

Grade 7

Science Focus



Lab Workbook

Unit 3

Heat and Temperature

# Using Energy

**Problem:** Can a survey, by students in the school, provide enough information to make conclusions about how energy is used for heating and cooking?

**Hypothesis:** \_\_\_\_\_

**Investigative Procedure:** Follow the directions outlined on page 189

### Data Collection:

Respondent	Energy source to heat building	Energy source to cook	Method	Why it was chosen?

### Analysis of Data:

1. \_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Extend your Knowledge (Optional)**

**Lab Investigation 3-A submitted by** \_\_\_\_\_

**Date** \_\_\_\_\_

# Make Your Own Thermometer

Investigation 3-B  
Pages 196 - 197

**Problem:** Is it possible to make an accurate thermometer from everyday materials?

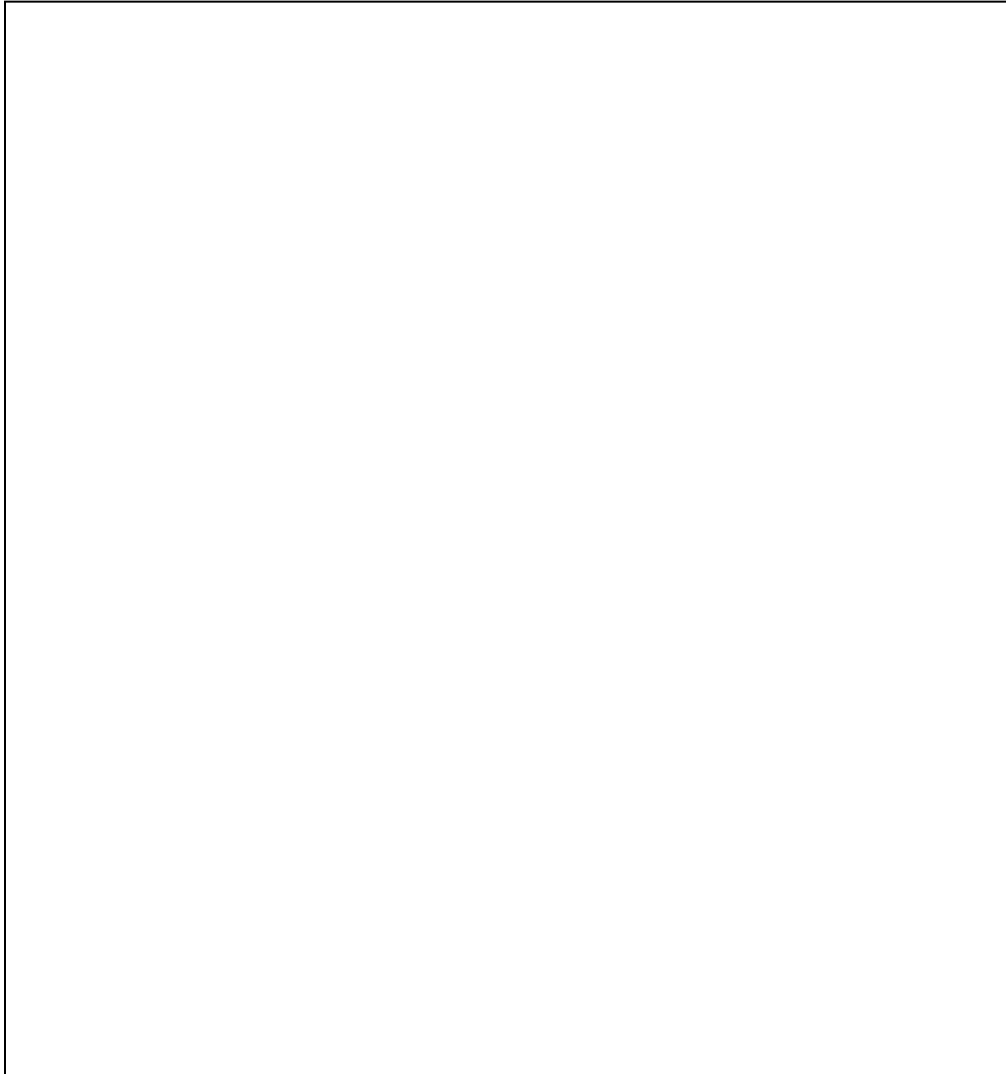
**Hypothesis:** \_\_\_\_\_

\_\_\_\_\_

**Investigative Procedure:** Follow the directions outlined on pages 196 - 197

## Part 1

**Scientific Illustration of Your Thermometer:**



**Evaluation of Model:**

1. \_\_\_\_\_

Heats Up

Cools Down

2. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Part 2**

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

3. \_\_\_\_\_

\_\_\_\_\_

Lab Investigation 3-B submitted by \_\_\_\_\_

Date \_\_\_\_\_



# Expanding Solids

Investigation 3-D  
Pages 212 - 213

**Problem:** What evidence can you observe of solid materials expanding as they are warmed, and contracting as they are cooled?

