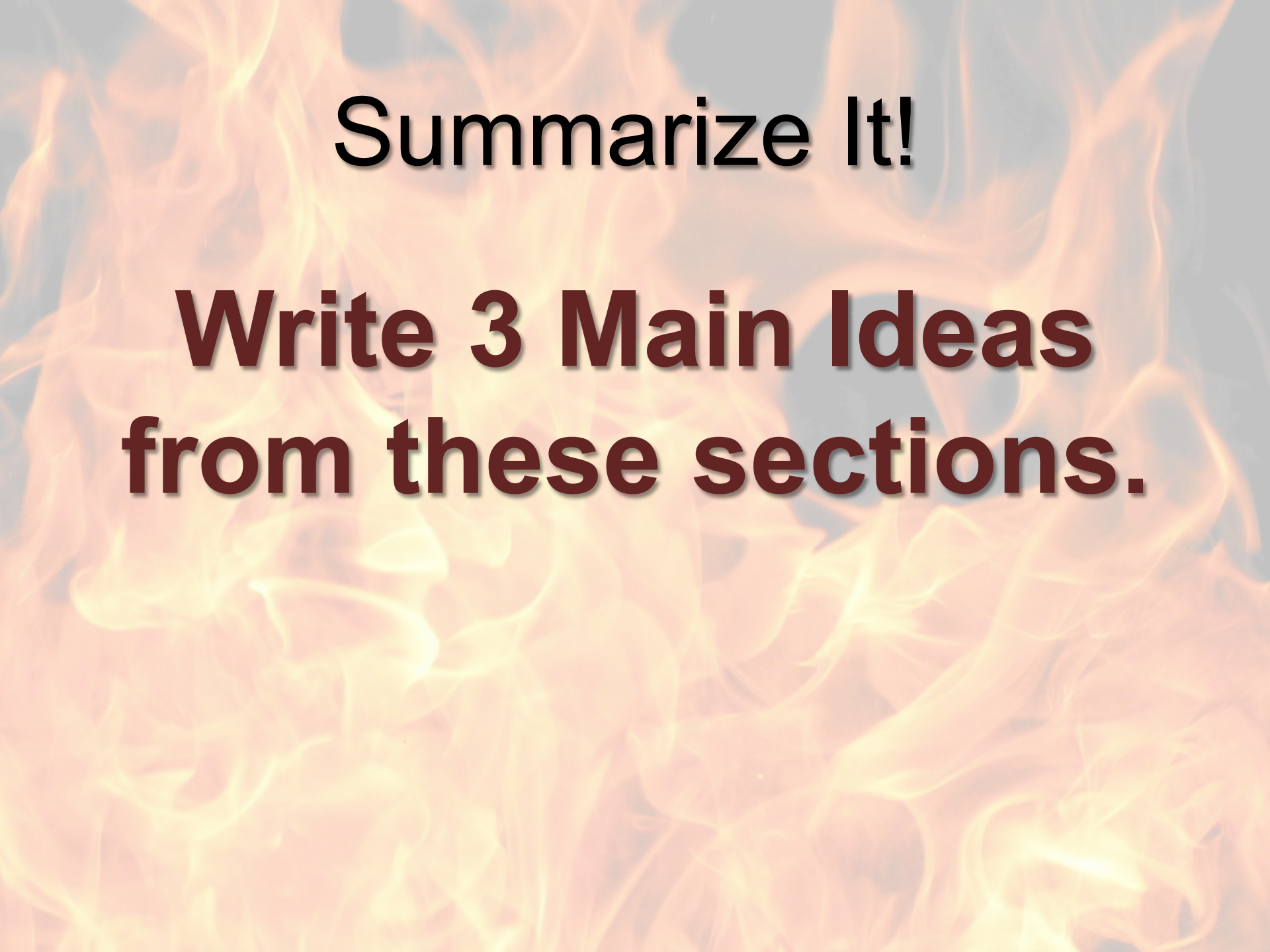
**Energy is measured in
joules**

**The symbol for this unit is
J**

What is Energy?

Distinguish two ways to increase the gravitational potential energy of an object.



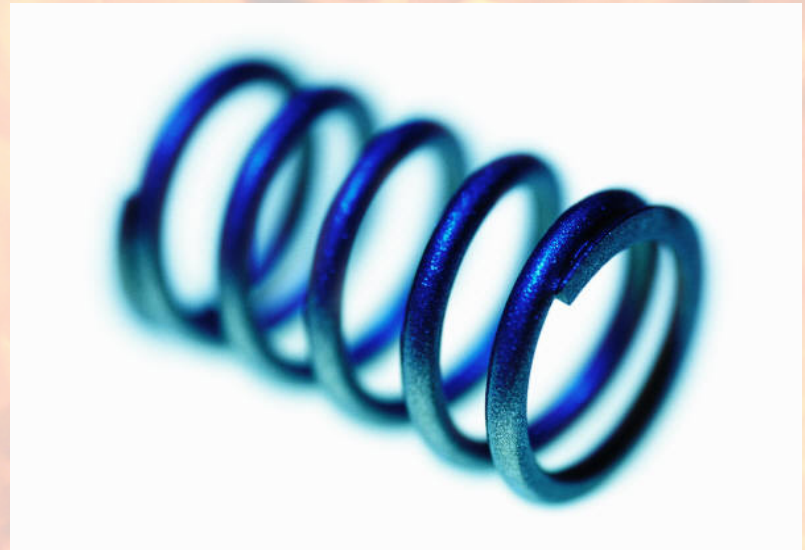


Summarize It!

