Unit 13 Test Review

1. One form of energy can be converted to another. Here are some examples:

a. A flaming hot Cheeto is burned in chemistry lab.

As chemical energy is converted to thermal energy,

does the amount of energy change? **YES** or **NO**

b. A space heater is plugged into an electrical outlet and used to warm up a room.

As electrical energy is converted to thermal energy,

does the amount of energy change? **YES** or **NO**

c. The process of photosynthesis is used to make a tasty carrot.

As light energy is converted to chemical energy,

does the amount of energy change? **YES** or **NO**

2. Complete the chart below.

Scenario	System/ surroundings?	Endothermic or Exothermic?	Why? (Explain.)
1. Water melts.	system: water surroundings: air	endo	heat is going into water
2. Liquid wax solidifies.	system: wax surroundings: air	exo	heat is going out (exiting) of the wax
3. The salt NH_4Cl is dissolved in water, and the beaker becomes very cold.	system: reaction surroundings: beaker	endo	(energy) heat is going into the reaction
4. When sodium hydroxide, NaOH, is mixed in a beaker with sulfuric acid, H_2SO_4, a neutralization reaction occurs. The beaker becomes very warm.	system: reaction surroundings: beaker	exo	(energy) heat is going out (exiting) the reaction

$\Delta T = 4^{\circ}C$

3. A 74.1 g sample absorbed 87 J as it was heated from 28°C to 32°C. Calculate the specific heat of this compound.

$q = m \cdot C \cdot \Delta T$ **(USE YOUR GUESS BOXES!!)** $C = 0.29\ J/g^{\circ}C$

$\Delta T = 7^{\circ}C$

4. Gold has a specific heat of 0.129 J/g°C. How much heat is required to heat a 55 g piece of gold from 28°C to 35°C?

$q = m \cdot C \cdot \Delta T$ **(USE YOUR GUESS BOXES!!)** $q = 49.67\ J$

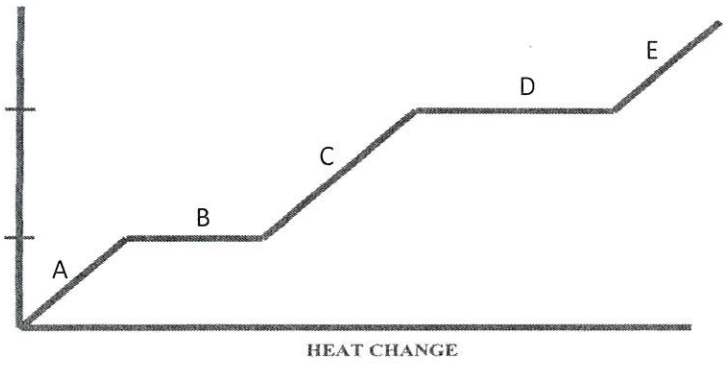
5. A piece of food is tested in a calorimeter to determine how many calories it contains. If the water in the calorimeter has a mass of 106 g and the temperature of the water increased by 33.0°C, calculate the heat gained by the water. (Specific heat of water = 4.18 J/g°C)

#6 is #13 down below

$q = m \cdot C \cdot \Delta T$ **(USE YOUR GUESS BOXES!!)** $q = 14,621.64\ J$

(3) 6. Heating Curve: Match the process or state of matter with the appropriate number on the graph. (Letters may be used more than once!!)

a. Condensation D
b. Freezing B
c. Evaporation D
d. Melting B
e. Vaporization D
f. Solid only A
g. Liquid only C
h. Gas only E
i. Liquid/gas D
j. Solid/liquid B
k. Lowest energy A
l. Highest energy E



(8) 7. Complete the chart below:

	ΔH (+ or - ?)	Heat (Absorbed or released?)	Type of Reaction Endothermic or Exothermic?
energy+$2H_2S$+ SO_2 →3S + $2H_2O$	+	absorbed	endO
$N_2(g)$+ $3H_2$ (g) →$2NH_3$ + energy	−	released	exO
Ice freezing $l \rightarrow s$	−	released	exO
Dry ice sublimation $s \rightarrow g$	+	absorbed	endO

For each reaction: **(1)** use the heats of formation in the chart below to determine the heat of each reaction
(2) predict if reaction is endothermic or exothermic & energy released/absorbed **(3)** write the thermochemical eq