**Hypothesis:** \_\_\_\_\_

\_\_\_\_\_

## Part 1

**Investigative Procedure:** Follow the directions outlined on page 212

### Analysis of Data:

1. (a) \_\_\_\_\_

(b) \_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

3. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Part 2

**Investigative Procedure:** Follow the directions outlined on page 213

1. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Conclude and Apply:**

5. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Lab Investigation 3-D submitted by** \_\_\_\_\_

**Date** \_\_\_\_\_

# Hot Stuff !

**Challenge:** What is Specific Heat Capacity. **Procedure:** Directions outlined on page 219

## **PART 1:** Rate of Temperature Change(Complete the Tables)

Material	Rate of Temperature Change	Specific Heat
Sand on the Beach	warms _____	_____
Water in the Lake	warms _____	_____

Material	Your Answer	Specific Heat Capacity
Bottom of a cooking pot	_____	High Low
Cold pack for treating injuries	_____	High Low
Water in the Lake	_____	High Low

## **PART 2:** Size of Temperature Change

5. faster \_\_\_\_\_ slower \_\_\_\_\_
6. \_\_\_\_\_
7. (a) \_\_\_\_\_  
(b) \_\_\_\_\_  
(c) \_\_\_\_\_
8. \_\_\_\_\_  
\_\_\_\_\_

Lab 3-E submitted by \_\_\_\_\_

Date \_\_\_\_\_

# The Plateau Problem

Investigation 3-F  
Pages 222 - 223

**Problem:** What happens to the temperature of water while it changes state?

**Hypothesis:** \_\_\_\_\_

**Investigative Procedure:** Follow the directions outlined on pages 222 - 223

**Data Collection:** (Record your observations)

Time (min)	Temperature of melting ice (°C)	Temperature of boiling water (°C)

## **Analysis of Data:**

1. (a) responding variable \_\_\_\_\_

(b) manipulated variable \_\_\_\_\_

2. **Line Graphs (next page)**    3. Marked on graph (a) and (b)    4. Marked on graph

5. (a) \_\_\_\_\_

\_\_\_\_\_

(b) \_\_\_\_\_

\_\_\_\_\_

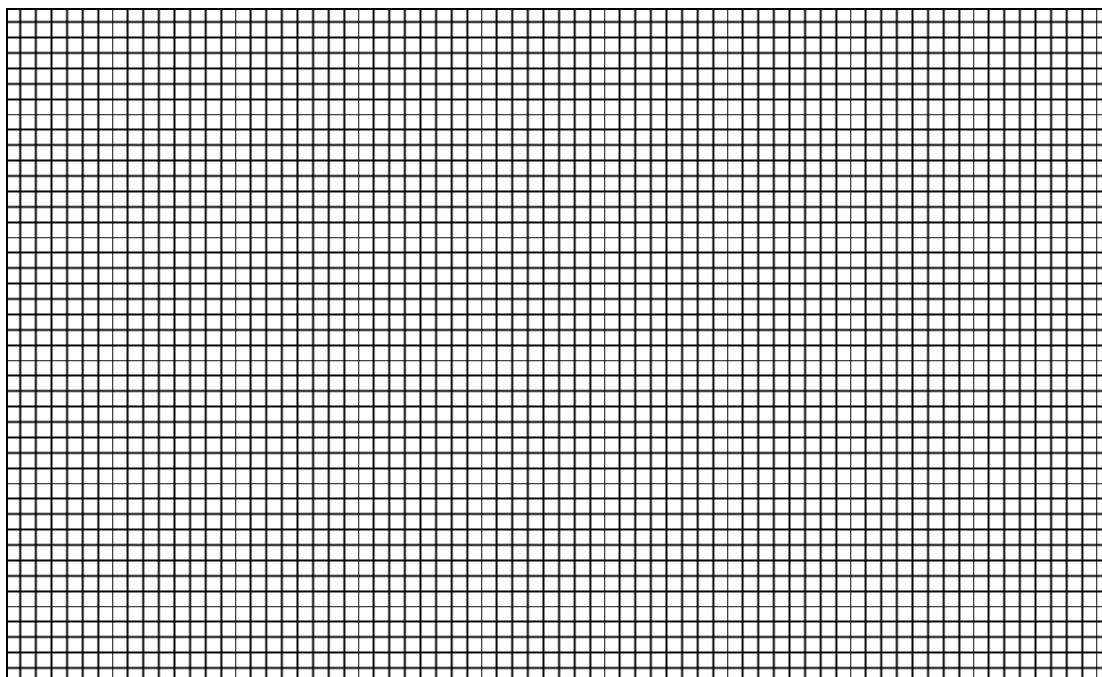
6. **Line Graph (next page)**    7. Marked on graph