**Write 3 Main Ideas
from these sections.**

Potential Energy (Stored Energy)

Model and label two ways a spring can store elastic potential energy.



Potential Energy

A spring can store elastic potential energy when it is compressed or stretched.

Potential Energy

Contrast the ways chemical potential energy is stored and released.

**Chemical
energy is
stored in**

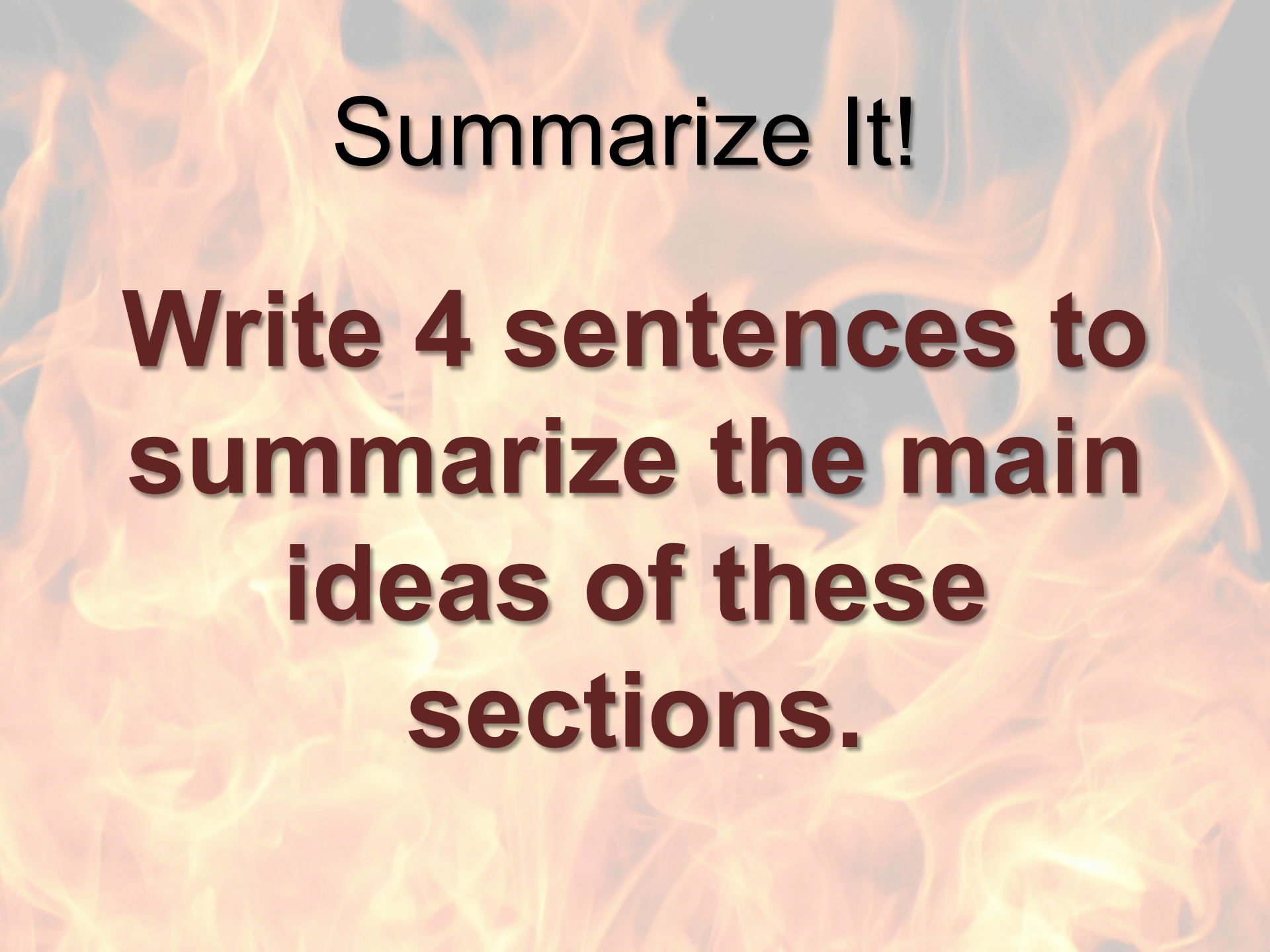
**Bonds between
atoms**

**Chemical
energy is
released
when**

**Bonds between
atoms are broken**

Light Energy & Thermal Energy

Form of Energy	Definition	Characteristics
Light Energy	Energy carried by light waves	Radiates in all directions from its source
Thermal Energy	Energy that moves from one place to another due to temperature differences	Always moves from warmer to colder objects



Summarize It!

**Write 4 sentences to
summarize the main
ideas of these
sections.**

Lesson 2

Energy Transfer

See selections from:

<http://player.discoveryeducation.com/index.cfm?guidAssetId=0D0DC30F-A7EE-4991-80E8-47B4886FF91F&blnFromSearch=1&productcode=US>

Work: Transfer of energy that occurs when a push or pull makes an object move.

Wave: Disturbance in a material that transfers energy without transferring matter.

Fuel: Material that can be burned to produce energy.

Friction: Force between 2 surfaces in contact that resists the sliding of the surfaces past each other.

Review Vocabulary

Force: a push or pull that one object exerts on another object.

Academic Vocabulary

Transfer: to move, carry, or send.

