Review #1 for Wednesday's Test

VAHS CΛ3MIs+rγ

Mr. Genest

Name________________

Date________________

[redacted]

For Test 3 you should go re-do all homework we had since February 25. Go to the website to find it. The sheet you are holding will give practice in most of the types of math problems we solved.

I. If you know the reaction AND you already know the ΔH…
• Do a railroad tracks style unit conversion • You might need to convert grams to moles using the periodic table. • For examples of this type of problem look on pages 304-306

II. If you know the reaction but you need to find the **ΔH** …	III. If hot water or another hot substance is gaining or losing heat and you know three of the four values for q, m, C, or ΔT
• Write a balanced reaction • Look up the energies of each substance using a table of Standard Heat of Formation. • Plug the table numbers into the following equation ΔH = (ΔH of the products formation) – (ΔH of the reactants formation) • Remember to multiply each energy by its coefficient in the balanced reaction. Be careful of all the double negative signs. To be safe, punch your answer into the calculator more than once to avoid careless goofs.	• Use your data to complete the equation **q = m C ΔT** • For calculating metal dropped into water you should do one entire formula where all the letters are data for the water. Then do one entire formula where all the letters are data for the metal.

Use Method 1

For the reaction of $CaCl_2 + Na_2CO_3 \rightarrow CaCO_3 + 2NaCl$ ΔH = -360 kJ 3. Find how much heat is released when 9.2 **moles** of $CaCl_2$ react.	4. Find how much heat is released when 100. ***grams*** of $CaCl_2$ react

$$9.2 \text{ moles } CaCl_2 \times \left(\frac{-360\text{ kJ}}{1 \text{ moles } CaCl_2}\right) = 3300\text{ kJ}$$

$$100.\text{g} \times \left(\frac{1 \text{ mol } CaCl_2}{110 \text{ gram } CaCl_2}\right) \times \left(\frac{-360\text{ kJ}}{1 \text{ mol } CaCl_2}\right) = 32$$

Use Method 2

5. Compute $\Delta H_r°$ for the following reaction. $2NO(g) + O_2(g) \rightarrow 2NO_2(g)$	6. Compute $\Delta H_r°$ for the following reaction. $4FeO(cr) + O_2(g) \rightarrow 2Fe_2O_3(cr)$

ΔH = products − reactants

$\Delta H = [2(NO_2)] - [2(NO) + 1(O_2)]$

90.25

$\Delta H = [2(33.18)] - [2($[redacted]$) - 1(\text{zero})]$

ANSWER: −114.14

$\Delta H = [2 Fe_2O_3] - [4FeO + O_2]$

$\Delta H = [2(-824.2)] - [4(-272) + (\text{zero})]$

Answer: −560 k

Use Method 3

We wish to determine how much heat paraffin gives off on burning. We use a candle flame to heat some water in a calorimeter. These data are obtained.

Mass of water in calorimeter	350 g
Initial mass of candle	150 g
Final mass of candle	112 g
Initial temperature of water	15°C
Final temperature of water	23°C

$\Delta T = T_{final} - T_i = 8°C$

Find Heat that entered the Water

$q = mC\Delta T$ ← note: all are for water

$q = (350g)(1.0 \frac{cal}{°g})(8$

$q = 2800 \approx 3000$

For each change, circle either exothermic or endothermic. In each case, the system is underlined.

IV. You get into a parked car on July 10th and **you** sit on the hot car seat. *(exothermic / endothermic)*

V. The **oil** in a bowl of burning oil *(exothermic / endothermic)*

VI. The **air** around a bowl of burning oil. *(exothermic / endothermic)*

VII. True story: a Verona teacher once poured an unlabeled beaker of chemicals into a drain. **The water in the drain** instantly boiled and shot out all over the teacher's face, forcing them to run to the safety shower and spray their eyes. *(exothermic / endothermic)*

VIII. Your **hand** if it is holding onto an ice cube *(exothermic / endothermic)*

IX. A pancake is cooking on **a griddle**. You just turned off the stove and the pancake is still cooking.

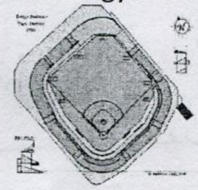
(exothermic / endothermic)

X. In each pair circle the number which represents more energy;

i) 30,000 joules of heat energyvs 3 kilojoules of heat energy

ii) 300,000 joules of energy vs 3000 kilojoules of energy

XI. On game night, 52,000 people are in Tiger Stadium. By noon the next day there are only 200 people. Calculate the change in population. Describe the change with a bar graph.