8. (Class Averages) **Average melting point** \_\_\_\_\_ °C    **Average boiling point** \_\_\_\_\_ °C

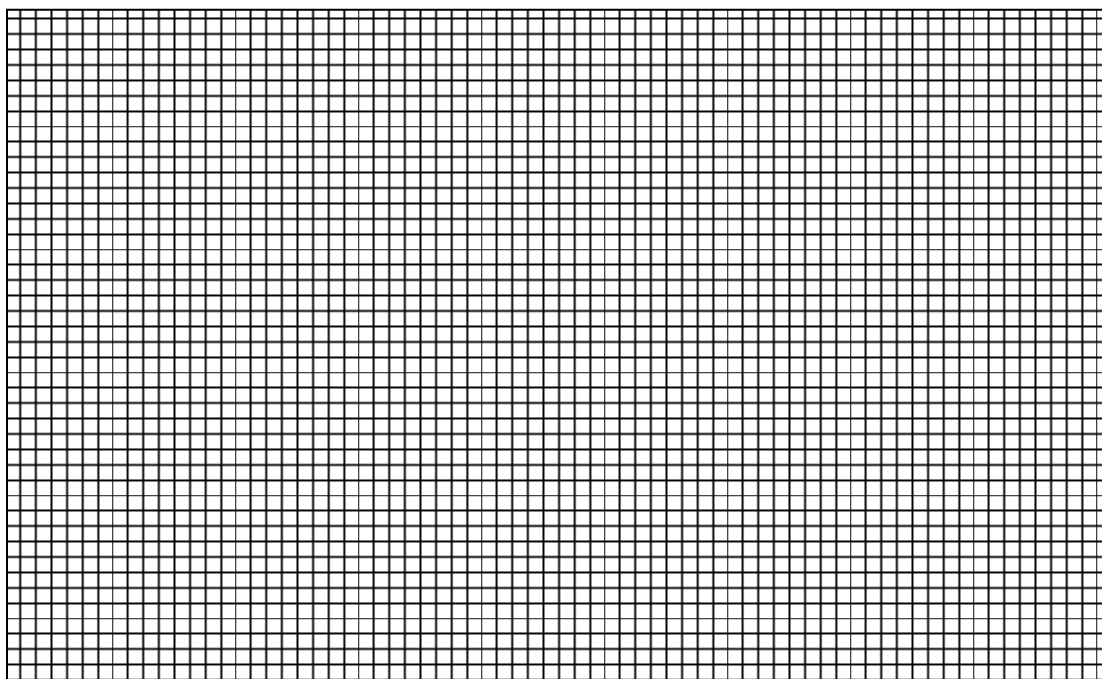
\_\_\_\_\_

\_\_\_\_\_

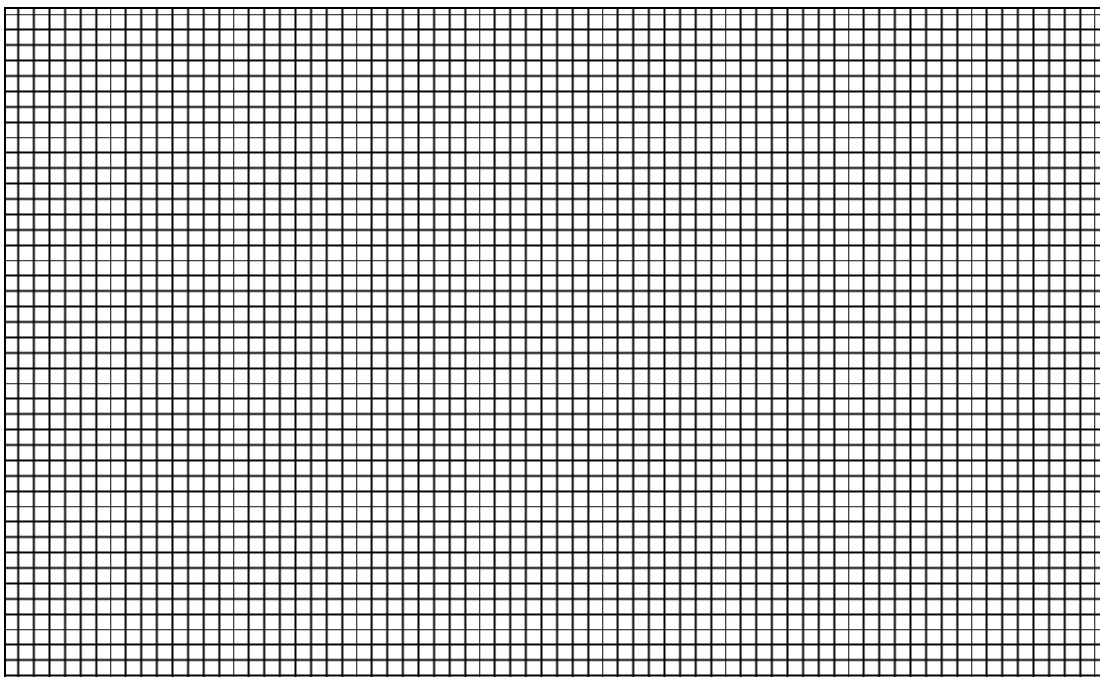
**Title :** \_\_\_\_\_



**Title :** \_\_\_\_\_



**Title :** \_\_\_\_\_



**Conclude and Apply:**

9. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

10. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

11. (a) \_\_\_\_\_  
\_\_\_\_\_

(b) \_\_\_\_\_  
\_\_\_\_\_

**Lab Investigation 3-F submitted by** \_\_\_\_\_

**Date** \_\_\_\_\_

# Comparing Surfaces

**Problem:** How can information about materials help you to make wise choices about which material to use for a particular situation?

**Hypothesis:** \_\_\_\_\_  
\_\_\_\_\_

**Investigative Procedure:** Follow the directions outlined on page 228

**Title :** \_\_\_\_\_

Surface	Ability to absorb	Ability to radiate	Ability to reflect
light-coloured			
dark-coloured			
shiny texture			
dull texture			

**color and texture that is :**

- (a) the best reflector - \_\_\_\_\_
- (b) the worst reflector - \_\_\_\_\_
- (c) the best absorber - \_\_\_\_\_
- (d) the worst radiator - \_\_\_\_\_

## **Analysis of Data:**

1. (a) \_\_\_\_\_  
\_\_\_\_\_
- (b) \_\_\_\_\_  
\_\_\_\_\_
- (c) \_\_\_\_\_  
\_\_\_\_\_
- (d) \_\_\_\_\_  
\_\_\_\_\_

2. (a) \_\_\_\_\_

\_\_\_\_\_

(b) \_\_\_\_\_

\_\_\_\_\_

3. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Lab Investigation 3-G submitted by** \_\_\_\_\_

