NAME_____ SAMPLE!!

HEAT LAB 05:
PART ONE
PREDICT THE TEMPERATURE!!
Take an amount of Hot Water and half the amount of Cold Water.
Predict what you think the final temperature will be!
Mix Them!

OBJECT	MASS	StartingTemp	Final Temp	SpecificHeat
Hot Water	***.213 kg***	***78 °C***	***55***	4187 J/kg/°C
Cold Water	***.098 kg***	***17 °C***	***55***	4187 J/kg/°C

How much heat did the Hot Water lose?

ΔQ = mCΔT =
.213kg* (4187)*(78-55)=
.213kg *4187*(23°)=20, 512 Joules

How much heat did the Cold Water gain?

ΔQ=mCΔT=
.098*4187*(55-17)=
.098*4187*(38°)= 15, 592 Joules

Are these the same? Should they be? What should've the final temperature been? What is your percent error? Why? Explain what happened in terms of the molecules and heat transfer.

We lost 20,512-15,592 Joules of Heat= 4920 Joules of heat lost to air

The final temperature for this should have been 58.78°C
mCΔT = mCΔT

.213 (4187)(78 – Tf) = .098 (4187) (Tf-17)
891.831 (78-Tf) = 410.326 (Tf-17)
69562.8 – 891.8 Tf = 410.3Tf -6975.5
76538.3 = 1302.1Tf
Tf = 76538.3/1302.1 = 58.78 °C

Percent Error = |Theor-Actual| / Theor =
(58.78-55)/58.75 = 3.78/58.78= 6.43 % error

PART TWO:

Determine the specific heat of aluminum!

Place an amount of HOT water in an aluminum calorimeter, along with an amount of an ice cube. When the ice melts, determine the final temperature and the specific heat of the calorimeter.

OBJECT	MASS	START TEMP	FINAL TEMP	SPECIFIC HEAT	Heat of Fusion
Al Cup	***.016 kg***	***23°C***	***46°C***	??	XXXXX
Water	***.110 kg***	***75 ° C***	***46°C***	4187 J/kg/°C	XXXX
ICE	***.022 kg***	***0 °C***	***46°C***	2090 J/kg/°C	335,000 J/kg

How much energy did the hot water lose?
The hot water lost ΔQ= mCΔT = .110 * 4187*(75-46)
=.110*4187*29=
=13356 Joules

How much energy did the ice gain by melting?
By melting (solid to liquid) = m Hf = .022 * 335,000=
=7370 Joules

How much energy did the ice gain by heating up (as water)?
As Ice Water it gained ΔQ= mCΔT = .022 * 4187*(46-0)
=.022*4187*46=
=4237.244 Joules

How much energy must've the Al cup gained?
Hot Water Lost = Ice Gained (Melting + Heating) + Al Cup gained
13356 = (7370 + 4237.244) + Al Cup gained
Al Cup gained = 13356.23 – (7370+4237.244) = 1748.986 Joules

What is the specific heat of Al according to your lab?
It gained ΔQ= mCΔT = .016 * C_{Al}*(46-23)= 1748.986
C_{Al}= 1748.986/(.016*23) = 4752.679348 Joules

How does this compare with the real specific heat?
The real specific heat is 900 J/kg°C

What is your percent error?
that gives me a percent error of (4752.6-900)/900 = 428 %!!

Why?
Well, I wasn't too far off! There was probably heat loss to the surroundings, and I didn't wait long enough…. The cup only SHOULD have gained (.016 * 900 *23)=331.2 Joules of heat…I calculated it gained 1748 Joules, so 1415 Joules was lost to the surroundings.

The real final temperature should have been around 48.5 °C

.110 * 4187*(75-Tf) = .022 * 335,000 + .022 * 4187*(Tf-0) + .016 * 900*(Tf-23)
algebra or math solver shows the real final temp….
Explain what happened in terms of the molecules and heat transfer.