A force that
does work

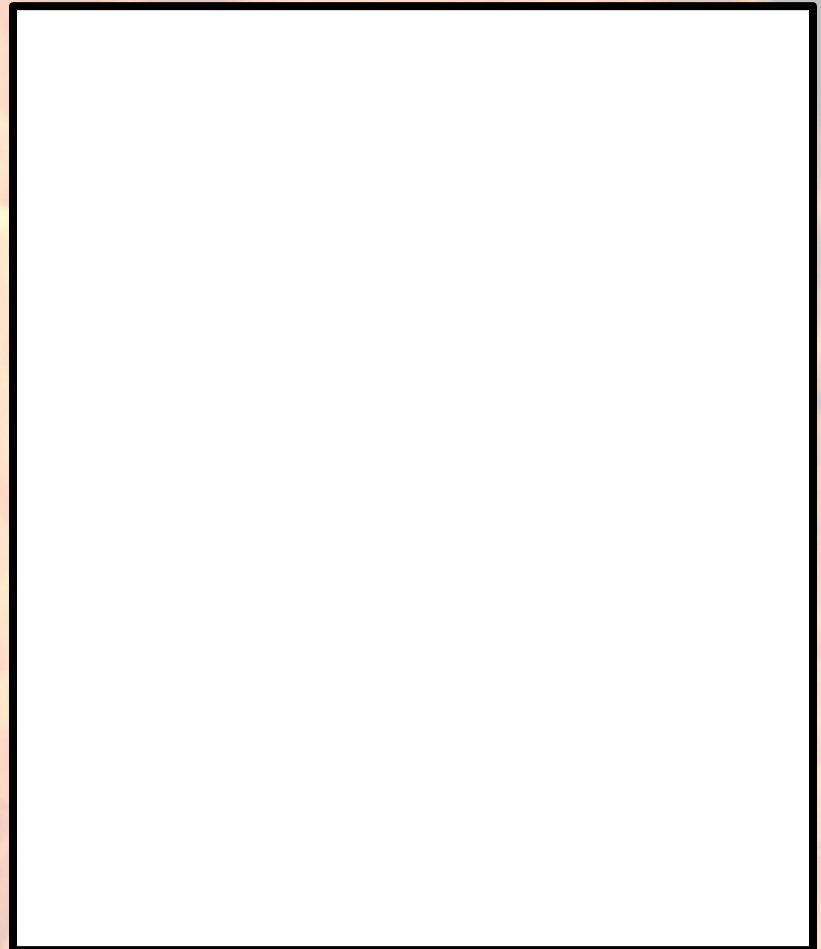
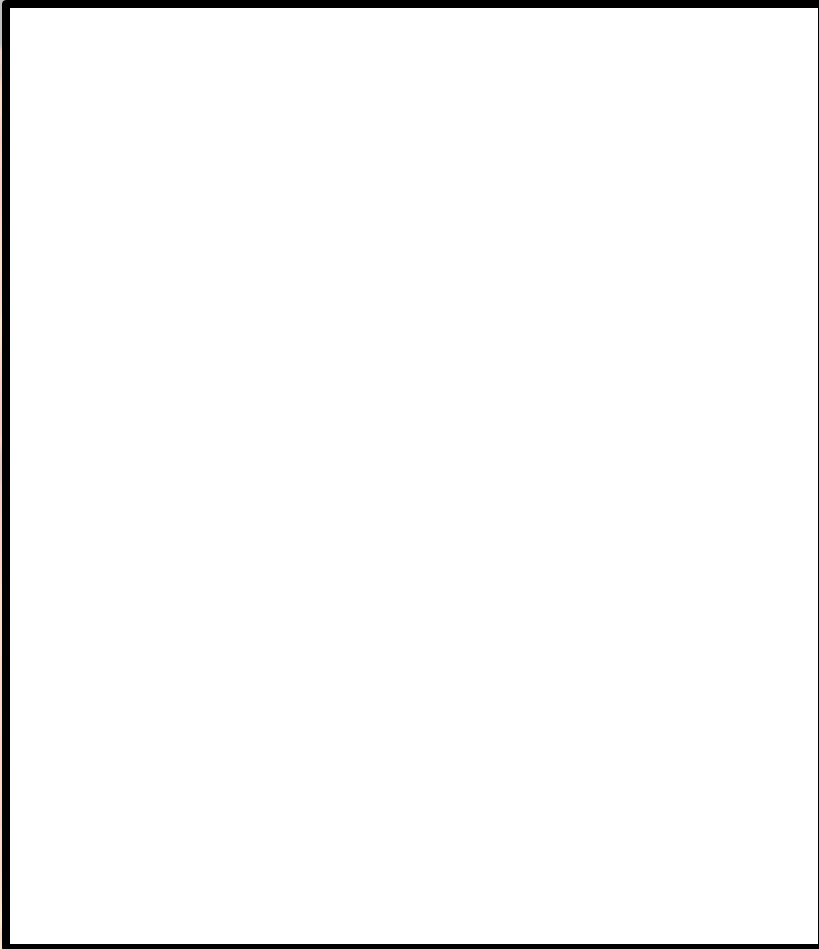
Causes an
object to
move

&

Transfers
Energy



Model how waves carry energy. Draw a water wave and a sound wave. Use arrows to show how matter and energy move.

