Thermodynamics
The Heat Plume of a Fire

Name:	Class/Period:	Date:

Introduction to Fire Lab Safety

Since this is the first activity with fire, we will discuss safe laboratory procedures. The "FireWorks Safety" poster is a great source of basic fire safety information. Take a moment to read each of the safety considerations.

Safety Checklist for Fire Activities

- ❑ Wear appropriate Personal Protective Equipment [PPE].
  - ❑ Wear: 100% cotton clothing; safety goggles; closed-toed shoes
- ❑ Tie back loose sleeves and long hair.
- ❑ Make sure a charged fire extinguisher is close. Know how to use it.
- ❑ Make sure each station has a spray bottle that is filled with water.
- ❑ Never lean over a fire.
- ❑ Extinguish burned materials with water before putting them in the trash. *Fire is not out if there is any smoke or heat coming from the fuels.*
- ❑ If a fire starts on you … Stop! Drop! and Roll!

An instructor must be present for fire to be used.

(Adapted from the USFS "FireWorks Safety

We will now take a quiz over this material to ensure that you understand each of the points and the importance of appropriate behavior and personal protective equipment (PPE).

Record your answers to the safety quiz questions in the **Safety Quiz Responses** table below.

Safety Quiz Responses

Question	1	2	3	4	5	6
Answer						

Diagrams of Heat Transfer

Mechanism			

Before beginning, read all of these directions together

1) Plan your team roles. From the slideshow, take notes for each role
    a) **Observer**
    b) **Measurer**
    c) **Igniter/Recorder/Safety Monitor**
2) Data Collection

Table 1: Directions and Measurements

Direction	#1 (cm)	#2 (cm)	Avg. (cm)
Right			
Left			
Above			
Below			

    a) When everyone is ready, use the stove lighter to light the downward-pointing match in the alligator clip. Make the first measurement from one side. Record your data in **Table 1** above.
    b) Use the gloves or oven mitt to remove the burned match and insert a new one.
    c) Repeat a) and b) until you have two measurements from each side of the flame, from beneath the flame, and from above the flame.
    d) Calculate the average distance for each direction and record the result in the "Avg. (cm)" column of **Table 1.**
3) Using a dry-erase marker on the laminated graph paper, plot the average values for the "heat detected" distances and then "smoothly" connect the points to show the approximate shape of the heat plume. Show your graph to the instructor. Be prepared for your instructor to ask questions about how the three heat transfer mechanisms are related to the shape of your group's heat plume. **Instructor's initials:**_____
4) Reproduce your group's "average heat plume" in the box above (include appropriately scaled axes).
5) Answer these questions using complete sentences:
    a) When you burn a match in still air, where does most of the heat go?

    b) What appears to be the primary mechanism of heat transfer for a burning match? How were the other two mechanisms apparent in the activity?

    c) How would you expect this pattern to change if there is a slight breeze in the air?