# Thermal Energy Transfer Lesson 1: “The Solve”

## Student Handout

**I. Watch the Mosa Mack Mystery.**

Either on your own, in a small group or as a class (your teacher will let you know), watch Mosa Mack’s episode on Thermal Energy Transfer. Then, fill out the questions below. Include a time code in your answer as evidence of where you found your answer.

**Name: _____** **Date: _____**

**Episode Questions**

1. In the infomercial, Willy presents a new pair of thin, but warm gloves. Draw a picture of the cross-section he shows in his infomercial. What does he claim cannot get in the glove because of the dense fibers?

2. When Mosa puts on the glove and approaches the sub-zero freezer, what happens?

3. Willy claims that no cold can get into the glove. What does Mosa figure out is wrong with that statement? What is actually moving?

4. How do we know (heat) thermal energy is moving? How does it move?

5. When Mosa and her team use the quantum microscope on the soup and spoon, what do they see happening with the particles? Draw a diagram below using arrows to show the direction of thermal energy transfer.

6. How do the particles conduct heat up the spoon? (Hint: think about the dance party!)

7. Why does the metal spoon conduct heat better than the plastic spoon?

8. What does Mosa mean when she says the gloves need to be made out of a material that is a “good insulator”?

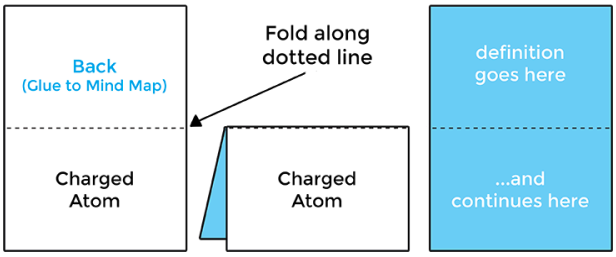
9. Why do the “Insulators” leave an air space between the two window panes when they install them?

10. Help Mosa solve the mystery. Why does merino wool, with its pockets of air, make warmer gloves than the dense fibers of the Willy Warm gloves?

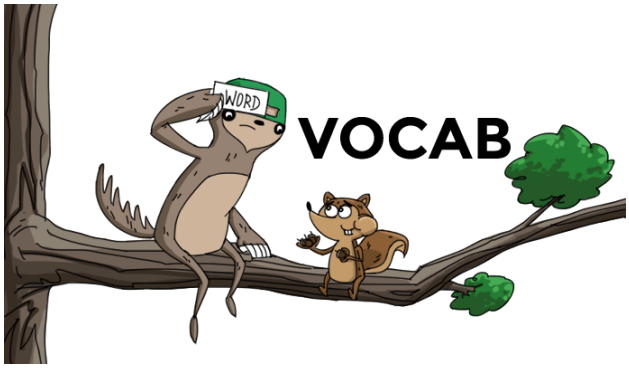
## II. Vocabulary Activity

Note: Your teacher will tell you whether you will complete this activity online here, or offline by following the instructions below.