Δpeople = (after - before)

Δpeople = (200 - 52000)

Δpeople = −51,800 people

assume formula C_3H_8

XII. If burning 4.50 grams of propane gas gives off 12,221 calories of heat to the room,

a. Is the change to room air exothermic or endothermic?

b. Calculate using railroad track conversions the number of kilojoules that would be given off by burning 61.00 grams of propane.

~~61.00g x mol C_3H_8 / 44.1g C_3H_8 x~~ 4.50g x (/ i)

XII. If burning 4.50 grams of propane gas gives off 12,221 calories of heat to the room,

a. Is the change to room air exothermic or endothermic?

endothermic to the air

b. Calculate using railroad track conversions the number of kilojoules that would be given off by burning 61.00 grams of propane.

$$\frac{61.00 \text{ grams propane}}{1} \times \left(\frac{12221 \text{ calories propane}}{4.50 \text{ grams propane}}\right) \times \left(\frac{4.184 \text{ joules}}{1 \text{ calories}}\right) \times \left(\frac{1 \text{ kJ}}{1000 \text{ joules}}\right) = 69\ldots \text{ k}$$

c. Calculate using railroad track conversions the number of kilograms of propane you would have to burn to give off 450. calories

$$450. \text{ calories} \times \left(\frac{4.50 \text{ gram}}{12221 \text{ cal}}\right) \times \left(\frac{1 \text{ kg}}{1000 \text{ grams}}\right) = 1.66 \times 10^{-4} \text{ kg}$$

NOTE SLIGHTLY CHANGED NUMBERS for 4th Peri

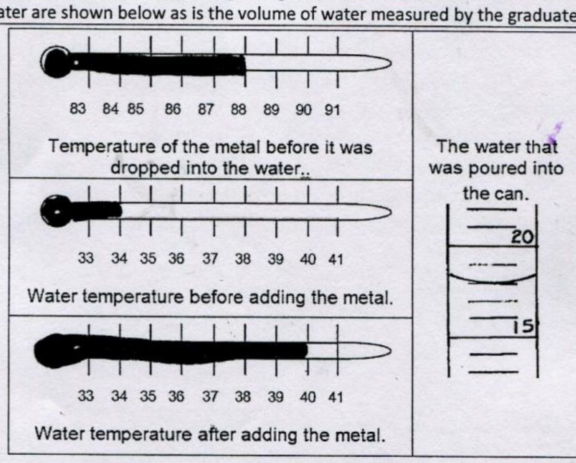
XIII. Assume that a student does an experiment by adding 52.2 grams of hot metal to a calorimeter of water. The before and after temperatures of the water are shown below as is the volume of water measured by the graduated cylinder.

How much heat entered the water?

$q = m\, c\, \Delta t$

$q = (18.0 \text{ gram})(4.184 \frac{J}{g°})(6.0)$

$q = 450$ joules



How much heat left the metal?

It's also 450 joules

Finally, calculate what the specific heat of the metal.

$q = m\, c\, \Delta t$

$\frac{q}{m \Delta T} = C$

$\frac{(450 J)}{(52.2 \text{ gram})(-48.0)} = C$

$0.180 \frac{J}{g°C} = C$

13. A 4 pts. 12.0 g piece of lead decreased its temperature from 87.6 C to 21.4 C. The amount of heat released was –98.0 J. Find the specific heat of lead

$\boxed{q = m\, c\, \Delta T}$ $\quad \frac{q}{m \Delta T} = C$

$$\boxed{\frac{(-98.0 J)}{(12.0 g)(-66.2°C)} = 0.123 \frac{J}{g°C}}$$

B. 3 pts. The theoretical specific heat of lead is .1276 J/g C. Calculate the percent error.

$$\% = \frac{(\text{lab result}) - (\text{accepted result})}{\text{accepted result}} \times 100$$

$$\% = \frac{.123 - .1276}{.1276} \times 100 = -3.60\%$$

the negative sign means our result was below the accepted value