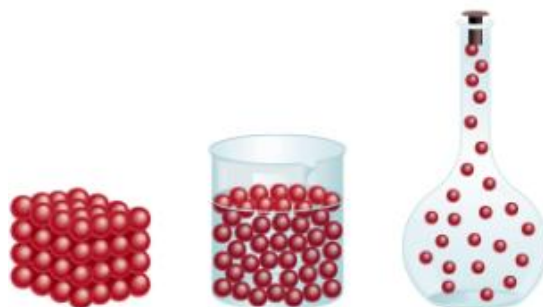


Chapter 2/17: Matter and Change/Thermochemistry

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1

Matter:

- anything that has _____ and takes up _____ or has _____
- Properties- characteristic that helps to define a group
 - Two types:
 - Extensive- _____

 - Intensive- _____

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Three States of Matter

- Solid- definite _____, definite _____ (*s*)
- Liquid- definite _____, indefinite _____ (*l*)
- Gas- no definite _____, no definite _____ (*g*)

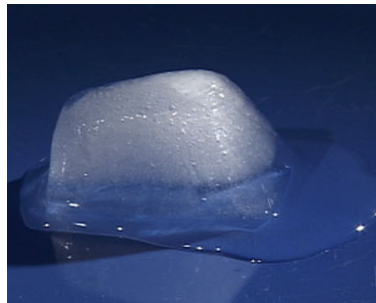
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Changes in Matter

_____ Change in the _____ of
a subject

– Liquid H_2O → _____ (phase change)

– _____



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Changes in Matter continued

Chemical Change

- a. Chemical _____
 - b. atoms _____ to form a new

- Example: lighting a match, rusting
 - Law of Conservation of Mass
 - »matter can not be _____ or

5

Elements and Compounds:

- Atoms - basic _____ of matter
- Elements - composed of only ___ atom
 - Pure substance that can not be
_____ by chemical changes.
 - Each element has its own _____
 - Arranged on _____ based on
chemical characteristics

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Elements and Compounds cont'd

- Molecule – the smallest _____ of a substance that retains all the _____ of the substance and is composed of _____ atoms
- Compound – substance formed by chemical union of _____ ingredients in _____ by weight
 - Atoms are in a _____, combined by _____
 - Can be _____ or _____ into its elements
 - Example: H₂O, CO₂

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Classification of Matter

- All matter is either a _____ or a _____
- 1) Mixture
- blend of _____ kinds of matter
 - Example: salt water, kool-aide
 - Properties of mixtures=
 - Combination of _____

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Classification of Matter cont'd

- Can be separated

- _____
- _____
- _____
- _____
- _____

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Classification of Matter cont'd

- Two types
 - Homogenous (_____)
 - » _____ + water solutions
 - Heterogenous (_____)
 - » _____ + water

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Classification of Matter cont'd

2) Pure Substances

- Homogenous (uniform composition)
- Two types

- _____

- _____

Mixtures	Pure Substances
Properties of mixture are dependent on relative _____	Has the same _____
_____ ratios	_____ ratio (_____) ¹¹

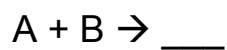
Thermochemistry/Energy:

- Energy
 - The ability to _____
 - 3 categories
 - Kinetic or _____
 - Potential or _____
 - Radiant or _____
- Law of Conservation of Energy:
Energy may not be _____ or _____ (but it may be converted into _____)

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Types of Reactions

1) Synthesis or composition= to make



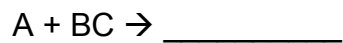
2) Decomposition= to break



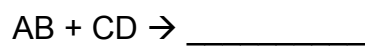
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Types of Reactions continued

3) Single Replacement \rightarrow one element switched



4) Double Replacement \rightarrow both elements switched



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Types of Reactions continued

5) Combustion (burning) in presence of Oxygen



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Indications of chemical reactions:

- Release (or absorption) of _____

- Production of _____
- Formation of _____ (ppt)
 - appearance of a _____ when 2 _____ are mixed
 - Ex. _____

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Heat Energy:

- Sum of total _____ of the particles in a sample of _____
- Dependent on:
 - Nature of substance (_____)
 - _____ of substance
 - _____ change
- Heat always flows from _____ to _____ temperature

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Heat Energy continued

- Joules = SI base unit for measuring _____
 - _____ are commonly used (_____ J/KJ)
 - $4.184\text{J} = 1\text{ cal}$
- Specific heat
 - Amount of heat energy required to raise the temperature of _____
 - _____ specific heat = easy temperature change
 - $4.18\text{J/g}^\circ\text{C}$ for _____ (l)

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Thermochemical Equation $\rightarrow q = mc\Delta T$

- $q =$ _____ (in calories or Joules)
- $m =$ _____
- $c =$ _____
- $\Delta T =$ _____

Ex. What amount of energy is needed to raise 500. mL of water from 15°C to 25°C ?

