Name: _____ Date: _____ Block: _____

Chapter 17 ~~Unit 11~~: Review Sheet:

**Heat and Temperature**

1. What is the difference between heat and temperature? measure / $K_i$ / Energy
2. Can you add heat to an substance and the substance's temperature stay the same, why or why not? Yes, ~~the~~ During a phase change

**Specific Heat Capacity**

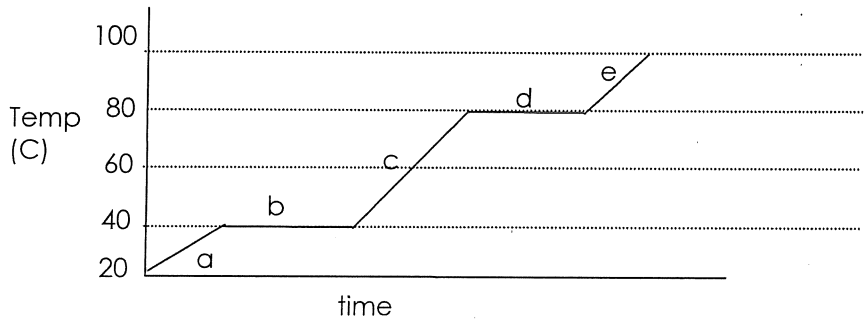
3. What is the definition of specific heat capacity? - amount of heat (J/cal) to heat 1g; 1°C
4. What is the specific heat capacity of water? 4.184 J/g°C
5. Which requires more energy to change the temperature?
   a. Gold (C = 0.128 J/g °C) or Silver (C = 0.235 J/g °C)?
   b. Water (C = 4.184 J/g °C) or ethanol (C = 2.44 J/g °C)?

**Calorimetry**

6. How many calories are in a Joule? 1 J = .2390 cal (1 cal = 4.1845 J)
7. 66,938 joules of heat energy is needed to raise the temperature of a 425 g aluminum baking sheet to a baking temperature of 200°C? What is the initial temperature of the baking sheet? The specific heat of aluminum is 0.90 J/g 0C $\Delta T = 175$, (25°C)
8. The temperature of an iron bar with a mass of 87.0 g is raised from 31°C to 543°C. In the process, 4900 calories of heat energy were absorbed. What is the specific heat of iron? 4900 cal 44,544 Lp = 20,501.6 = .46 J/g°C = .11 cal/g°C

**Phase Changes**

The following graph is a heating curve for an unknown substance.




9. At what temperature is the melting point? 40°
10. At what temperature is the boiling point? 80°
11. Which letter corresponds to a time when
    a. the solid form of the compound is changing temperature? a
    b. the liquid form of the compound is changing temperature? c
    c. the gas form of the compound is changing temperature? e
    d. The solid is melting b
    e. The liquid is freezing b
    f. The liquid is evaporating d
    g. The gas is condensing d
12. If you wanted to calculate the heat associated with the changes in the graph (use the letters labeled on the graph as your answers.

Not needed

    a. When would you use $Q = mC\Delta T$? a, c, ~~e~~
    b. When would you use $Q = m\Delta H_{fus}$? b
    c. When would you use $Q = m\Delta H_{vap}$? d

*Extra

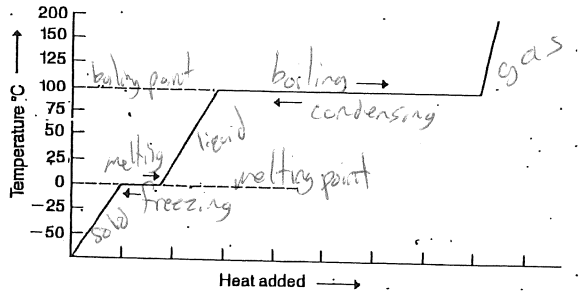
**Enthalpy**

13. The thing we measure when we want to determine the average kinetic energy of random motion in the particles of a substance is Temperature.
14. The Heat of reaction is used to describe how much energy is produced or used during a chemical change.
15. The Specific heat cap is the energy needed to raise the temperature of a substance by one degree Celsius.
16. Endothermic reactions require energy in order to take place.
17. A(n) Exothermic reaction is one where the products have lower energy than the reactants.
18. Another word for ~~freezing~~ melting is fusion.
19. ~~_____ changes take place by themselves, without a continuous supply of energy.~~
20. The Heat of vaporization is the energy required to boil one mole of a substance, and its symbol is $\Delta H_{vap}$.
21. ~~_____~~

**Word Bank:**

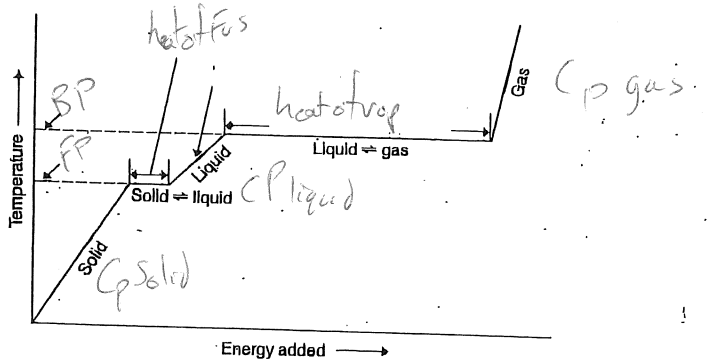
| | | |
|---|---|---|
| Endothermic | Temperature | Specific heat capacity |
| Enthalpy | Exothermic | Heat of vaporization |
| Heat of reaction | Fusion | Heat of fusion |
| Heat | | $\Delta H_{fus}$ |
| $\Delta H_{vap}$ | | |

