Packet 4

Substance	Specific Heat (J/g·°C)	Substance	S. H. (J/g·°C)	Substance	S. H. (J/g·°C)
Hydrogen	14.267	**Helium**	5.300	**Gold**	0.129
$H_2O(L)$	***4.184***	**Lithium**	3.56	**Lead**	0.160
Ethanol	2.460	**Ethylene glycol**	2.200	**Silver**	0.240
Ice	2.010	**Sodium**	1.23	**Mercury**	0.140
Air	1.020	**Magnesium**	1.020	**Tin**	0.21
Aluminum	0.900	**Concrete**	0.880	**Sand**	0.290
Potassium	0.75	**Sulfur**	0.73	**Brass**	0.380
Calcium	0.650	**Iron**	0.444	**Copper**	0.385
Nickel	0.440	**Zinc**	0.390		

1. What is the difference between heat and thermal energy?

2. What units are generally used to describe energy? Show the derivation of the unit if you can.

3. Describe the conversion of energy for each of the following situations.

a) A pitcher winding up and throwing a 70 mi/hr pitch.
b) A person striking a match on a box.
c) Turning on an electric blender

4. Describe and give an example of each type of energy below.
Put in your own words and do NOT use the examples from the website or class.

Radiant	Kinetic	Thermal	Chemical	Potential

5. What is the final temperature when a 100 g piece of silver at 200°C is placed in 200 mL of water at 20°C?

6. What is the final temperature is 100 g of silver at 200°C is placed in a 200 mL of mercury at 20°C? Density of Hg is 13.59 kg/L

7. A 150 g sample of aluminum at 250°C is placed in 1.000 L of water at 15°C, what is the final temperature?

8. A 150 g sample of aluminum at 250°C is placed in .9009 L of ethylene glycol at 15°C**,** what is the final temperature?

9. A 150 g sample of aluminum at 250°C is placed in a mixture of 500 g H_2O and 500 g ethylene glycol at 15°C, what is the final temperature of the mixture?

Demonstration – Changes in Energy

There will be several stations setup in the class room. For each activity you will need to describe the changes in energy that are occurring. You will hand in a typed description of the energy changes that occur during each of the following processes. I will be performing #2.

1. Light a match
2. Reaction of a gummy bear with molten potassium chlorate.
3. Addition of concentrated H_2SO_4 to a sample of water (be ***careful*** the sulfuric acid is very concentrated and corrosive)
4. Select an unknown salt. Wet a Q-tip and collect some of the salt on the wet end. Put over a Bunsen burner.
5. Plug in the pickle.

Lab

We have gone over specific heats of different substances and we are now going to put that idea to the test.

Procedure

1. Obtain a sample of either aluminum, iron, or nickel
2. Mass the sample of the metal.
3. Obtain approximately 250 mL of water. Be sure you have enough water to cover the metal sample in the Styrofoam cup.
4. Mass the water, it is important that your mass in accurate.
5. Using a thermometer measure the temperature of the water to the nearest 0.1°C.
6. Ignite a Bunsen burner and heat your metal sample. DO NOT over heat the metal, Bunsen burners can get extremely hot and the goal of this lab is not to deform the metal pieces.
7. When you feel the metal has heated up sufficiently, quickly put the metal close to the surface of the water and drop it in. The metal should be close to the surface, if you drop it from too high some of the water will splash out.
8. Record the *highest* temperature the water reaches, it is important that you pay attention during this part.
9. Mass the metal and water mixture.
10. Repeat the steps with the other two metal samples

Questions

1. Create a data table indicating the following: metal, mass of metal, mass of water, initial temperature of water, final temperature of water
2. What was the final temperature of each metal?
3. Calculate the initial temperature of each metal sample.
4. Which metal increased the temperature of the water the most and why?
5. Determine the mass of water after dropping the metal in.
6. If the mass of the water is different please provide and explanation as to why. If it is not different does that make sense?