Name _____ Date _____ Period _____

COLD STUFF

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

RESEARCH: Answer the following True or False questions about insulators:

1. Insulators don't allow heat to pass through them easily T / F
2. Most metals make good insulators T / F
3. Conduction, convection and radiation are ways that heat can move around T / F
4. A good insulator will make an object get warmer T / F

HYPOTHESIS: I think that _____will be the best insulator.
(cotton, air, steel wool)

MATERIALS:

- 3 different materials to test
- Thermometer
- Stopwatch
- Bowl filled with 500 milliliters of ice water

PROCEDURE

1. From your team, assign a **Time Keeper** (tells the Temperature Reader when to read the temperature), a **Temperature Reader** (tells the Data Recorder what the temperature is at that time), and a **Data Recorder** (writes the temperature in the data chart)
2. Put the thermometer in one of the three insulators and measure its **Initial Temperature**. This should be somewhere near 20° C. It might take the thermometer a few minutes to read the correct temperature. Give it time to get used to its new home.
3. Record the Initial Temperature on the chart on the next page.
4. 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**.
5. 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.
6. At the end of five minutes, get ready to test the next insulator. Your team will have to:
   a. Reset the stopwatch
   b. Get 500 milliliters of new ice water

c. Put the thermometer in the next insulator to measure its initial temperature (Remember: the initial temperature should be somewhere near **20° Centigrade**!)

d. Put the insulator in the ice water **after** you have recorded its initial temperature

7. 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!**

8. Test the third insulator when you finish with the second one.

9. Make certain that everyone on your team has all of the temperatures written down.

10. Make a line graph for each insulator on the Data Table.

OBSERVATIONS:

DATA TABLE 1

For each insulator: **Record** the Initial Temperature (somewhere near 20° C)
Start the stopwatch when you put the insulator in the ice water
Record the temperature EVERY 20 SECONDS
Stop the stopwatch when it reaches 5 minutes