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Thermochemical Reactions

- _____ Reaction (Out of system)
 - Heat is _____ (Think hand warmers)
 - "q" is negative
- _____ Reaction (Into system)
 - Heat is _____ (Think ice pack)
 - "q" is positive

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**Examples

- 1) Determine the specific heat of a substance if a 35g sample absorbed 48J as it was heated from 293 °K to 313°K

- 2) If 780KJ of energy are added to 6.2 Liters of H₂O at 291 °K, what will the final temperature of the H₂O be? In °C?
 - Hint: you must convert the following first;
 - KJ → Joules L → grams

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Heat of Fusion (Hf) $q = m H_f$

- Heat energy used to convert _____
- Not accompanied by _____

- Ex. How much heat energy in joules is needed to melt 12.0g of ice at its melting point?
- $q = m H_f$

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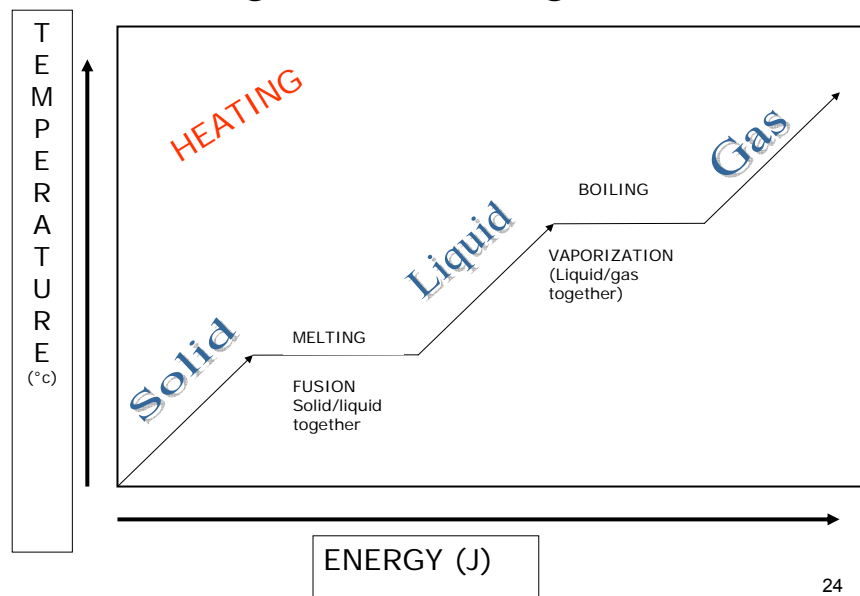
Heat of Vaporization (H_v) $q = m H_v$

- Heat energy used to convert _____
- not accompanied by _____
- ** ____ is always higher than ____

- Ex. How much heat energy in joules is released by 10.0 grams of liquid copper as it condenses at its boiling point ($H_v = 1210$ J/g)
- $q = m H_v$

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Heating and Cooling Curves



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Heating Curve

Solid/Liquid/Gas phases

*Increase in _____

*no change in _____

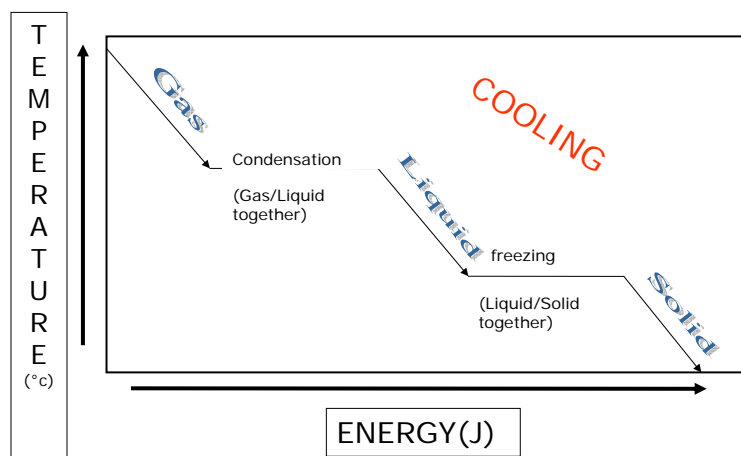
Fusion(melt)/Vaporization (boil)

*Increase in _____

*no change in _____

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Heating and Cooling Curves Cont'd



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Cooling Curve

Solid/Liquid/Gas phases

*Decrease in _____

*no change in _____

Condensation/ Freezing

*Decrease in _____

*no change in _____

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Temperature:

- Thermochemistry
 - Study of _____ that accompany chemical _____
 - Measurement of heat energy:

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Temperature continued

- Temperature = measurement of average _____ of particles
 - calculate's energy change based on temp. change
 - greater kinetic energy = _____
 - measured in °C (_____) or K (_____)
$$K = ^\circ C + 273$$

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Absolute Zero

- the lowest _____ for any matter to exist as a gas
 - 0 K or -273 °C
 - motion of all particles _____

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