Name: _____ Team Member(s): _____

DESIGN A THERMOS LAB

DIRECTIONS: Using the materials list below, design a thermos that keeps liquid hot.

CONSTRAINTS:

- must be able to hold with one hand
- cost under $5 to construct
- can be easily taken apart.
- liquid can be easily poured in and out

plastic bottle $1	aluminum foil $0.25/30 cm²	bubble wrap $1/sq ft	fabric $0.50/30 cm²	quilt lining $0.75/30 cm²	tape $0.25/cm	newspaper $.25 sheet
paper bag $0.50 each	polyester fur $1/30 cm²	cotton stuffing $0.75/bag	polyester stuffing $1/bag	polyester fleece $0.75/30 cm²	Rubber band $.75	wool $1/30 cm²

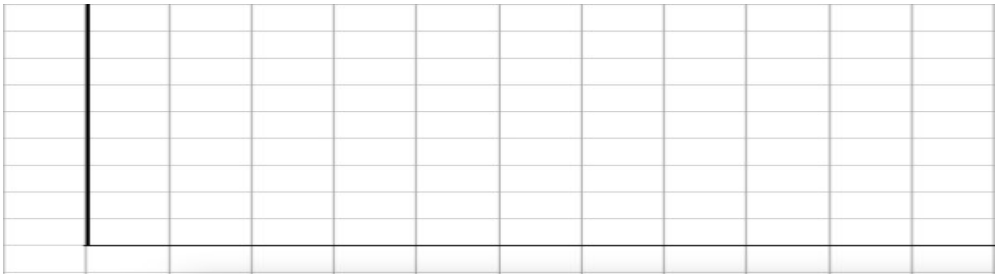
1. Decide upon the materials you will need for your first design, complete your materials budget table and add up your cost. You can trade out materials later if you need.

MATERIALS BUDGET 1

material	cost	quantity	total cost
bottle	$1	1	$1
		Total Project Cost	

DESIGN 1 SCHEMATIC

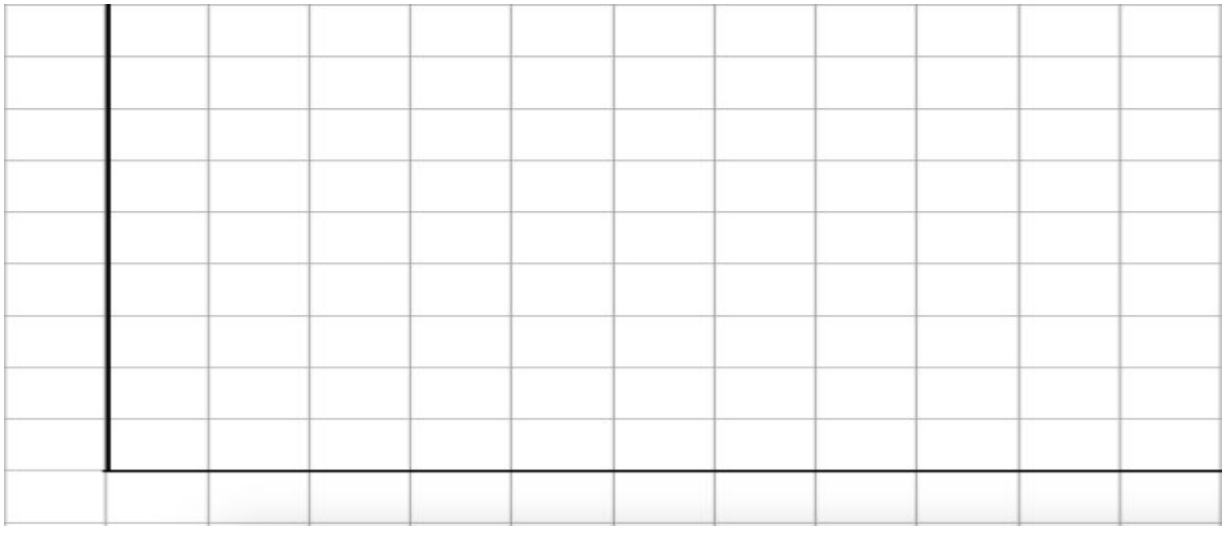
2. ***PREDICT*** what the results may look like, do you think there will be a fast, steady, or slow drop in temperature? Sketch a simple graph below and write your prediction sentence.



DATA TABLE 1

Minutes	Temperature °C	Difference °C
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
total temperature difference		

GRAPH 1 Use the grid below to graph your data. Be sure to label everything and include a title.



Now it's time to improve your design.
Go back to the drawing board and think of a better way to design your thermos. Start your design process over again, test your results and make another graph.

MATERIALS BUDGET 2

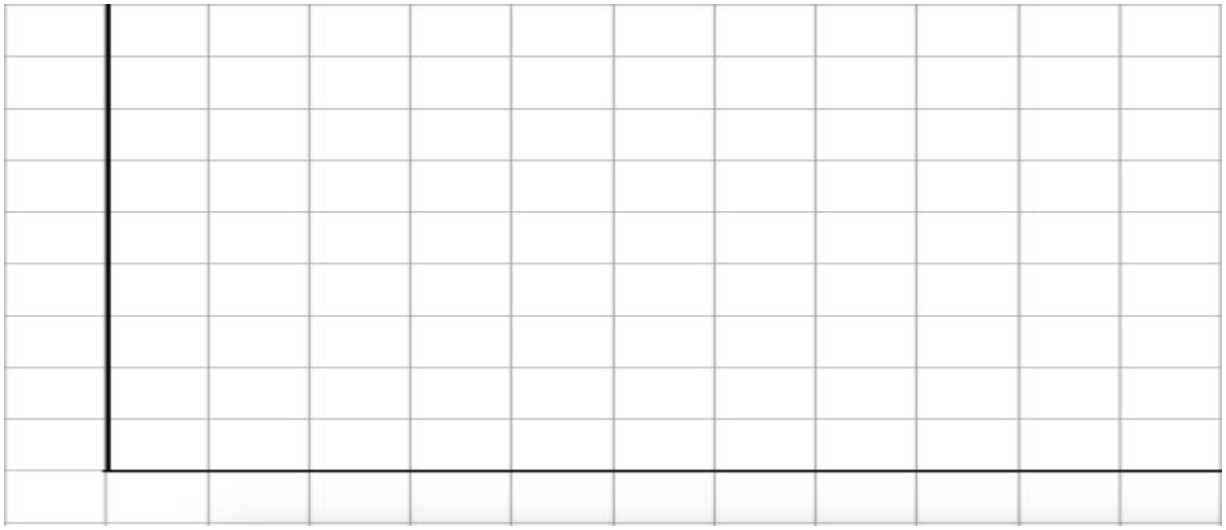
material	cost	quantity	total cost
bottle	$1	1	$1
Total Project Cost			

DESIGN 2 SCHEMATIC

DATA TABLE 2

Minutes	Temperature °C	Difference °C
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
total temperature difference		

GRAPH 2 Use the grid below to graph your data. Be sure to label everything and include a title.



QUESTIONS

1. Looking at all three graphs, how did your prediction compare with the actual results?

2. Compare the temperature difference between your two designs.

3. Which design kept water hot the longest and why do you think it did?

4. Of the materials you used, which do you think were the best insulators? What properties of these materials might make them good insulators?

5. Do you think the rate of heat loss would be the same if
   a. You started with a different temperature?

   b. The bottle was in a different environment?

6. Go online and find out how a real thermos works. Explain and draw a diagram below.