Name: _____ Period: _____

Lab 11A: Temperature and Heat (25)

Essential Question: How are temperature and heat related?

Part A: Mixing Hot and Cold Water

1. Make a prediction. Suppose you mix equal amounts of water, but one is 0°C and the other is 50. What do you think the final temperature will be? Why?

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- Set your Data Collector to "Meter Mode."
- Get 50mL or ice water and 50mL of hot water.
- Measure the temperature of each the hot and the cold temperatures separately and write the values in the table below.
- Pour the hot into the cold water and mix it with the temp. probe. Record the temperature and record in the table below.
- Give the water BACK to Ms. Grapes so that she can re-heat it for another class.

2. Fill in the Table 1: Temperature data for mixing equal masses of water

Cold Water Temp. (°C)	Hot Water Temp. (°C)	Mixture Temp. (°C)

3. Did the result agree with your prediction (+ or – 5° C)? Circle one. Yes/No
4. If yes, or imagining that it did not, what are TWO possible sources of error in this experiment?
   a. _____
   b. _____

Part B: Combining Hot Metal and Cold Water

- Get fresh hot and cold water from Ms. Grapes and an aluminum cube.
- Drop the aluminum cube in the hot water
- Record the temperatures of the cold and hot water.
- Use the tongs to take the aluminum cube out of the hot water and into the cold water
- Record the new temperature of the cold water

5. Fill in Table 2: Temperature data for combining water and hot metal

Metal mass (g)	Initial metal temp (°C)	Cold water mass (g)	Initial water temp (°C)	Mixture temp (°C)
45g		45g		

6. Explain what is happening between the aluminum cube and water in terms of temperature and energy/heat transfer.

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7. The specific heat of water is 4.179 J/g and the specific heat of aluminum is .902 J/g. What does this mean?

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8. How can the above values explain why the temperature did not stabilize exactly halfway between the metal and the cold water even though they were equal masses?

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11B The Specific Heat of Different Materials

1. You are going to repeat what you did with the aluminum cube in 11A with 3 other materials. Between each metal reading you must get FRESH hot water every time. This time, you will be using room temperature water instead of cold water to put the metal into. Record your readings in the table below.

Table 1: Mass and temperature data

		A	B	C
		Material 1: _____	Material 2: _____	Material 3: _____
1	Mass of metal (g)			
2	Mass of water (g)	100g	100g	100g
3	Room temp. water (°C)			
4	Temp. of hot water/metal (°C)			
5	Final temp. of mixture (°C)			
6	Temp change of water (5-3)			
7	Temp change of metal (5-4)			
8	Heat gained by water			

$E=mC_p\ (T_2-T_1)$ where: **m**=mass (100g) | C_p = specific heat of water (4.184 J/g °C) | **(T2-T1)** = row 6 in table

2. Use the heat equation above to calculate the heat gained (joules) by the water and put in row 8 in the table. Show your work here:
    a. Material 1:

    b. Material 2:

    c. Material 3:

3. Place in order the materials that are EASY to raise the temperature of (#1) to those that are hardest (#3)

    1: _____

    2: _____

    3: _____