UNIT CHALLENGE

Purpose: The unit challenges help students explore the big picture themes that tie together each unit of Ignite! content. These challenges are designed to complement the Ignite! Topic Lessons.

Each challenge presents students with an open-ended task with no single correct solution. Working in small groups, students prepare a short response, in either written or oral form, in which they use knowledge gained by studying the unit's multimedia movies to formulate and defend a particular position. These responses can be used to stimulate further class discussion and exploration of the issues.

> *NOTE: In order to use this activity with your class for a particular Ignite! unit, you should plan on having students study the Ignite! movies from most of the topics in that unit. Otherwise, students will not have enough information to complete the challenge activity.*

Class time required:

- 15 minutes at the start of unit to organize students into groups and review the challenge, and for the groups to discuss and record their initial thoughts and current knowledge of the issues.
- 20 minutes at the end of the unit for student groups to complete their responses to the challenge.
- *Optional*: 20-30 minutes for student groups to present their responses to the class.

Teacher Instructions:

At the Start of the Unit: Before studying any of the unit's topics or movies:

1. divide your class into teams of 3 to 4 students;
2. reproduce the unit challenge worksheet and distribute to students;
3. decide whether teams will give oral presentations and/or written statements in response to their challenge;
4. read the challenge(s) out loud and make sure that all terms and concepts are understood;
5. ask groups to complete Part One of their worksheets (Getting Started). They should discuss and write down their thoughts, based on their current knowledge for how they might respond to the selected challenge.

While the Class Studies the Unit's Topics: Over the next few days or weeks, as you are using the Ignite! Topic Lessons for this unit, occasionally remind students to record on their worksheets any information they have found in the Ignite! movies that might help them to develop or support their response to the challenge. They should record this information in Part Two of their worksheets (Taking Notes).

After Completing the Last Topic of the Unit: Give your students 20 minutes to discuss and write up their response to the challenge. They can use the space provided in Part Three of their worksheets (Preparing Your Response). You might consider allowing them to review some of the movies from the unit. Then, have students give brief presentations of their responses (2 to 3 minutes each) and/or submit their written responses.

Energy

Transforming Energy

Background: Energy is what you need to get stuff done, and it comes in many forms, including chemical, electrical, thermal, radiation, kinetic, potential, and nuclear. But energy can be changed from one form into another. For example, the chemical energy in the food you eat gets turned into kinetic energy when you run.

Challenge: Give five examples of how energy is changed from one form into another.

Tips:

- Think about the technology and machines that you use every day.
- Try to cover all of the energy forms listed above – each form should appear in at least one of your examples.

PART ONE – Getting Started

Directions: Based on what you already know, talk with the other members of your group about how you might respond to this challenge. Write your thoughts in the box below. You can change your mind later, after you have reviewed the Ignite! movies in this unit.

Notes:

PART TWO – Taking Notes
Directions: As you view and discuss the Ignite! movies in this unit be on the lookout for information that will help you develop a response to your challenge. Record that information in the box below. Use additional paper if necessary.

Notes:

PART THREE – Preparing Your Response
Directions: Depending on your teacher's instructions, work with your group to create a written or oral response to your challenge. Decide on what you want to communicate, and be sure to support your statements with evidence from the Ignite! movies. Use the space below for your response. Use additional paper if necessary.

Notes:

unit Energy

Types of Energy

Class: _____ **Type Instruction:** Whole Class

Learning Objective(s): Students define matter and energy.

Length of Time: 10 Minutes

Ignite! Movies:

- Six Forms of Energy
- Defining Energy

Teacher Instructions: Play Ignite! movies with students and complete the following activity.
Part One: Students complete a vocabulary building activity.
Part Two: Students create a list individually and share with the class.

Target Vocabulary/Key Terms:

- *atom*
- *chemical energy*
- *electrical energy*
- *electron*
- *energy*
- *kinetic energy*
- *matter*
- *molecule*
- *nuclear fusion*
- *nucleus*
- *potential energy*
- *proton*
- *radiant energy*
- *thermal energy*

Notes:

Name: _____

Energy Vocabulary

Directions: Match the term below with the correct definition.