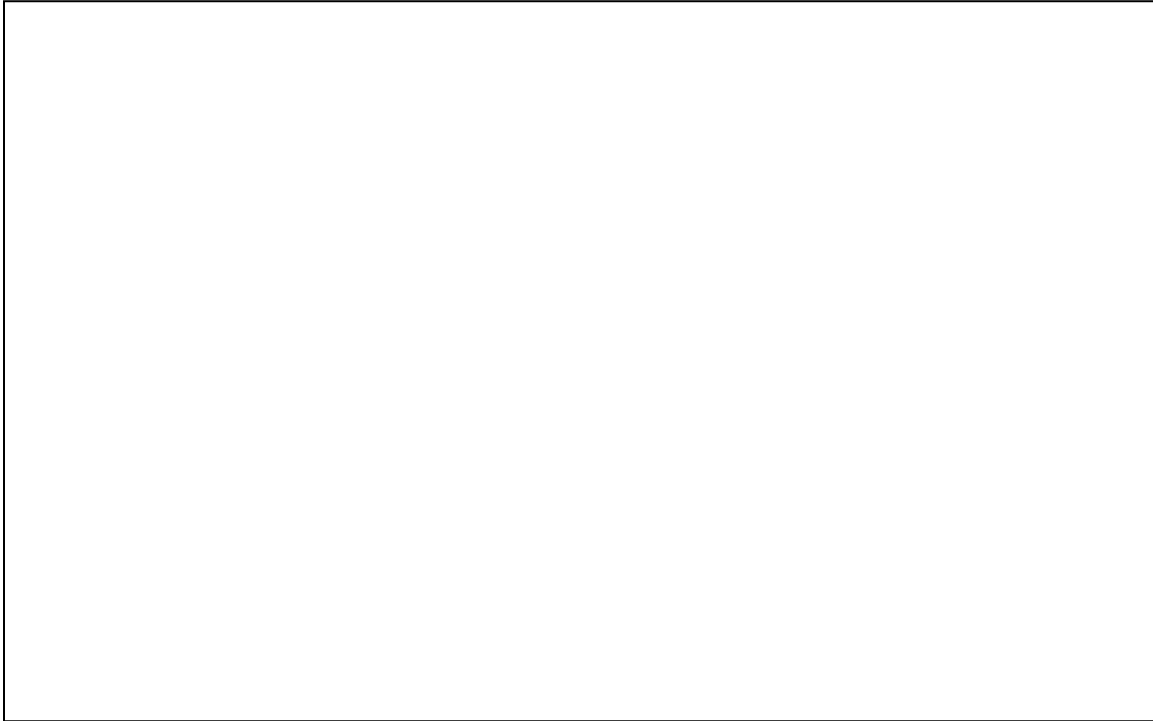
**Date** \_\_\_\_\_

# Making A Transfer

**Problem:** How can you design and build a candle-powered water heater?

**Specifications:** Outlined on page 234

## **Scientific Illustration of Model**



## **Evaluate:**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

Lab Investigation 3- H submitted by \_\_\_\_\_

Date \_\_\_\_\_

# Passive Paint

Investigation 3-I  
Page 242

**Problem:** Can painting walls in a room change the efficiency of a solar heated model?

**This Lab has to be approved before you do it**

**Specifications:** Outlined on page 242

**Hypothesis:** \_\_\_\_\_  
\_\_\_\_\_

## **Scientific Procedure**

Step 1 \_\_\_\_\_

Step 2 \_\_\_\_\_

Step 3 \_\_\_\_\_

Step 4 \_\_\_\_\_

Step 5 \_\_\_\_\_

Step 6 \_\_\_\_\_

Step 7 \_\_\_\_\_

Step 8 \_\_\_\_\_

Step 9 \_\_\_\_\_

## **Variables:**

(a) responding variable \_\_\_\_\_

(b) manipulated variable \_\_\_\_\_

(c) controlled variables \_\_\_\_\_

\_\_\_\_\_

**Scientific Illustration and Observations:**

--

**Observations**


**Evaluate:**

1. \_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
\_\_\_\_\_
3. \_\_\_\_\_

Lab Investigation 3-I submitted by \_\_\_\_\_

Date \_\_\_\_\_

# Simulating the Greenhouse Effect

Investigation 5-J  
Page 246

**Problem:** How can you simulate the greenhouse effect?

**Hypothesis:** \_\_\_\_\_  
\_\_\_\_\_

**Investigative Procedure:** Follow the directions outlined on page 246

**Analysis of Data:**

1. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
\_\_\_\_\_
3. \_\_\_\_\_  
\_\_\_\_\_

