1

MATTER AND CHANGE

Ch 3

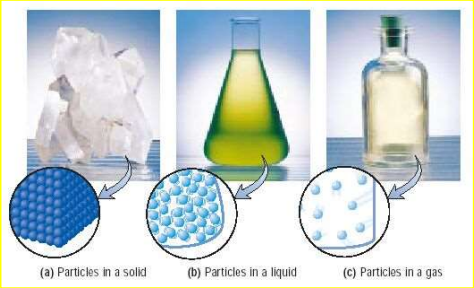
2

Objectives

- Understand different properties of matter
- Label changes as physical or chemical
- Describe separation techniques
- Classify matter according to type

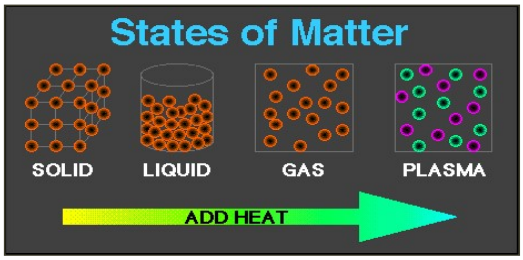
3

Three Main Phases



4

4th state: Plasma - formed at high temperatures; ionized phase of matter as found in the sun



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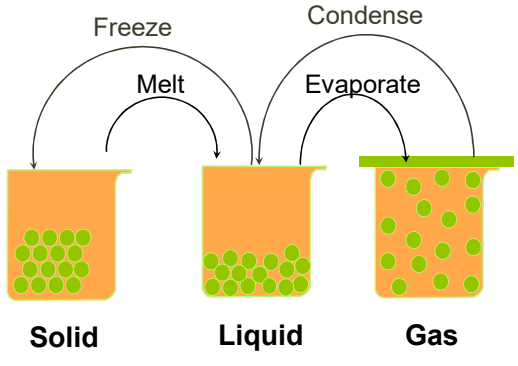
States of Matter

	SOLID	LIQUID	GAS
Shape			
Volume			
Compress?			

6



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Heating curve

- https://www.youtube.com/watch?v=Xg6RBH-OJuU

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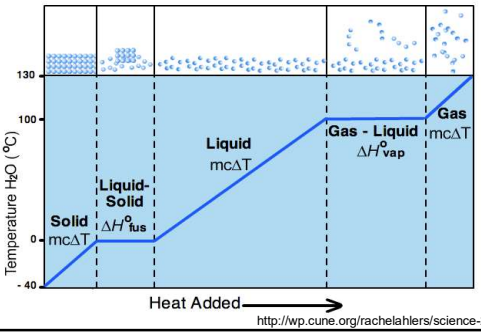
Heating Curve



http://wp.cune.org/rachelahlers/science-202/unit-3/

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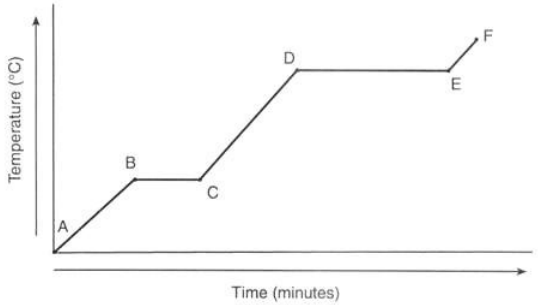
Heating Curve



http://www.kentchemistry.com/links/Matter/HeatingCurve.htm

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Pressure/altitude affects boiling pt

Sea Level Atmospheric pressure at the surface of water at 70°C is greater than its vapor pressure. Bubbles of vapor cannot form in the water, and it does not boil.

Sea Level At the boiling point, the vapor pressure is equal to atmospheric pressure. Bubbles of vapor form in the water, and it boils.

Atop Mount Everest At higher altitudes, the atmospheric pressure is lower than it is at sea level. Thus the water boils at a lower temperature.

Figure 13.9 Interpreting Graphs - Page 394

a. 60 ºC b. about 20 kPa c. about 30 kPa

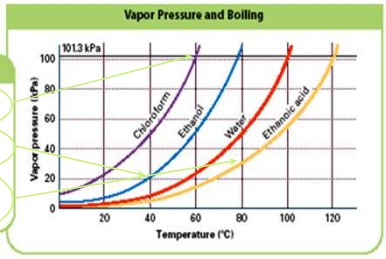
Questions:

INTERPRETING GRAPHS

a. **Analyzing Data** What is the boiling point of chloroform at 101.3 kPa?

b. **Analyzing Data** What is the vapor pressure of ethanol at 40°C?

c. **Analyzing Data** What would atmospheric pressure need to be for ethanoic acid to boil at 80°C?



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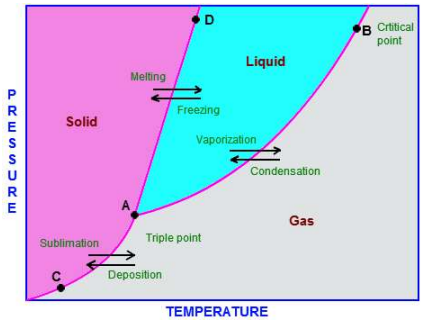
Phase diagram



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Extensive and Intensive Properties

- Extensive
  - Depends on amount of matter
  - Example?
- Intensive
  - Depends on type of matter, not amount
  - Example?

