Topic II Test Study Guide 2

1. Classification of Matter

Understand what is meant by the number of phases in a mixture, homogeneous and heterogeneous mixtures, pure substances (elements and compounds, compounds being both molecular and ionic or salts);

Know examples for all of the above from homework, lab, and class notes

Mixtures & Pure Substances

Matter

I

I

I

----------*Can Substances be separated physically?* **----------**

NO		**YES**	
I Pure Substances I		**I Mixtures I**	
I		**I**	
I		**I**	
Elements	**Compounds**	**Homogeneous**	**Heterogeneous**
substance the can't be broken down into other substances even by chemical processes (1 type of atom)	Substance made up of 2 or more elements that can be broken down chemically ex) H20, CO2, NaCl	uniform through out uniform composition 1 phase (one part) *"solution"* ex.) salt water, sugar water, grass (alloy)	not uniform not uniform comp. 2 or more phases ex) sand + H20 oil +H20 salad dressing chex mix blood

2. Physical Properties/ Physical Changes:

Review examples from homework and class notes

- **States of matter**
- **Sublimation, deposition**
- **Boiling point, Freezing point, Melting, Condensation**
- **Solubility**

Chemical Properties/Chemical Changes:

Review examples from homework and class notes.

Combustion, corrosion, rusting, acid and base reactions
Evidence of chemical reactions
Reactants → Products
Law of Conservation of Mass

Physical Change/Properties
Change when properties of the material change, but composition does not.

- Color
- Shape
- Density
- Malleability
- Dissolving
- Melting point
- Boiling point
- Freezing Point
- (Change of state)

Reversible:
Change of state (dissolving)

Irreversible:

- malleability
- breaking
- cracking
- spitting
- tearing,
- cutting

Extensive:
Depends upon the **amount** of matter in a sample.
ex.) mass, volume, length, width

Intensive:
Depends on **composition** of matter in a sample
ex.) density, boiling point, freezing point, melting point, luster (shiny), malleable (shape it), hardness, conductivity, color, texture, ductility (pull into wire)

(odor) (taste)--> could be both

States of Matter:

State	Definition	Examples	Diagram
Solid	Definite shape Definite volume rigid	Banana, coconut, rock, ice	*particles* vibrate, close together. Dense very little room to move.
Liquid	No definite shape (shape of container) Definite volume	Water, oil, syrup, mercury, ethanol	Pourable (fluidity), particles slide past each other
Gas	No definite volume No definite shape Takes shape and volume of container	Oxygen, hydrogen, chlorine, carbon monoxide	Made up of mostly empty space
Plasma	High energy state of matter		

Gas vs. Vapor:

Gas: Any substance that is a gas at room temperature

Vapor: any substance that is typically a liquid/solid at room temperature

Chemical Change/ Properties
Change that alters the chemical composition of a substance, a new substance is formed.

- burning (combusting)
- reacting
- fizzing/bubbling
- formation of precipitate
- rusting

Law of Conservation of Mass: Matter is not created or destroyed

3. Separation of Mixtures

(usage for homogeneous and heterogeneous mixtures)

Chromatography **Using a separatory funnel**
Simple distillation **Filtration**
Fractional Distillation **Decanting**
Evaporation **Centrifuging**
Know examples in your notes and handout.

Technique 1: Simple distillation
- separates a mixture by boiling points. Could be used for soluble solid (homogeneous mixture) , but able to recover both solid and liquid.

Technique 2: Filtration
- When you separate insoluble solid from a liquid. Able to recover both solid and liquid.

Technique 3: Chromatography
- homogeneous mixture-1 phase. Separate by attraction to 2 phases in chromatography. Set up stationary-paper & mobile-water. The liquid that travels the furthest(mobile. The liquid that travel's shortest (stationary)

Technique 4 : Evaporation
- Separation of mixture by boiling point. Soluble solid in liquid (ex. salt)-don't care about liquid. Evaporate liquid-left with solid. Not going to recover liquid.