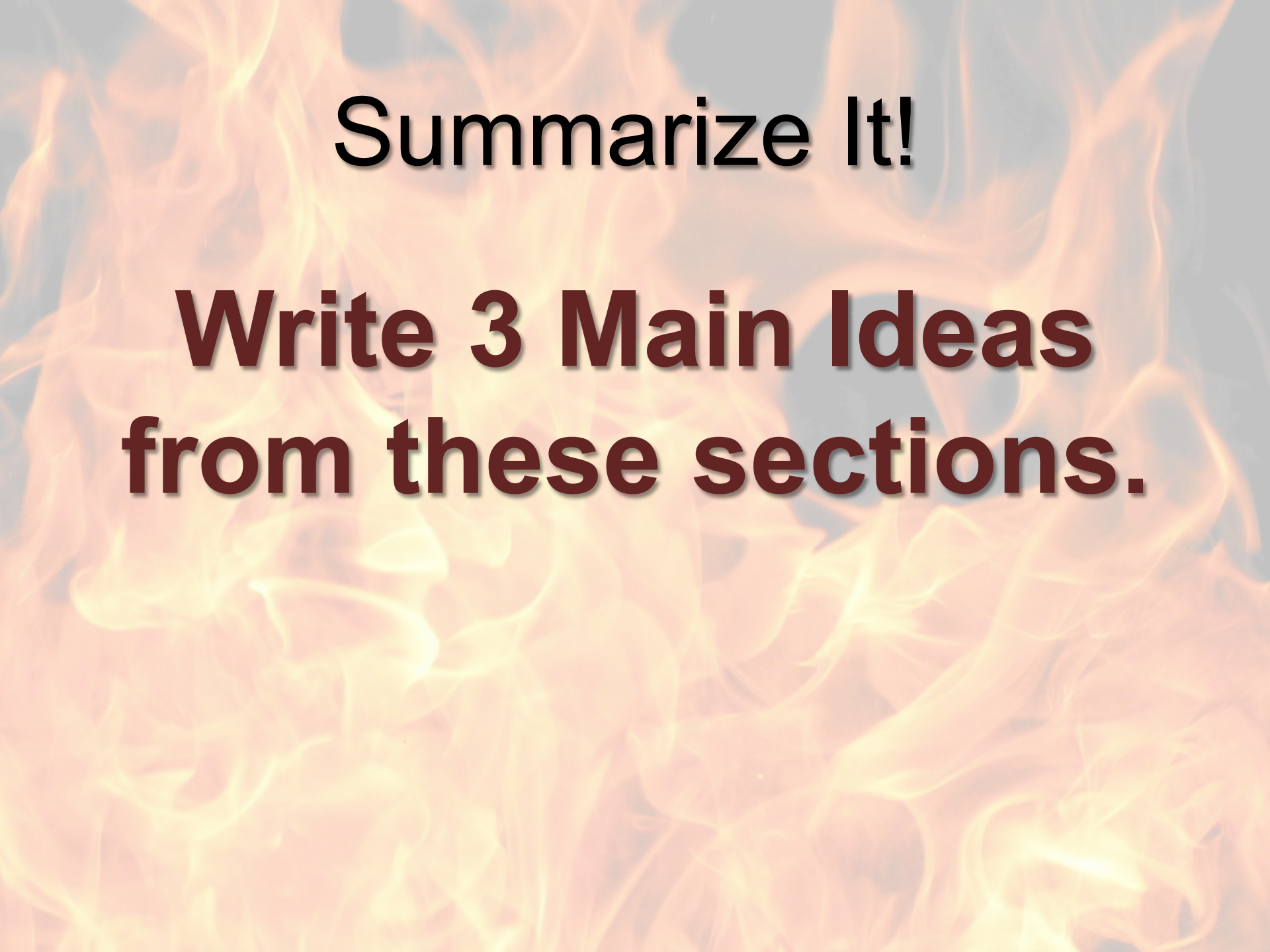


Contrast electromagnetic waves with water and sound waves.

Electromagnetic waves, unlike other waves, can travel through both matter and empty space.

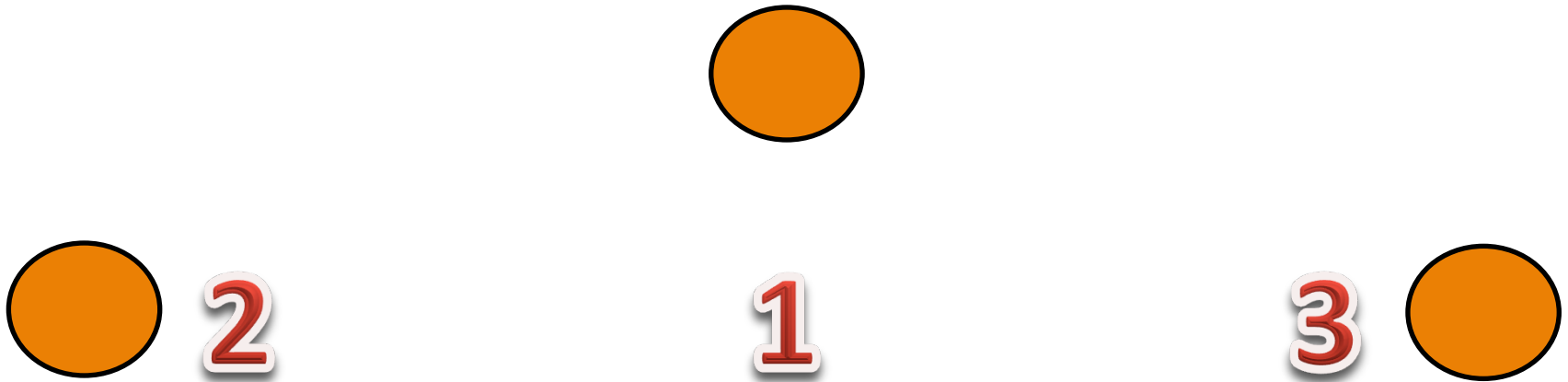
Electromagnetic Waves:

- ✓ **Light waves**
- ✓ **Radio waves**
- ✓ **Microwaves**
- ✓ **Infrared rays**
- ✓ **X-rays**



Summarize It!