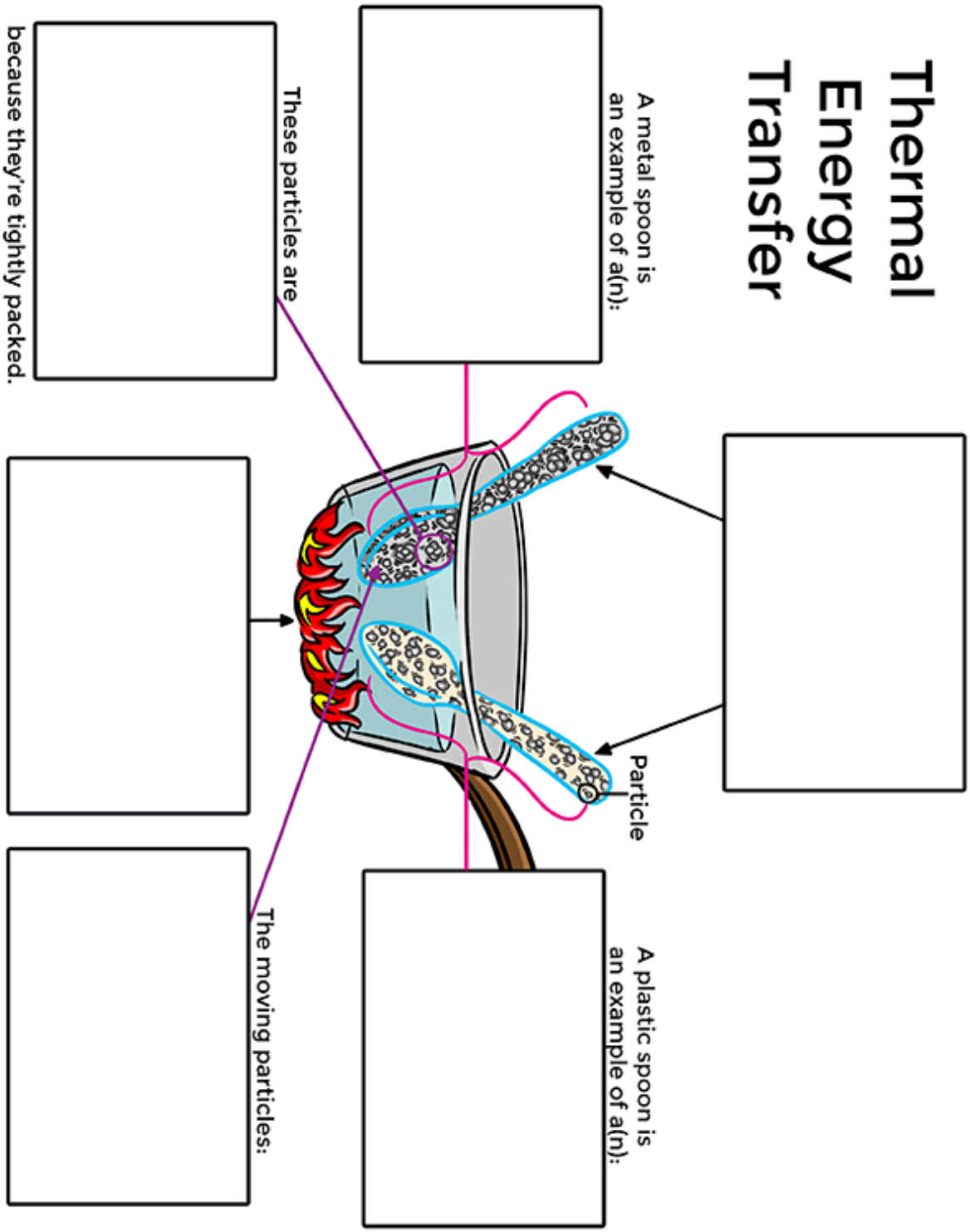
1. Using the materials at your table, cut out your vocabulary cards along the **solid lines**. Note: Do not cut at the dotted lines.
2. Fold the cards at the dotted lines.
3. Write the definition of the term on the inside of the card using the definitions below.




4. Use the clues from the Mind Map images, definitions, and vocabulary terms to place the cards in the correct location in the Mind Map, explaining your thinking to group members as you go.
5. When you're ready to glue or tape, raise your hand so you can check your Mind Map with your teacher.
6. Use glue or double-sided tape to connect the back of the vocabulary card to the correct place on the Mind Map.
7. Discuss with your group:
   a. Brainstorm: Where have you heard the word "insulator" used before? "Conductor"?
   b. How do the particles differ in an insulator vs. a conductor?



## Thermal Energy Transfer Vocabulary



**Thermal Energy Transfer Vocabulary**

| | | |
|---|---|---|
| Conductor | Dense | Vibrate |
| Hot | Insulator | Cold |

**Thermal Energy Transfer Vocabulary**

- **Vibrate**: short quick movements back and forth
- **Hot**: having high thermal energy or lots of particle motion
- **Cold**: having low thermal energy or minimal particle motion
- **Dense**: when particles are crowded closely together
- **Conductor**: a material that easily transfers heat
- **Insulator**: a material that does not easily allow heat to pass through

## III. Quiz: Check for Understanding

Complete the exit ticket below *or* you can take the quiz online!

**Name: _____** **Date: _____**

1. Which direction does thermal energy transfer?
    a. Cold to hot
    b. Hot to cold
    c. Either direction
    d. Neither, they just mix

2. How does thermal energy transfer?
    a. Faster particles move past other particles.
    b. Slower particles bump into faster particles, slowing them down.
    c. Particles vibrating at a higher speed bump into those next to them.
    d. The colder particles move.

3. A metal spoon has denser particles than a wooden spoon. If both were placed in a hot pot of water, which would be a better conductor?
    a. The metal spoon.
    b. The wooden spoon.
    c. Both spoons would be equal conductors.
    d. It depends on the heat of the water.

4. The Willy Warm Gloves were an example of a good:
    a. Insulator
    b. Conductor

5. Why is air a good insulator in between window panes?
    a. Air on its own is warmer than all solids.
    b. Air is a gas, so the particles are farther apart and cannot conduct thermal energy as easily.
    c. Air is a gas, so its higher density of molecules allows it to conduct thermal energy easily.
    d. Air on its own is cooler than all solids.