Name: _____

Cold Stuff

WHAT MATERIALS MAKE GOOD INSULATORS?

Problem

Which substance makes the best insulator: cotton, air or steel wool?

Research

Answer the following True or False questions about insulators:

True/False Insulators don't allow heat to pass through them easily.

True/False Most metals make good insulators.

True/False Conduction, convection and radiation are ways that heat can move around.

True/False A good insulator will make an object get warmer.

Identification of Variables

Identify the **Independent Variable**, **Dependent Variable**, **Constants** and **Control** of this experiment:

Independent Variable	
Dependent Variable	
Constants	
Control	

Hypothesis

If cotton, air and steel wool are exposed to cold temperatures, then _____ will be the best insulator.

(cotton / air / steel wool)

Procedure

1. To do this experiment, your team will need:
   - 3 different materials to test
   - A thermometer
   - A stopwatch
   - A bowl filled with 500 milliliters of ice water
2. There are three jobs to do:
   - **Time Keeper** - tells the Temperature Reader when to read the temperature
   - **Temperature Reader** - tells the Data Recorder what the temperature is at that time
   - **Data Recorder** - writes the temperature in the data chart
3. Put the thermometer in one of the three insulators and measure its **Initial Temperature**. This should be somewhere near 20˚ Centigrade. It might take the thermometer a few minutes to read the correct temperature. Give it time to get used to its new home.
4. Record the Initial Temperature on the chart on the next page.
5. Put the insulator in the ice water and start the stopwatch. Hold the insulator in the ice water by the lid. Keep the insulator in the water for **5 minutes**.
6. Measure and record the insulator's temperature **every 30 seconds** for 5 minutes. **DO NOT STOP THE STOPWATCH UNTIL 5 MINUTES HAVE PASSED!!** If you stop the stopwatch early, you won't know how long the insulator has been in the ice water.
7. At the end of five minutes, get ready to test the next insulator. Your team will have to:
   - Reset the stopwatch
   - Get 500 milliliters of new ice water
   - Put the thermometer in the next insulator to measure its initial temperature (Remember: the initial temperature should be somewhere near **20˚ Centigrade**!)
   - Put the insulator in the ice water **after** you have recorded its initial temperature
8. Put the second insulator in the ice water and measure its temperature **every 30 seconds** for 5 minutes, just like you did with the first one. **Don't forget to record your data!**
9. Test the third insulator when you finish with the second one.
10. Make certain that everyone on your team has all of the temperatures written down.
11. Make a line graph for each insulator on the **Cold Stuff Results Graph**.

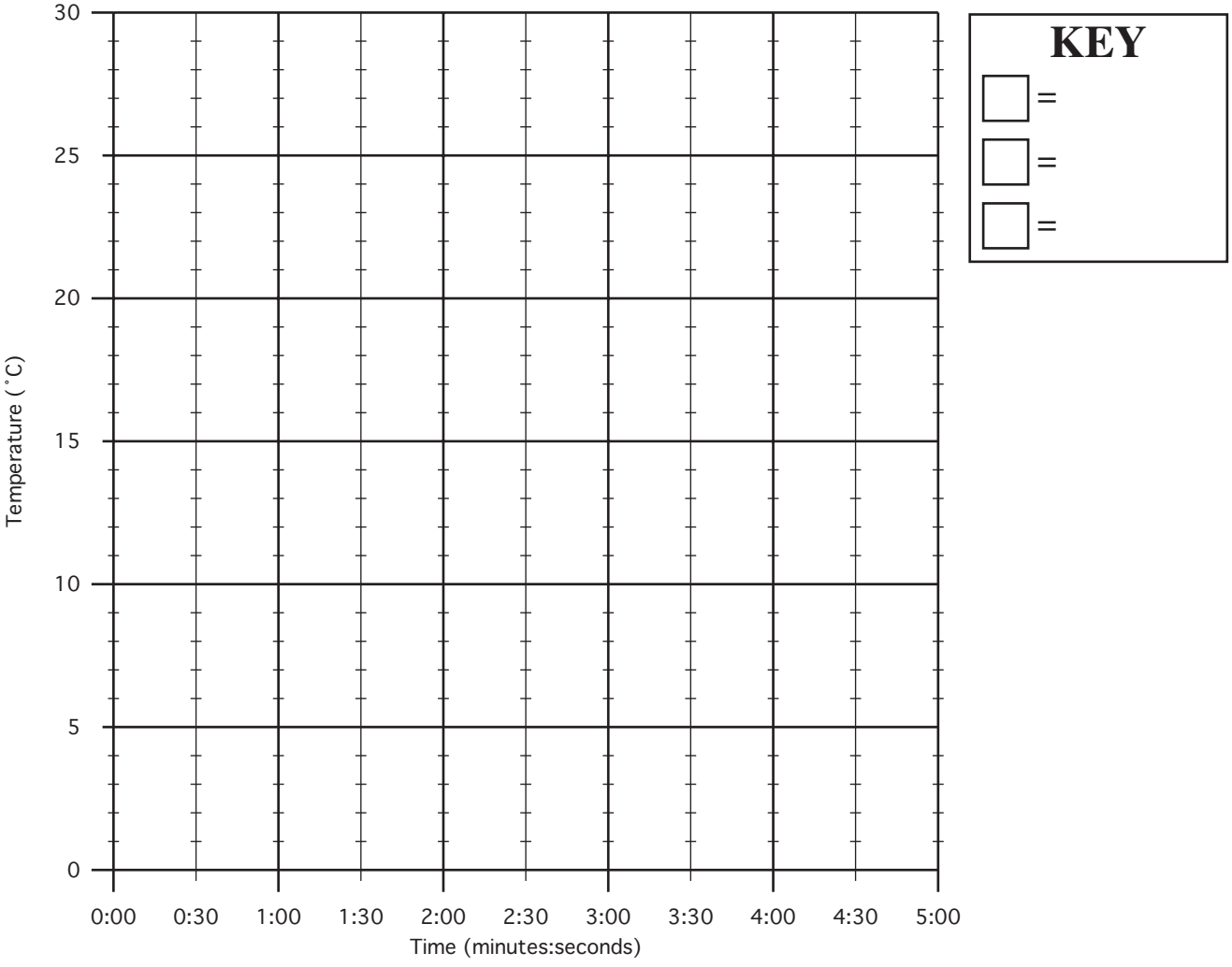
Data Collection and Analysis

Directions: Record the temperature of each insulator **every thirty seconds** over the course of five minutes. Once all of the data has been collected, make a **line graph** for each insulator that shows how the temperature changed. You will need to make a symbol for each insulator so that you will be able to tell them apart on the graph.

Cold Stuff Data Chart

INSULATOR	*(initial temperature)*	TEMPERATURE of insulator at TIME (minutes:seconds)									
	0:00	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00

Cold Stuff Results Graph



Conclusion

THE BEST INSULATOR APPEARS TO BE _____.

Questions to Think About

1. Which container cooled the fastest?

2. Which container took the longest to cool?

3. Where did the heat inside the containers go as they were cooling?

4. Which material that your team tested is the best insulator? How can you tell?

5. What other materials do you think might make good insulators?

6. What materials would make poor insulators?