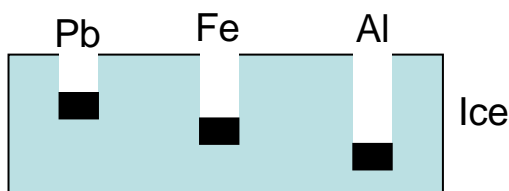


CHM 151
Recitation #7 15 October 2008

1. A glass containing 200 g of H_2O at 20°C was placed in a refrigerator. The water *loses* $1.17 \times 10^4 \text{ J}$ of heat as it cools to a constant temperature. What is the new **temperature** of the water? [$s_{\text{H}_2\text{O}} = 4.184 \text{ J/g}\cdot^\circ\text{C}$]

2. A sheet of gold weighing 10.0 g and at a temperature of 18.0°C is placed flat on a sheet of iron weighing 20.0 g and at a temperature of 55.6°C . What is the **final temperature** of the combined metals? Assume that no heat is lost to the surroundings. (*Hint*: The heat gained by the gold must be equal to the heat lost by iron.) [$s_{\text{Fe}} = 0.444 \text{ J/g}\cdot^\circ\text{C}$, $s_{\text{Au}} = 0.129 \text{ J/g}\cdot^\circ\text{C}$]

3. You are out on the lake ice fishing in Wisconsin and decide to perform an experiment. In your fishing box you have 3 weights, each with a mass of 500g. One weight is Lead, one is Aluminum, and the third is Iron. You warm each weight in your hand to a final temperature of 98.6°C and place them on the ice. You make the following observation (see picture). Which metal has the highest heat capacity? Explain to your fishing buddies how you know this.



4. A particular form of electromagnetic radiation has a frequency of $8.11 \times 10^{14} \text{ Hz}$.
 - (a) What is its **wavelength** in nanometers?

 - (b) What is the **energy** (in joules) of one quantum of this radiation?

5. Which of the following regions of the electromagnetic spectrum has the **lowest energy** associated with it?
- [a] ultraviolet ($\lambda = 1.0 \times 10^{-7}$ m) [b] X-ray ($\lambda = 1.0 \times 10^{-10}$ m)
 [c] infrared ($\lambda = 1.0 \times 10^{-4}$ m) [d] visible ($\lambda = 5.0 \times 10^{-7}$ m)
 [e] microwave ($\lambda = 1.0 \times 10^{-2}$ m)
6. If the **frequency** of electromagnetic radiation **doubles**, which of the following statements is **false**.
- a) The wavelength of the radiation is cut in half.
 b) The energy of the radiation doubles.
 c) The number of cycles passing a given point per unit time doubles.
 d) The velocity of the radiation doubles.
7. Which electronic transition in the spectrum of the hydrogen atom results in the **emission** of light with the **shortest** wavelength?
- a) $n = 2$ to $n = 6$ b) $n = 2$ to $n = 4$ c) $n = 4$ to $n = 1$
 d) $n = 7$ to $n = 1$ e) $n = 2$ to $n = 1$
8. Calculate the **energy** of the 6th orbit (energy level) in a hydrogen atom.

Potentially Useful Information

$$q = ms\Delta t$$

$$\Delta t = t_f - t_i$$

$$s_{\text{H}_2\text{O}} = 4.184 \text{ J/g}\cdot^\circ\text{C}$$

$$c = \lambda\nu$$

$$E = h\nu$$

$$E = \frac{hc}{\lambda}$$

$$c = 3.00 \times 10^8 \text{ m/s}$$

$$h = 6.626 \times 10^{-34} \text{ J}\cdot\text{s}$$

$$E_n = -R_{\text{H}} \left(\frac{1}{n^2} \right)$$

$$R_{\text{H}} = 2.18 \times 10^{-18} \text{ J}$$

$$\Delta E = E_f - E_i$$