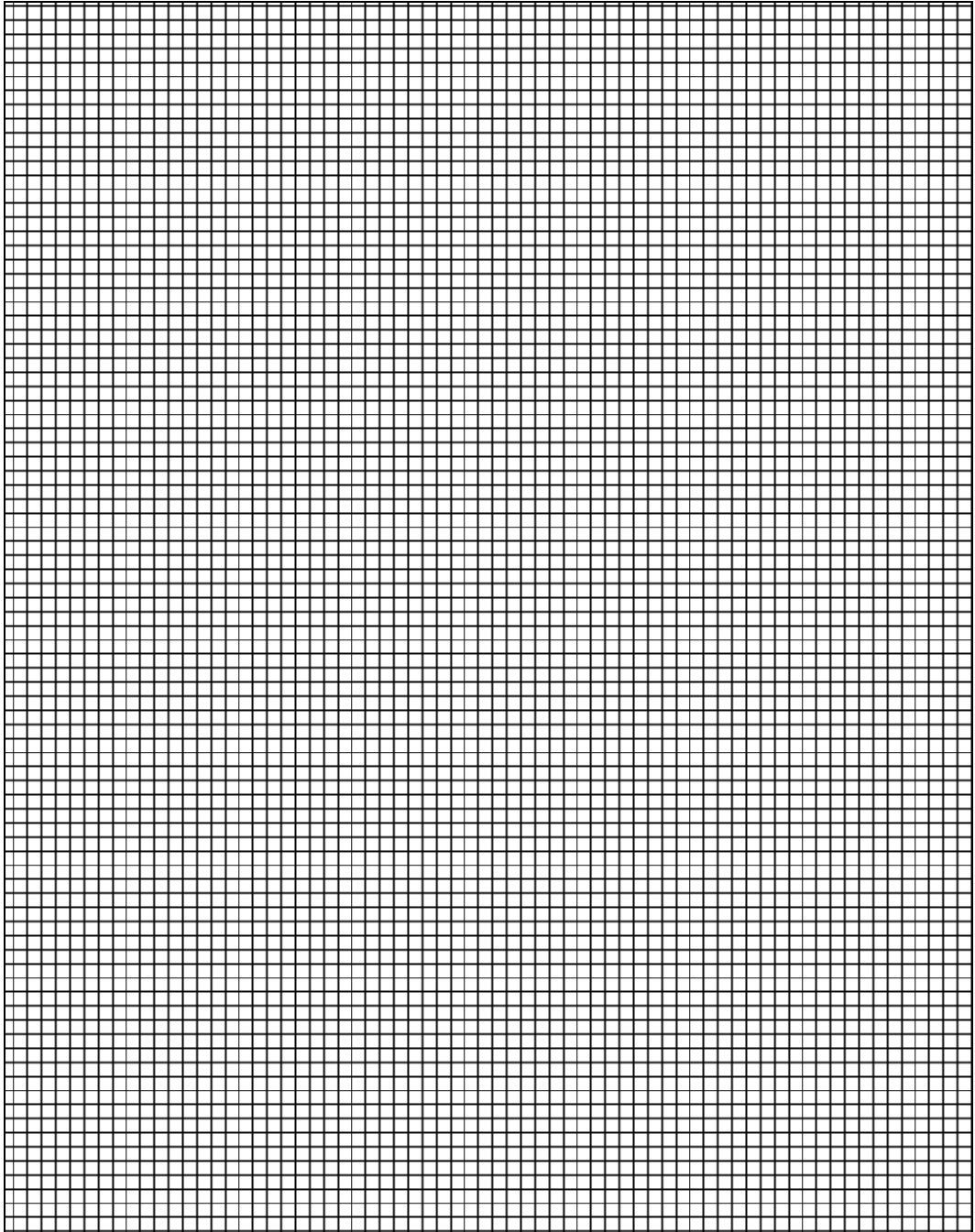
**Conclude and Apply:**

4. \_\_\_\_\_  
\_\_\_\_\_
5. **Line Graph** (Next page)

Lab Investigation 3-J submitted by \_\_\_\_\_

Date \_\_\_\_\_

Title : \_\_\_\_\_



# You Choose !

**Decision Making Situation:** What are the best choices?

**Investigative Procedure:** Follow the directions outlined on page 249

Producing Hot Water (heater)	My Action (or Inaction) and why .....
- insulate	
- turn down thermostat	
Transporting hot water (pipes)	
- insulate	
Using hot water (shower)	
- take fewer showers	
- take shorter showers	
- install energy-saving shower head	
- other alternatives	
Estimate of time (minutes) spent in shower ...	
Amount of Water used (15L X # of minutes)	
Shower time compared to bath time	<p><math>220L / 15L = \underline{\hspace{2cm}}</math></p> <p>You would need to take <u>        </u> showers to use the same amount of water as one bath.</p>

**Analysis of Data:**

- \_\_\_\_\_
- \_\_\_\_\_

3. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

5. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Extension:** (Optional)

1. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Lab Investigation 3-K submitted by \_\_\_\_\_

Date \_\_\_\_\_

# Keep It Warm

Investigation 3-L  
Pages 250 - 251

**Problem:** What is the effect of increasing the thickness of an insulating material on the amount of energy transferred through the insulation?

