Name: _____ Date: _____ Class: _____

Measuring Heat Transfer Worksheet

Liquid	Specific Heat Capacity (kJ/kg-K)	Mass in 500 ml of Fluid (kg)
A	3.93	0.51
B	4.19	0.50
C	2.10	0.66
D	1.67	0.46
E	2.72	0.71

Question: Examine the list of unknown liquids in the table above. In the space below, write which of the liquids you think would work best as a radiator fluid to cool the engine. Explain your thinking.

Instructions

- When instructed to do so, put your beaker of liquid on the hot pad and take the initial temperature reading. Record all temperature readings in the table below.
- **After a minute,** stir the liquid gently with the thermometer and take a temperature reading.
  - Rotate who takes the temperature measurement.
- Take temperature readings once every minute for 10 minutes. After your final temperature measurement, turn off the hot plate.

Time (minutes)	Temperature (^oC)	Temperature (K)
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

- **Leave the beaker on the hot plate** and go back to your seat and complete the worksheet:
  - Graph temperature vs. time
  - Calculate the heat transferred during the 10-minute time interval
  - Answer the questions
- Have one person from your group write your results from ΔT=10 minutes in the table on the classroom board so the class can see all results. Record class results on the page 2 table.

Graph Your Results

For fluid: _____

Calculate the heat transferred during the entire 10-minute time period using the equation:

$$Q = m*C*\Delta T$$

where Q is heat (kJ), m is the mass of material (kg), C is specific heat capacity (kJ/kg-K), and ΔT is the change in temperature (K).

Class Results

Liquid	Heat Transferred During 10min (kJ)
A	
B	
C	
D	
E	

Questions

1. **Define heat and describe the three different ways that it can be transferred.**

2. **Explain what it means for a liquid to have a high specific heat capacity? A low specific heat capacity?**

3. **Looking at your results, how does the specific heat capacity affect the heat transferred to the different liquids?**

4. **Which liquid to you think would work as the best radiator fluid? Why?**

5. **What other factors should engineers consider besides a liquid's specific heat capacity when choosing a radiator liquid?**

6. **A businesswoman travelling cross-country in her car notices the temperature gauge on her dashboard is in the red and reads 150ºC. She pulls over and inspects her radiator fluid. She sees that there is no coolant in the radiator. Her car's engine is made of cast iron (specific heat = 0.460 kJ/kg-K) and she estimates that it is 200 kilograms. She wants to get the engine down to a safe temperature of 100ºC. She has a jug of water at 20ºC in her trunk. What volume of water does she need to put into the radiator? Assume that the water and engine exchange heat only with each other, not with the surrounding air or other mechanical parts.**