Term	Definition
1. _____ **atom**	A. the capacity of a physical system to do work
2. _____ **chemical energy**	B. energy that is carried through the electrons or protons of atoms
3. _____ **electrical energy**	C. everything that has mass and occupies space
4. _____ **electron**	D. the smallest complete unit of a compound; a combination of atoms joined by covalent bonds
5. _____ **energy**	E. energy that an object has because of its motion
6. _____ **kinetic energy**	F. energy that is released in a nuclear reaction either by fusion or fission
7. _____ **matter**	G. a process in which stars give off light and heat; the joining of two nuclei together into one, which releases great amounts of energy in the form of heat and light
8. _____ **molecule**	H. the smallest part of an element that has all of the chemical properties of that element
9. _____ **nuclear energy**	I. energy that an object has because of its position
10. _____ **nuclear fission**	J. a subatomic particle inside the nucleus of an atom; it has positive electric charge
11. _____ **nuclear fusion**	K. the splitting of a nucleus of an atom nuclei of a heavy element, induced by the absorption of a neutron; it releases a large amount of energy
12. _____ **nucleus**	L. energy that is transferred by rays, waves, or particles; its transfer between objects does not require a medium; also known as radiation
13. _____ **potential energy**	M. a negatively-charged particle found in regions around an atomic nucleus
14. _____ **proton**	N. energy associated with heat
15. _____ **radiant energy**	O. energy stored in the chemical bonds of molecules
16. _____ **thermal energy**	P. the positively charged and central part of an atom where most of its mass is concentrated

Examples of the Six Forms of Energy

Directions: Write a list of the six forms of energy and examples of each. Be prepared to share the examples with the class!

unit Energy

#2. Potential and Kinetic Energy

Class: _____ **Type Instruction:** Whole Class

Learning Objective(s): Students understand that energy is a property of many substances and is associated with mechanical motion.

Length of Time: 10 Minutes

Ignite! Movies:

- Life and Potential Energy
- Kinetic Energy & Earthquakes!

Teacher Instructions: Play Ignite! movies with students and complete the following activity.
Part One: Students complete a note-taking and application exercise.
Part Two: Earthquake Explanation is an individual writing assignment.

Target Vocabulary/Key Terms:

- *earthquake*
- *electricity*
- *fault*
- *hydroelectric dam*
- *mass*
- *speed*
- *turbine*
- *wave*

Notes:

Potential Energy Transforming Into Kinetic Energy

Directions: List and describe five examples of potential energy transforming into kinetic energy. In each case, state the potential energy, the kinetic energy, and how it was transformed from one to the other.

1. _____

_____

2. _____

_____

3. _____

_____

4. _____

_____

5. _____

_____

Earthquake Explanation

Directions: Write a paragraph explaining the stages of the catastrophic event of an earthquake. Explain how an earthquake is an example of the relationship between kinetic energy and potential energy. Be sure to use the following terms:

- earthquake
- fault
- kinetic energy
- potential energy
- wave

#3. Conduction, Convection, and Radiation

Class: _____ **Type Instruction:** Whole Class

Learning Objective(s): Students understand that energy is a property of many substances and is associated with heat.

Length of Time: 10 Minutes

Ignite! Movies:

- Thermal Energy Transfer
- Three Types of Heat Transfer

Teacher Instructions: Play Ignite! movies with students and complete the following activity.
Part One: Students complete a note-taking and diagramming activity.
Part Two: Examples of Conduction, Convection, and Radiation is a class discussion.

Target Vocabulary/Key Terms:

- *conduction*
- *convection*
- *radiation*

Notes:

Three Types of Heat Transfer

Directions: In the spaces below, describe and diagram examples of the three types of heat transfers.

	Description	Diagram
Conduction:		
Convection:		
Radiation:		

Examples of Conduction, Convection, and Radiation

Directions: As a class, discuss the following question: what are examples of conduction, convection, and radiation that we see in our everyday lives?

unit Energy

4. How Heat Is Transferred

Class: _____ **Type Instruction:** Whole Class

Learning Objective(s): Students understand that heat moves in predictable ways, flowing from warmer objects to cooler ones, until both reach the same temperature.