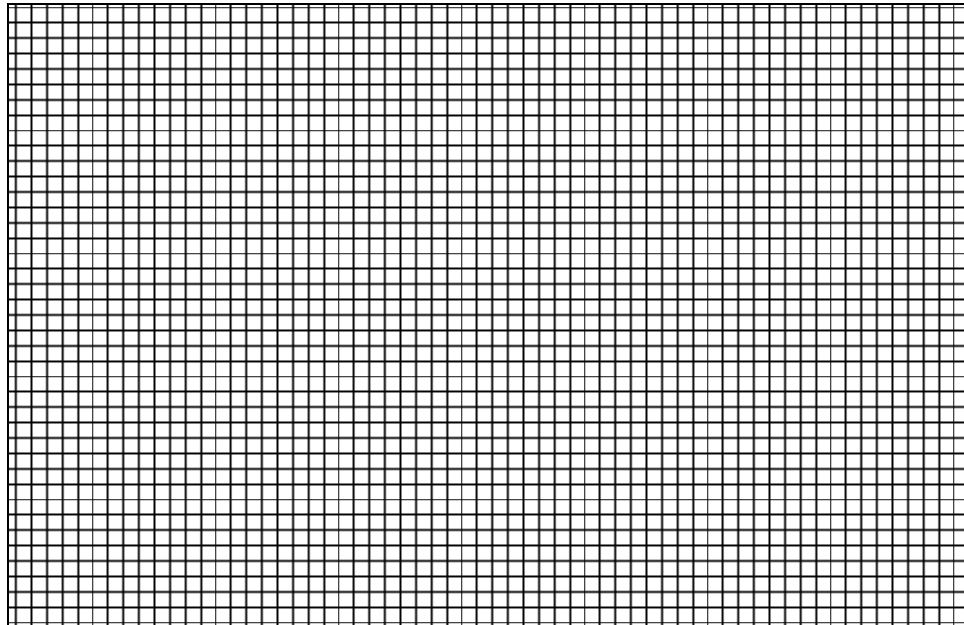
**Hypothesis:** \_\_\_\_\_

**Investigative Procedure:** Follow the directions outlined on page 250

**Data Collection:**

Group	Amount of Paper (sheets)	Temperature After							
		1 min	2 min	3 min	5 min	10 min	15 min	20min	...
1	0								
2	1								
3	2								
4	3								
5	4								
6	5								
7	6								
8	7								

**Results:** Graph Title : \_\_\_\_\_



**Analysis of Data:**

1. \_\_\_\_\_  
\_\_\_\_\_

**2. Variables:**

(a) responding variable \_\_\_\_\_

(b) manipulated variable \_\_\_\_\_

(c) controlled variables \_\_\_\_\_

\_\_\_\_\_

3. \_\_\_\_\_  
\_\_\_\_\_

4. (a) conduction \_\_\_\_\_  
\_\_\_\_\_

(b) convection \_\_\_\_\_

\_\_\_\_\_

(c) radiation \_\_\_\_\_

\_\_\_\_\_

**Conclude and Apply:**

5. \_\_\_\_\_  
\_\_\_\_\_

6. \_\_\_\_\_  
\_\_\_\_\_

7. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

8. \_\_\_\_\_  
\_\_\_\_\_

9. \_\_\_\_\_  
\_\_\_\_\_

**Extension:** (Optional)

10. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Web Pages found:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Lab Investigation 3-L submitted by \_\_\_\_\_

Date \_\_\_\_\_

# How Much Energy?

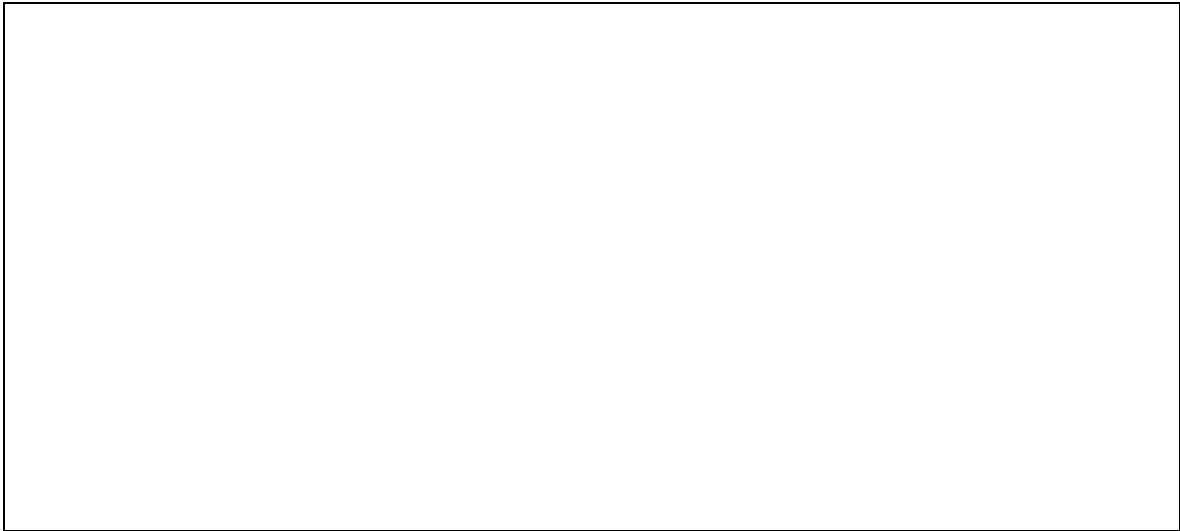
**Problem:** What is the effect of the choice of cooking method on energy use?