**Write 3 Main Ideas
from these sections.**



1. Most potential energy
2. Kinetic energy changing into potential energy
3. Potential energy changing into kinetic energy



Summarize how energy changes when a log burns.

When a log burns, stored

Chemical energy is

changed into

Thermal energy and

Radiant energy



Model how friction changes energy.

1. The bicycle's wheels have kinetic energy.



2. The brake pads rub against the wheels.



4. The bicycle comes to a stop.

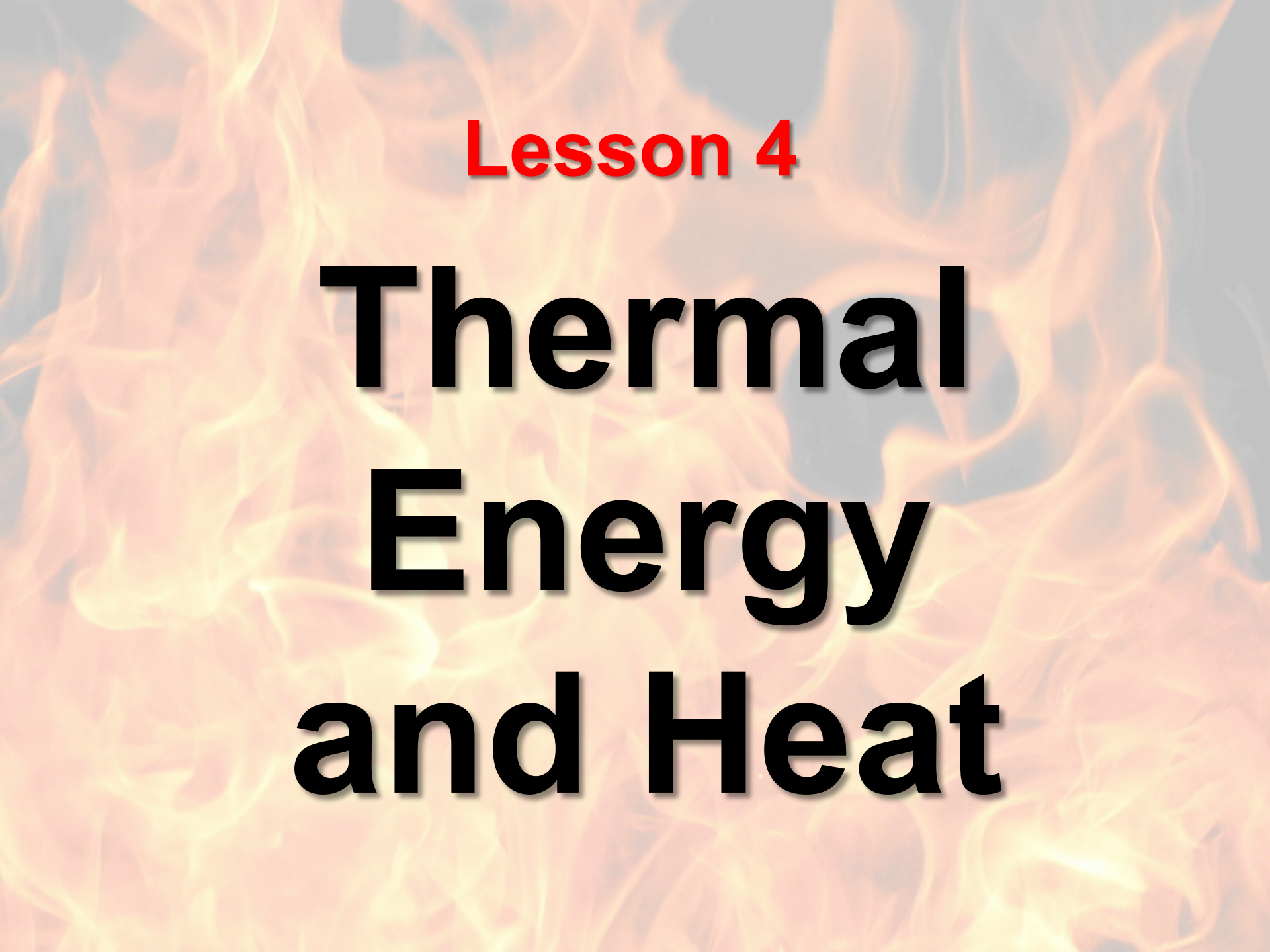


3. Friction between the pads and wheels changes kinetic energy into thermal energy.



Summarize It!

**Summarize the Main
Ideas from these
sections.**

The background of the slide is a close-up, high-resolution image of flames. The fire is bright yellow and orange, with intricate, swirling patterns that create a sense of intense heat and movement. The flames fill the entire frame, serving as a thematic backdrop for the text.