Length of Time: 10 Minutes

Ignite! Movies:

- The Flow of Heat
- Molecules in Motion

Teacher Instructions: Play Ignite! movies with students and complete the following activity.
Part One: Students create a caption for the illustrations.
Part Two: Students create a diagram showing The Process of Thermal Energy.

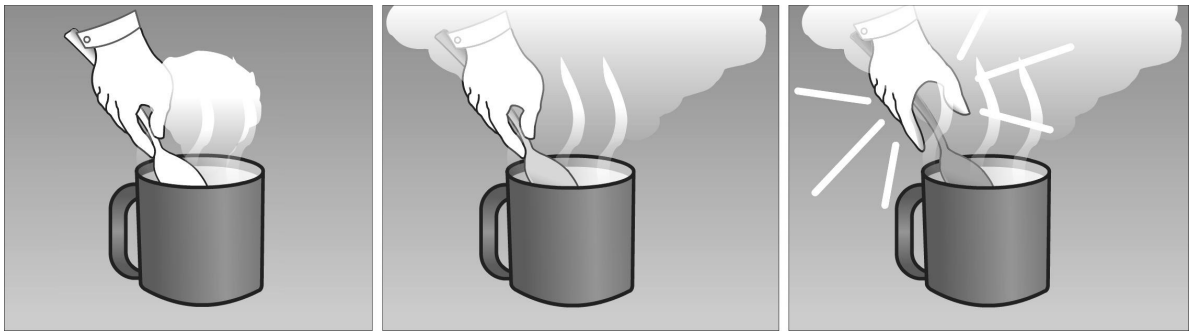
Target Vocabulary/Key Terms:

- *temperature*

Notes:

The Behavior of Molecules

Directions: Describe how the behavior of the molecules changes in the three panels of the comic strip below.



The Process of Thermal Energy

Directions: In the space below, draw the movement of particles during a transfer of thermal energy from a very hot substance to a cooler substance. Make it a sequential process. What will happen with the particles in each stage of the sequence? Do the particles speed up?

unit Energy
#5. Specific Heat

Class: _____ **Type Instruction:** Whole Class

Learning Objective(s): Students understand interactions between matter and energy, including specific heat.

Length of Time: 10 Minutes

Ignite! Movies:

- Looking at Temperature and Heat
- Specific Heat Capacity

Teacher Instructions: Play Ignite! movies with students and complete the following activity.
Part One: Students complete the statements.
Part Two: Knowing the Range of Specific Heat Capacities is a classroom sequencing activity.

Target Vocabulary/Key Terms:

- *calorie*
- *degree*
- *joule*
- *measure*
- *specific heat capacity*

Notes:

Understanding Specific Heat

Directions: Fill in the blanks in the sentences below.

1. _____ is the amount of heat per gram required to change the temperature of water by one kelvin (or one degree Celsius).

2. A substance with a large specific heat capacity requires _____ energy and heats up more _____.

3. A substance with a small specific heat capacity requires _____ energy and heats up more _____.

Knowing the Range of Specific Heat Capacities

Directions: As a class, rank three substances in order from smallest to largest specific heat capacity.

unit Energy
#6. Electricity

Class: _____ **Type Instruction:** Whole Class

Learning Objective(s): Students understand that energy is a property of many substances and is associated with electricity.

Length of Time: 10 Minutes

Ignite! Movies:

- We're So Electric
- Wind and Power

Teacher Instructions: Play Ignite! movies with students and complete the following activity.
Part One: Students complete a note-taking activity.
Part Two: Students work in pairs to create a diagram showing How Windmills Work.

Target Vocabulary/Key Terms:

- *magnet*

Notes:

Name: _____

Electricity

Directions: Complete the sentence below.

Two factors that create electricity are the _____ of particles with opposite charges and the _____ of particles with the same charge.

How Windmills Work

Diagram: With a partner, create and label a diagram sequentially showing how windmills transfer kinetic energy to electrical energy. Present your diagram to the class!