**Hypothesis:** \_\_\_\_\_

\_\_\_\_\_

**Investigative Procedure:** Follow the directions outlined on page 253

(Can you design a solar cooker?)



## **Analysis of Data:**

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

3. \_\_\_\_\_

\_\_\_\_\_

Lab Investigation 3-M submitted by \_\_\_\_\_

Date \_\_\_\_\_

Student Project **Analyzing An Issue Using Thermal Energy Efficiently**  
A Simulation - Unit 3 Pages 260 - 261

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Heat and Temperature  
Alternative End of Unit Project

**Reference: Using Thermal Energy Efficiently** (Textbook pgs. 260 – 261)

There are differences in heating principles that many people are unaware of. Your project is to convince them (by way of your Ads) that, there is value in various heating principles, because they can be used as alternatives to the burning of fossil fuels.

The essence of your project is to run an **Ad Campaign** that will get your points across. In other words, you must sell your ideas to your audience with authentic, realistic proof and meaningful proposals that will be attractive to your audience, in order to make them embrace your **Alternative Energy Ideas**.

**Specifications:**

- Your Ad Campaign must consist of **3** (different) – **30 sec** PowerPoint Slide Shows - which (theoretically) would air on T.V.
- Each slide show must focus on only one alternative energy idea you want to promote.
  - 3 different slide shows using one alternative energy, or
  - 3 different slide shows, each with a different energy alternative (approach it from a different perspective in co-operation with the use of other forms of thermal energy)
- Each **slide show must run automatically** and not exceed the time allowed.
- Sample ideas for content (principles) might include:
  - **Passive solar energy**
  - **Active solar energy**
  - **Wind power**
  - **Water power**
  - **Composter power**
  - **Geothermal energy**
- Each slide show should include:
  - The features of the thermal heating principle you are presenting
  - Statistical data used to support your principle
  - Benefits that would be gained by users
  - Cost difference/comparisons
  - **Catch phrase!**
  - **Enduring image!** ( it leaves a lasting impression on the audience)
  - Identify how **Science and Technology** has helped to make the use of this type of alternative energy possible.
- Your Ad Campaign also needs **3 posters**, one for each of the shows you are presenting
  - Each poster should promote only the idea you want to come across from each of the shows and should include the **catch phrase** and **enduring image**
  - Each poster ( **8½ X 11** ) should be **colored** and suitable for posting on a bulletin board, or used as a billboard sign
- Your Ad Campaign will be evaluated by a panel of judges who will use the Rubric you have been provided with for the Power Point Shows and the Posters.

## ‘Alternative Energy’ Ad Campaign Scoring Guide

Criteria	Comments	Score (Circle only one)
<b>Power Point 1</b>		Not Done   1   2   3   4   5   Exemplary
Scientific Principle covered ...		
Advertising Principle used ...		
<b>Power Point 2</b>		Not Done   1   2   3   4   5   Exemplary
Scientific Principle covered ...		
Advertising Principle used ...		
<b>Power Point 3</b>		Not Done   1   2   3   4   5   Exemplary
Scientific Principle covered ...		
Advertising Principle used ...		
<b>Poster 1</b>		Not Done   1   2   3   4   5   Exemplary
<b>Poster 1</b>		Not Done   1   2   3   4   5   Exemplary
<b>Poster 1</b>		Not Done   1   2   3   4   5   Exemplary
<b>Total</b>	<b>/ 30</b>	

### Evaluation Rubric for Project

- 5 - All elements covered, exceeds all expectations
- 4 – All elements covered, surpasses most expectations
- 3 – All elements covered – minimum expectations
- 2 – Most elements covered, within expectations
- 1 – Few elements covered, below expectations