Technique 5: Fractional distillation
- boiling point used to separate homogeneous mixture, two liquids that are "miscible" ("mix")

Technique 6: Centrafuge
- Uses centripetal force, separate insoluble solid from liquid. The particles are too fine to go through filtration (ex. blood)

Technique 7: Decanting "pour off"
- Used for separating 2 immiscible liquids (ex. oil &n water)

Technique 8: Separatory Funnel
- two immiscible liquids-pour off one layer--> better than decanting

Method	# Phases	Type of Matter	Example
1. Chromatography	1	miscible (soluble liquids)	ink
2. Simiple distillation	1	homogeneous (soluble solid in all liquid) recover both solid and liquid)	salt + H2O
3. Fractional distillation	1	homogeneous 2 miscible liquids	alcohol + H2O
4. Evaporation	1	homogeneoous soluble solid in a liquid liquid is not recovered	salt + H2O
5. Decant	2	heterogeneous 2 miscible liquids	oil +H2O
6. Separatory Funnel	2	"	"
7. Filtration	2	heterogeneous insoluble solid in a liquid	Sand + H2O
8. Centrifuge	2	" particles are too small & would pass through filter	Lead (II) Iodide (PbI_2) muddy H20 Blood

4. Solubility and Aqueous Solutions

Units of solubility: # grams of solute/100 grams of solvent
Compare solubility of gas and solid solute (liquid – miscible/immiscible)

Nature of solute, Temperature, Pressure (partial pressure of a gas and the effect on the solubility of the gas in aqueous solution)
Soluble substance, insoluble substance, saturated solution, unsaturated solutions, supersaturated solutions

Solvent: dissolving medium usually present in larger amount (H2O universal solvent)

Solute: What's being dissolved usually present in smaller amount
g solute/100 g H_2O

Solubility: Amount of solute that dissolves in a given amount of solvent at a given temperature and pressure.

Unsaturated solution: Contains less solute than the solvent can dissolve

Supersaturated solution: contains more solute than the solvent can theoretically hold

Factors affecting solubility (increase rate of solubility):

- Increase temperature
- Stirring/agitation
- Particle size/ surface area

Aqueous Solutions (Homogeneous)

Solute	Solvent	Solubility
Solid ex) Nacl, KNO_3, $C_{12}H_{22}O_4$	H_2O	Generally goes up as temp. goes up **Depends On:** -type solid -composition of solid
Gas ex.)CO_2,O_2	H_2O	-Temp. goes up, solubility goes down -pressure goes down, solubility goes down -pressure goes up, solubility goes up
Liquid ex.) ethanol	H_2O	-miscible("mix") -immiscible (not mix)

Soluble substances: Salt & Sugar

insoluble substances

5. Energy $q = c\ m\ \Delta\ T$

Heat energy, change in temperature, heat capacity, specific heat, joules, calories

Specific heats of metals, specific heat of water.

Exothermic and endothermic changes in chemical and physical changes.

Change in Enthalpy (heat content) = q

Temperature:
Measure of the average amount kinetic energy (NG of motion) in a sample (random motion of parcles)

Energy: Ability to do work; supply heat

- **potential:** (stored) Energy of position or composition
- **kinetic:** energy of motion

Chemical Potential Energy:
Energy stored in chemical bonds of substances
Heat
warmer--> colder

Law of Conservation of Energy:
In any chemical or physical process energy is not created or destroyed, it is just converted from one to another.

Exothermic: heat is released to surroundings
ex.) burn gasoline $2C_8H_8 + 25O_2$---> $16\ CO_2 + 9H_2O$ + **HEAT**

Endothermic: $Ba(OH)_2 * 8H_2O + NH$ + **HEAT** ---> *products*

Heat:
measure of the energy transferred from one object to another due to a difference in temperature.

Heat capacity:
Amount of heat needed to increase the temperature on an object by 1^oC
Depends on mass & chemical composition

ex.) 20 kg H2O in puddle
20 kg Fe sewer cover
heat capacity H2O > heat capacity Fe

Specific heat capacity:
"specific heat"
Amount of heat needed to raise the temperature of 1 gram of a substance by 1^oC

"S" specific heat
S_{H2O}= 4.184 J/g^{o}C

1 Calorie= 1Kcal=1000 calories
(nutritional)

1 calorie= 4.184 J

$q=ms\Delta T$
q=energy (Joules) J
m=mass (grams) g
s=specific heat (J/g^{o}C)
ΔT- T_F- T_I (^{o}C)

6. Periodic Table

(see textbook reading and class notes)

Metals, Nonmetals, Metalloids (also called semimetals)
Properties of Metals and Nonmetals
Know location on table:
Alkali metals, alkaline earth metals, transition metals, halogens, noble gases

Look at packet