## Heating – Cooling Curves




1. Use these terms to label the curve.

solid
liquid
gas
boiling
condensing
melting
freezing
boiling point
melting point




2. Use these terms to label the curve.

boiling point
freezing point
heat of fusion
heat of vaporization
specific heat of solid
specific heat of liquid
specific heat of gas

* Did not use Sig Figs *

Thermochemical Equations

Name _____

If a compound is mixed with water and the compound dissolves raising the temperature of the mixture, what word describes this process? Exothermic

PS. I don't like the wording of this...

Exothermic

$2\,NaHCO_3 + 129\ kJ \rightarrow Na_2CO_3 + H_2O + CO_2$

Is this reaction endothermic or exothermic? Endothermic

If this reaction were written without the energy on the reactant side and written as a Δ H, what would the sign of the Δ H be? +ΔH

If 3.6 grams of water are produced, how much energy would be involved?

Ratio: 1 mol $H_2O$ / 129 kJ

$3.6\,g \times \frac{1\,mol}{18\,g} = .2\,mol$

$.2\,mol \times \frac{129\,kJ}{1\,mol} = 25.8\,kJ$

$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O \quad \Delta H = -890.4\ kJ$

How much energy is produced when 0.32 moles of methane burn?

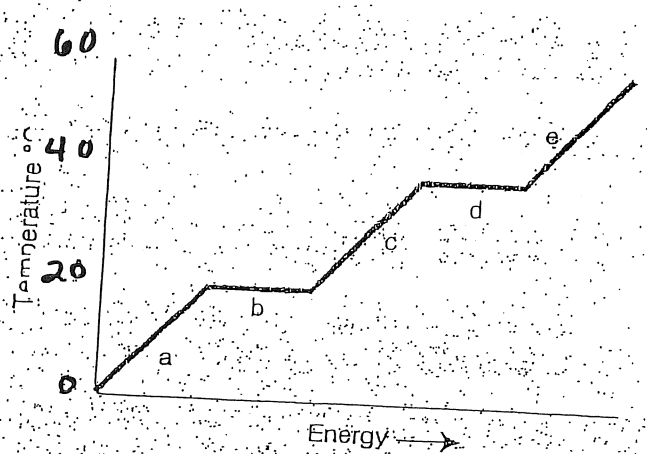
Ratio: 1 mol $CH_4$ / 890.4 kJ

$.32\,mol \times \frac{890.4}{1} = 284.9\,kJ$

*Did Not use SigFigs*

# REEZING AND BOILING POINT GRAPH

Name _____




swer the following questions using the chart above.

1. What is the freezing point of the substance? b 20°
2. What is the boiling point of the substance? d 40°
3. What is the melting point of the substance? b 20°
4. What letter represents the range where the solid is being warmed? a
5. What letter represents the range where the liquid is being warmed? c
6. What letter represents the range where the vapor is being warmed? e
7. What letter represents the melting of the solid? b
8. What letter represents the vaporization of the liquid? d
9. What letter(s) shows a change in potential energy? b, d
10. What letter(s) shows a change in kinetic energy? a, c, e
11. What letter represents condensation? d
12. What letter represents crystallization? b

# Thermochemistry

ΔT = positive

## Changes in Heat Energy

1. How much heat is lost as a 500. g cube of aluminum is cooled from 200.°C to 25.0°C? The specific heat for aluminum is 0.897 J/g·°C.

25 - 200
-175

78,488 J lost

2. How much heat is gained as 200. g of ethanol are heated from 25.0°C to 37.0°C? The specific heat for ethanol is 2.438 J/g·°C.

5851.2 J

3. A sample of walnuts is burned in a bomb calorimeter. The calorimeter contains 3.500 kg of water, and its temperature increases from 22.0°C to 72.0°C. What is the energy content of the walnut sample?

$(3{,}500\,g)(50°C)(4.184)$ = 732,200 J

732,000 J

4. What mass of hydrogen must be reacted with excess nitrogen to produce 5000. J of energy?

$3H_2(g) + N_2(g) \longrightarrow 2NH_3(g) + 2709\ J$

Ratio
3 mol H2
2709 J

5000 J × 3 mol H2 / 2709 = 5.5 mol × 2 g / 1 mol = 11 g

5. What mass of iron must be reacted with excess oxygen to produce 300.0 kJ of heat energy?

$4Fe(s) + 3O_2(g) \longrightarrow 2Fe_2O_3(s) + 1644\ kJ$

Ratio
4 mol Fe
1644 kJ

40.7 g = 300 kJ × 4 mol Fe / 1644 kJ = .73 mol × 55.8 g / 1 mol

6. What mass of sodium must be reacted with excess water to produce 1000. kJ of heat energy?

$2Na(s) + 2H_2O(l) \longrightarrow 2NaOH(aq) + H_2(g) + 282\ kJ$

Ratio
2 mol Na
282 kJ

163.1 g

1000 kJ × 2 mol Na / 282 kJ = 7.1 mol × 23 g / 1 mol = 163.1 g Na