Lesson 4

Thermal Energy and Heat

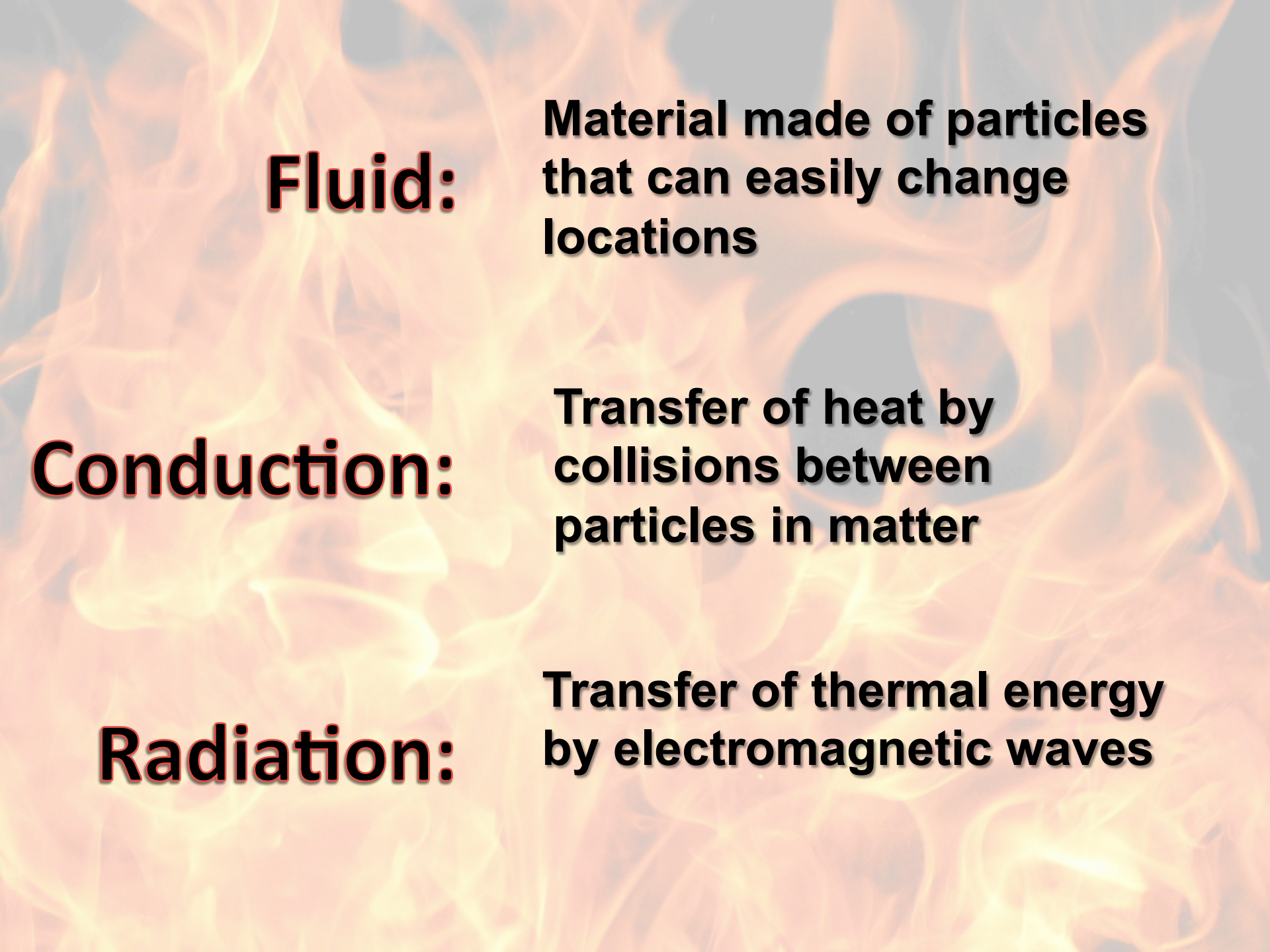
What you'll learn

- **Describe how thermal energy is transferred by collisions between particles**
- **Explain how thermal energy is transferred by the movement of matter from one place to another.**
- **Describe thermal energy transfer by electromagnetic waves.**

So What?!

The transfer of thermal energy is involved in cooking food, staying warm in a winter coat, and the warming of the Earth by the sun.





Fluid:

**Material made of particles
that can easily change
locations**

Conduction:

**Transfer of heat by
collisions between
particles in matter**

Radiation:

**Transfer of thermal energy
by electromagnetic waves**

Convection:

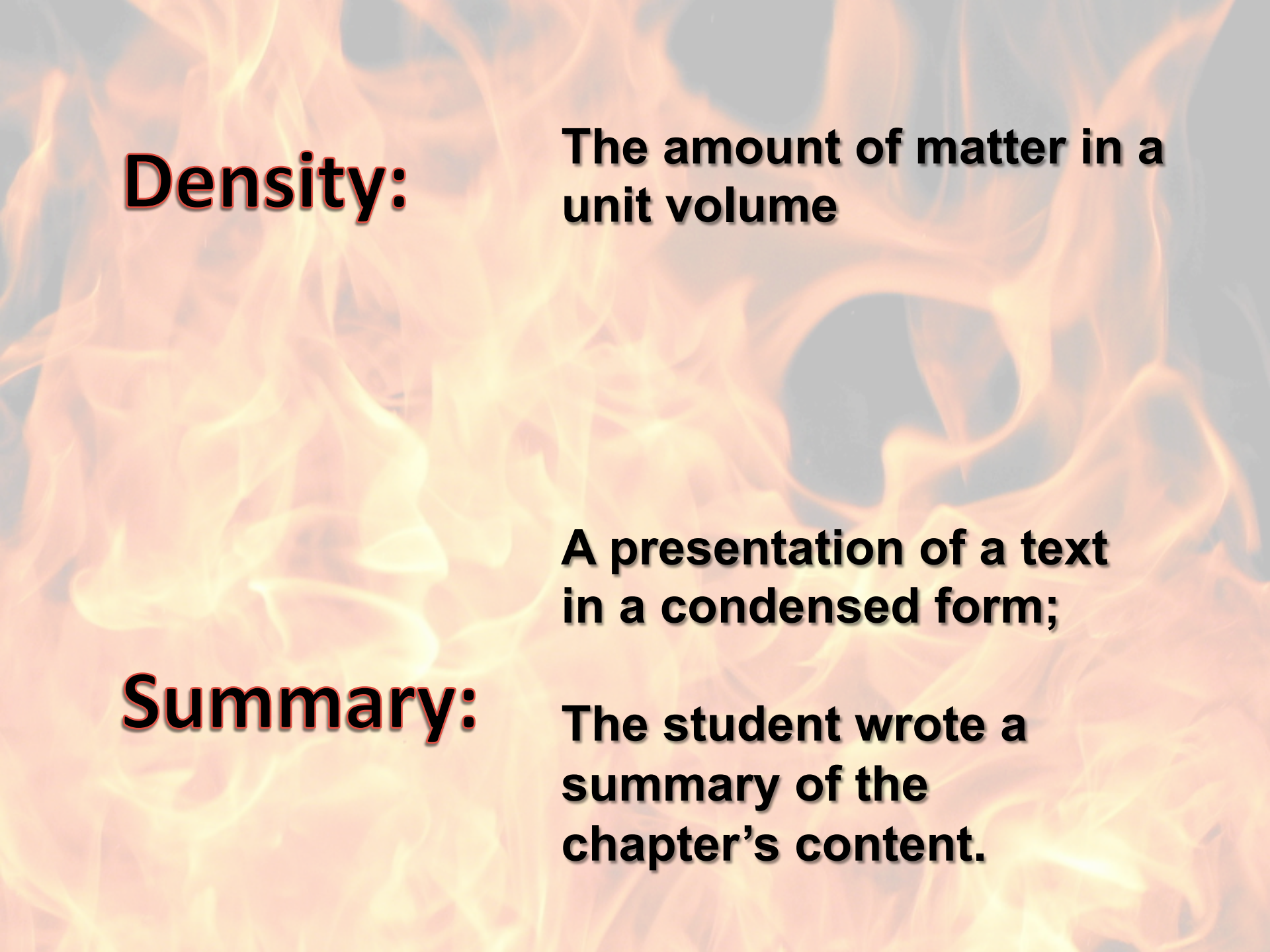
Transfer of thermal energy by the movement of matter from one place to another.

Conductor:

Material in which thermal energy moves quickly.

**Convection
Current:**

Overall movement of water



Density:

The amount of matter in a unit volume

Summary:

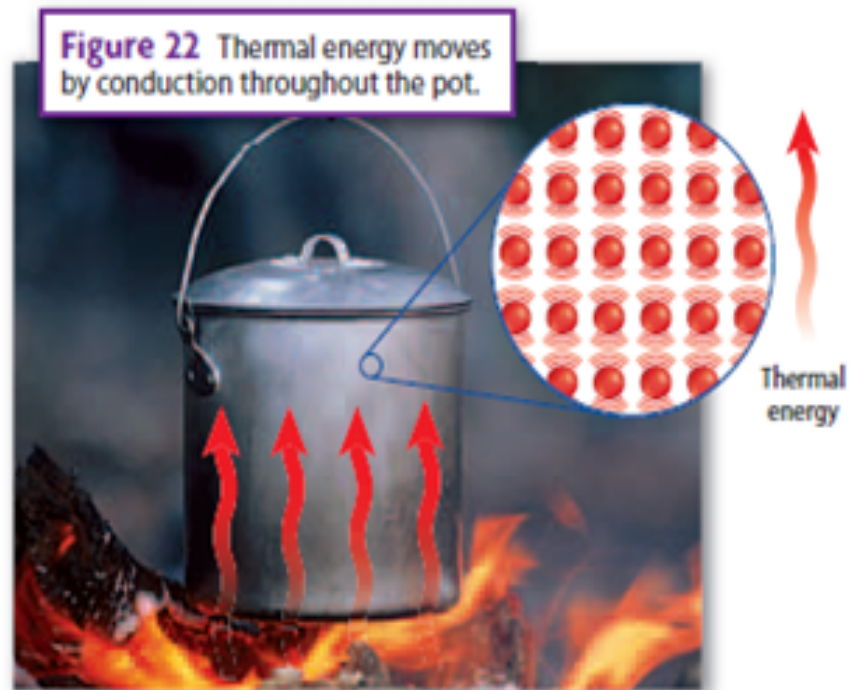
A presentation of a text in a condensed form;

The student wrote a summary of the chapter's content.

Conduction

Model how energy moves between particles in conduction. Use arrows to show the transfer of energy.

Particles with higher kinetic energy transferring energy to particles with lower kinetic energy.



Conduction

Contrast conductors and insulators.