Compound	ΔH_f (kJ/mol)	Compound	ΔH_f (kJ/mol)
$CH_4(g)$	-74.8	$HCl(g)$	-92.3
$CO_2(g)$	-393.5	CCl_4	-587
$H_2O(l)$	-285.8	$NH_4Cl(s)$	-315.4
$H_2S(g)$	-20.1	$MgO(s)$	-601.24
$MgCl_2(s)$	-641.8	$SO_2(g)$	-296.1

8. Reaction #1: $CH_4(g) + 2Cl_2(g) \rightarrow CCl_4 + 2H_2(g)$

(1) $\Delta H = [-587 + 0] - [-74.8 + 0]$
$= -512.2$ kJ
(2) exo (−)
(3) $CH_4 + 2Cl_2 \rightarrow CCl_4 + 2H_2 + 512.2$ kJ

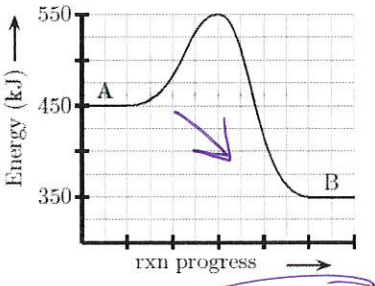
9. Reaction #2: $CO_2(g) + 2H_2O(l) \rightarrow CH_4(g) + 2O_2(g)$

(1) $\Delta H = [-74.8 + 0] - [-393.5 + 2(-285.8)]$
$= 890.3$ kJ
(2) endo (+)
(3) $890.3\text{ kJ} + CO_2 + 2H_2O \rightarrow CH_4 + 2O_2$

10. Reaction #3: $MgCl_2(s) + H_2O(l) \rightarrow MgO(s) + 2HCl(g)$

(1) $\Delta H = [-601.24 + 2(-92.3)] - [-641.8 + (-285.8)]$
$= 141.76$ kJ
(2) endo
(3) $141.76\text{ kJ} + MgCl_2 + H_2O \rightarrow MgO + 2HCl$

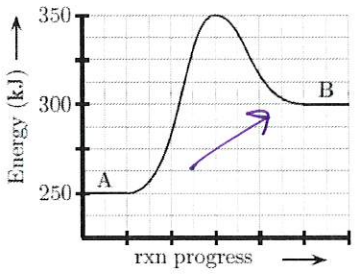
11. Reaction is going from A → B.



a. Endothermic or exothermic?

b. Energy absorbed or released?

12. Reaction is going from A → B.



a. Endothermic or exothermic?

b. Energy absorbed or released?

13) A hot cube of iron metal is added to 75.2 g of water originally at 23.0°C in a calorimeter. The final temperature of the metal and water in the calorimeter is measured to be 31.0°C. The specific heat of water is 4.18 J/g°C. How many joules of heat energy are transferred? $\Delta T = 8^{\circ}C$

(**USE YOUR GUESS BOXES!!**) $q = 2514.69$ J

Supposed to be #6

#3 $\Delta T = 32 - 28 =$

G: $m = 74.1\ g \quad \Delta T = 4°C$
$q = 87\ J$

U: C

E: $q = m \cdot C \cdot \Delta T$

S: $87 = (74.1)(C)(4)$

S: $C = 0.29\ J/g°C$

#4 $\Delta T = 35 - 25$

G: $C = 0.129\ J/g°C$
$m = 55\ g \quad \Delta T = 7°C$

U: q

E: $q = m \cdot C \cdot \Delta T$

S: $q = 55(0.129)(7)$

S: $q = 49.67\ J$

#5

G: $m = 106\ g \quad \Delta T = 33°C$
$C = 4.18\ J/g°C$

U: q

E: $q = m \cdot C \cdot \Delta T$

S: $q = 106(4.18)(33)$

S: $q = 14,621.64\ J$

#13 ~~#6~~ $\Delta T = 31 - 23 =$

G: $m = 75.2\ g \quad \Delta T = 8°C$
$C = 4.18\ J/g°C$

U: q

E: $q = m \cdot C \cdot \Delta T$

S: $q = 75.2$ (scribbled) $(4.18)(8)$

S: $q = 2514.69\ J$