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Physical Properties and Change

- Physical changes
  - Physical properties change without changing composition
  - Examples?
- Physical properties
  - Observed and measured without changing composition
  - Examples?

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Chemical Properties and Change

- Chemical change—changes into new substance
  - Examples?
- Chem property—ability to undergo chemical change
  - New products are formed
  - Only observed during chem change

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- Recognizing chemical changes:
  - Energy (heat)
  - Color change*
  - Gas produced
  - Precipitate formed

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Conservation of Mass

- Mass is neither created nor destroyed (mass is conserved)
  - Mass of products ALWAYS equal to mass of reactants

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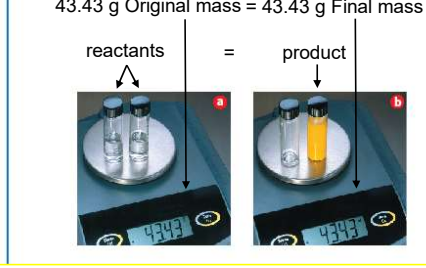
19 Figure 2.15 Conservation of Mass - Page 55



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Conservation of Mass

- If you react 2.0 g of hydrogen with 32.0 g of oxygen, what mass of water will be produced?
- Hydrogen peroxide decomposes into oxygen and hydrogen. If 68 g of hydrogen peroxide decomposes and forms 4 g hydrogen, how much oxygen will be produced?

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Practice problems

- A 10.0 g sample of magnesium reacts with oxygen to form 16.6 g of magnesium oxide. How many grams of oxygen reacted?
- A student separates water into hydrogen and oxygen gases. 10.0 g of hydrogen and 79.4 g of oxygen were collected. How much water was originally involved in this separation?

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Practice problems ANSWERS

- A 10.0 g sample of magnesium reacts with oxygen to form 16.6 g of magnesium oxide. How many grams of oxygen reacted? 6.6 g
- A student separates water into hydrogen and oxygen gases. 10.0 g of hydrogen and 79.4 g of oxygen were collected. How much water was originally involved in this separation? 89.4 g

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Classifying Matter

- Pure substances vs mixtures
  - Pure substances are the same throughout and are only composed of one thing (fixed composition)
    - Can you write a formula?
    - Examples?
  - Mixtures can differ throughout and are composed of two or more things (varied composition)
    - Examples?

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Substances vs mixtures

	Substances	Mixtures
Matter?		
Composition?		

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Substances vs mixtures

	Substances	Mixtures
Matter?	One type	Multiple
Composition?	Definite	Variable

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Substance	Mixture
One kind of material	More than one kind of material
Made by chemical change	Made by physical change
Definite composition	Variable composition

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Substances

- Pure substances can be elements or compounds
  - Elements—only one kind of atom
    - Simplest kind of matter with unique properties
    - Cannot be broken down into simpler substances by chemical means
  - Cmpds—two or more elements chemically combined
    - Can be broken down by chemical means

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Mixtures

- Mixtures are homogeneous or heterogeneous
  - Phase—part of a sample that looks and behaves the same
  - Homogeneous—looks the same throughout
    - How many phases?
  - Heterogeneous—looks different
    - How many phases?

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Mixture Activity

- In your groups, come up with examples of both homogeneous and heterogeneous mixtures
- Points earned for original mixtures
- Group with the most points will earn extra credit on homework!

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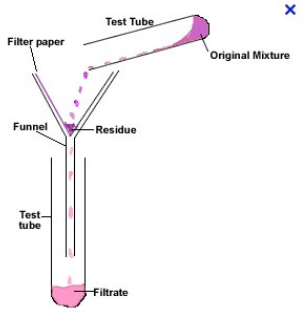
Filtration



- http://www.saskschools.ca/curr_content/science10/unita/redon17.html

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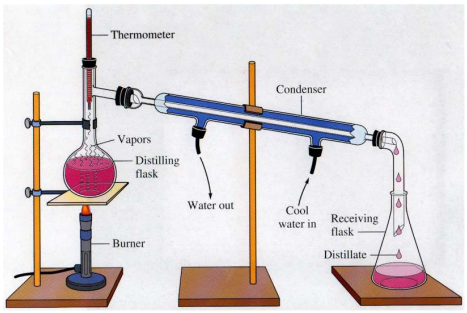
Distillation



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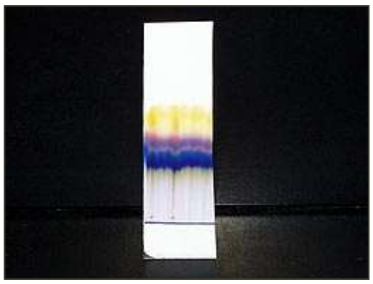
Chromatography



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Separation Techniques

- Filtration
  - Solid from liquid
- Evaporation
  - Dissolved solid from liquid
- Distillation
  - Liquid from dissolved solid, two liquids
- Chromatography
  - Two or more solids