	Conductors	Insulators
Speed of conduction	faster	slower
Examples	silver, copper, aluminum, steel, brass	air, plastic, foam, fiberglass, cork, wood

Convection

Analyze the transfer of energy by convection.

In convection, thermal energy is transferred by the movement of matter from one place to another.

In fluids, the particles can easily change their locations.

In solids, the particles cannot move from one place to another.



Summarize It!

**Summarize the Main
Ideas from these
sections.**

Convection

Summarize how changes in temperature and density cause a hot-air balloon to rise.

**The air in
a hot air
balloon
becomes
warmer.**



**The air
inside
the
balloon
expands.**



**The air
inside the
balloon is
less
dense
than the
air
outside.**

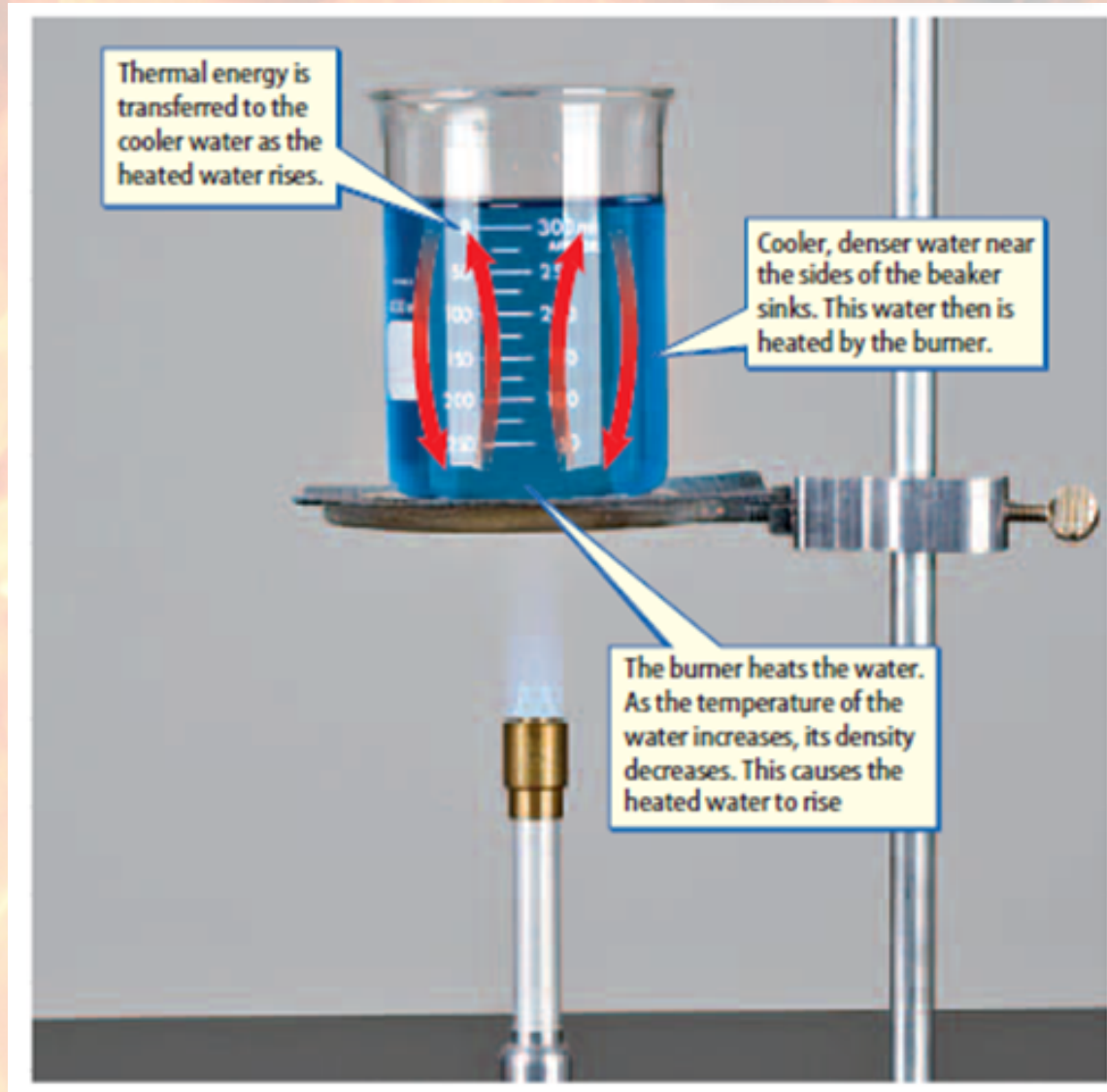


**The
balloon
rises.**



Convection

Model how convection currents form by drawing a



Radiation

Organize information about radiation.

Travels
Through
matter and
empty space

Transfers
Energy btween
objects that are
not touching

Radiation

Provides
Energy for
almost all
living things

Transfers
Energy from the
Sun to Earth



Summarize It!

**Summarize two Main
Ideas from these
sections.**

Table 2 Thermal Energy Transfer

Type of Transfer	How Transfer Occurs	Example
Conduction	Particles with more thermal energy collide with nearby particles that have less thermal energy. Conduction transfers thermal energy only through matter.	
Convection	Part of a fluid that is at a higher temperature moves to where the fluid is cooler. Convection transfers thermal energy only through matter.	
Radiation	Electromagnetic waves given off by objects at a higher temperature are absorbed by objects at a lower temperature. Radiation transfers thermal energy through matter and space.	