INSULATOR	TEMPERAURE 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**

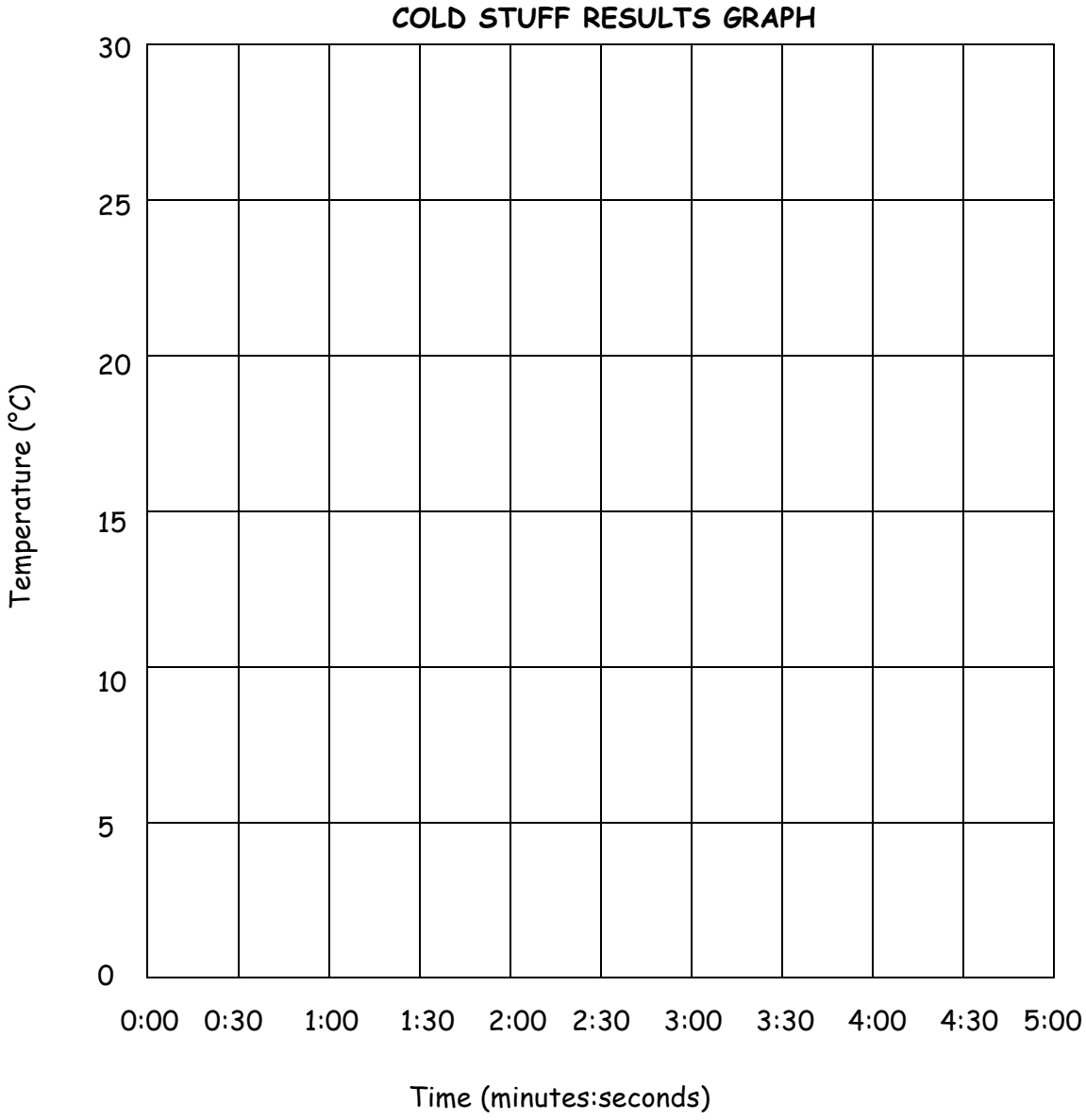
DATA TABLE 2

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

Independent Variable	
Dependent Variable	
Constants	
Control	

GRAPH:

Make a LINE GRAPH for each of the three insulators tested. Graph one insulator at a time. Start by plotting the insulator's initial temperature. Then plot the insulator's temperature at 30 seconds, one minute, one and a half minutes, all the way to 5 minutes. Plot the other two insulators on the graph in the same way. You will have to make different symbols for each insulator so that you can tell them apart.



ANALYSIS/CONCLUSIONS:

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 other materials make poor insulators?

_____

_____

_____

_____

ADDITIONAL ANALYSIS:

The lab you just did was an experiment in the transfer of heat. Heat can be transferred by three different means:

- **Radiation** the transfer of heat by means of rays
- **Conduction** the transfer of heat through two or more materials that are touching
- **Convection** the transfer of heat by the movement of a gas, like air, or a liquid, like water

Which method of heat transfer best defines each scenario: conduction, convection, or radiation?

1. You wake up on a Saturday morning and are glad you don't have to go to school. You sit outside in the sun because you don't really feel like doing anything at all. The heat from the sun is starting to make you sweat. _____

2. Last night you went to the store and bought fruit punch, so you have a big glass of it to help cool you off. _____

7. The news is on and the forecast calls for hot and muggy weather. The temperature in the house is rising too so you turn on the air conditioner. _____

6. It's boring sitting in the house on your day off, so you go to the pool to meet your friends. You jump in and the water is freezing but you don't want to look like a wimp so you try to get used to it. Your lips are turning blue and your skin now feels cold. _____

5. You climb out of the pool and lie on the warm concrete to warm your body back up. _____

4. You're beginning to feel comfortable again but don't want to get too warm, so you move to a place in the shade. It's getting hotter and hotter and you're starting to sweat again, even though you are in the shade. _____

3. You decide that it wasn't so bad at home after all and you're getting hungry anyway so you go back home and cool off in the air conditioning on the sofa with a good book.. _____