Welcome

Science of Cocktails

- 7 science-themed bars and drink-related demonstrations
- Double Bond award-winning wine
- Hors d'oeuvres
- 2 drink tickets, your choice
- $5 donation for additional drinks
- Check out all science stations
- Please provide feedback

This program is for adults 21 years of age and older. Sierra Nevada College and UC Davis encourage our adult audience to drink responsibly.

DOUBLE BOND

north lake tahoe Chamber | CVB | Resort Association

SNC TAHOE | SIERRA NEVADA COLLEGE

UCDAVIS TAHOE ENVIRONMENTAL RESEARCH CENTER

Science Stations /Bars

Science Theme	Drink	Location
Breathalyzer	Water	Lobby
pH	Color-changing Vodka & Soda	Next to Stairs
Fluorescence	Glowing Gin & Tonic	3-D Theater
Density	Layered B-52 Test Tube Shots	Boat Exhibit
Polymers	Jell-O Shots	TCES 139
Latent Heat	“Sphenopalatine Ganglioneuralgia” Margarita	TCES 141
Sublimation	Smokin’ Punch	TCES 141
Fermentation	Double Bond Wine	TCES 139
Digestion	Hors d‘oeuvers	TCES 139

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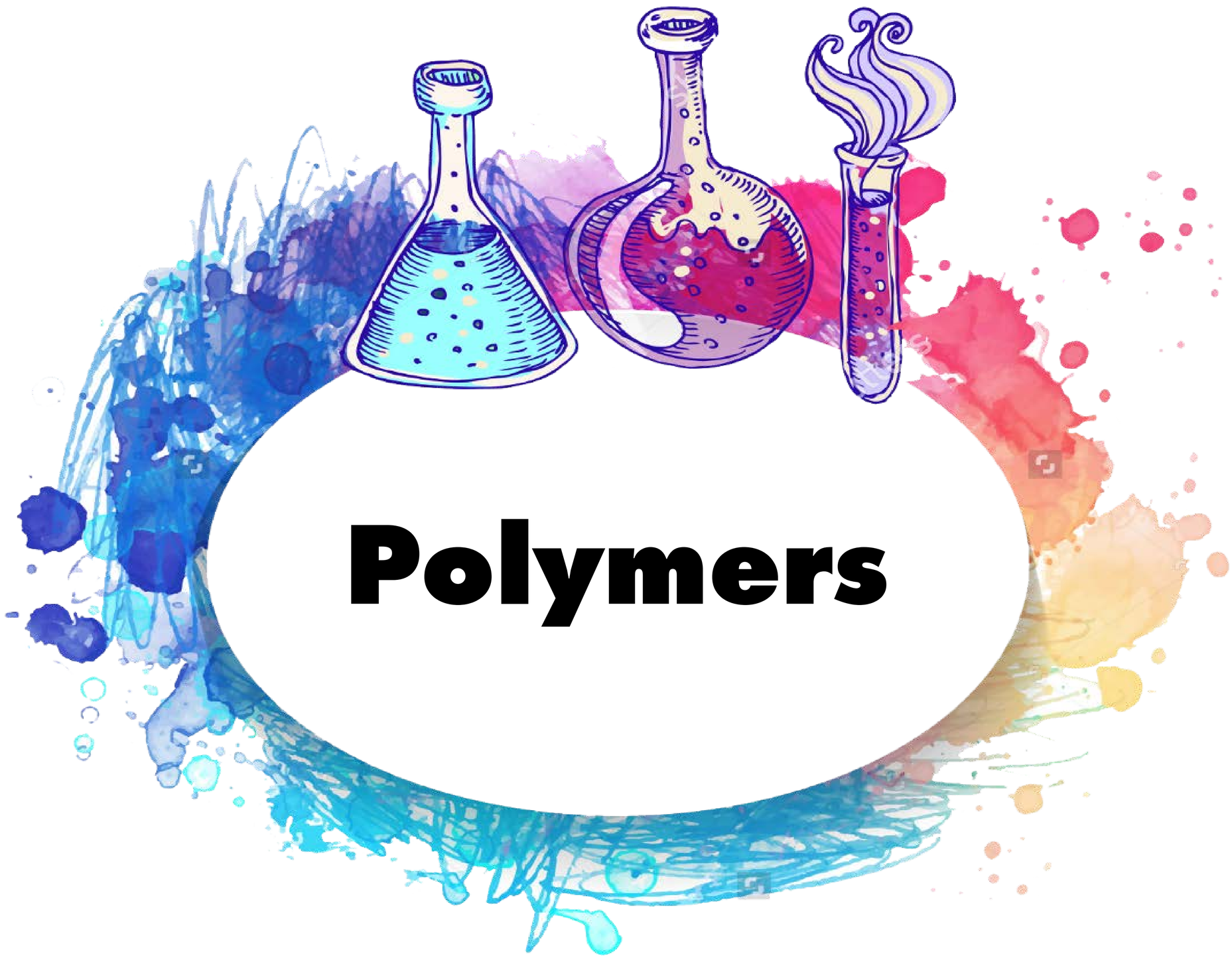
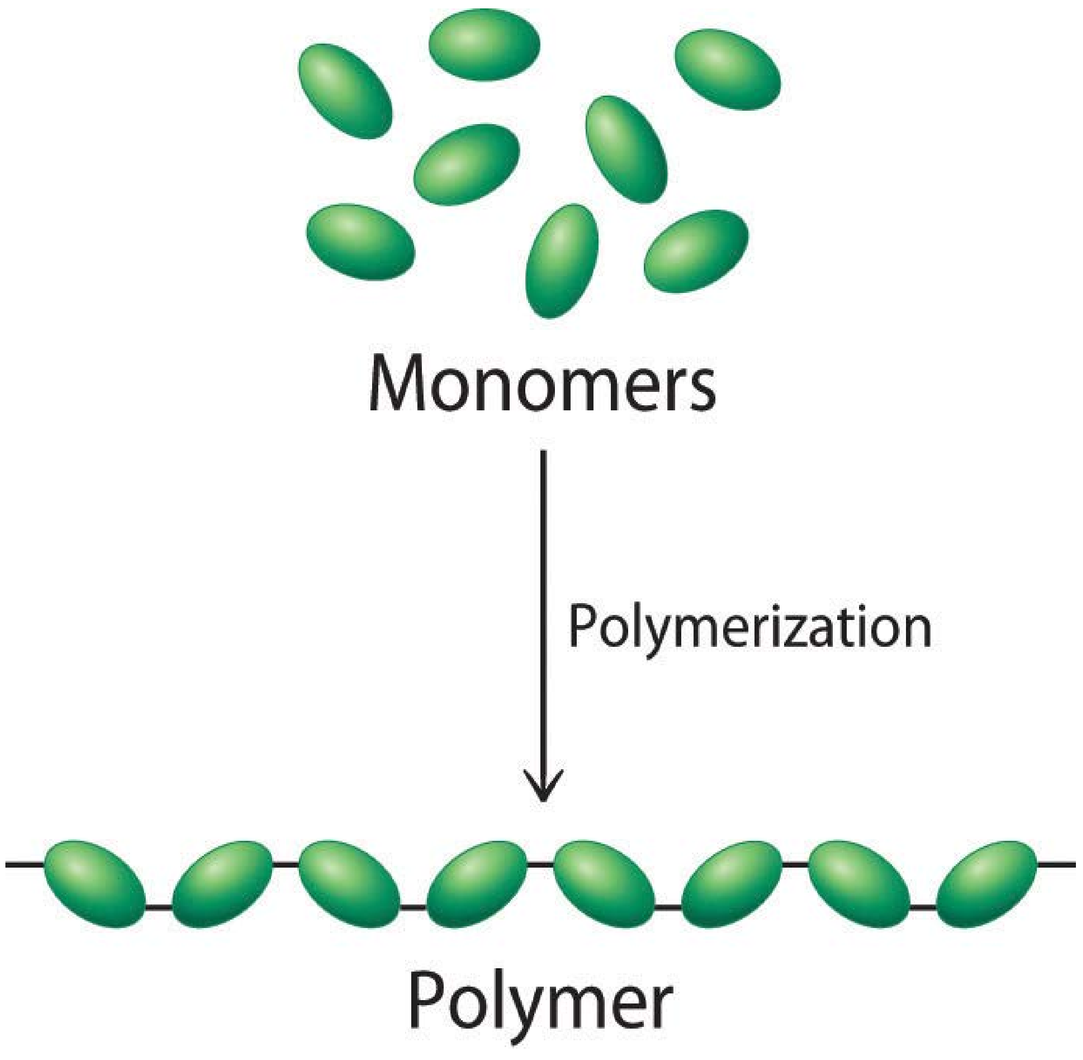


Polymers

Jell-O Shots

Polymers are a substance that have a molecular structure consisting of a large number of similar units bonded together. For example, many synthetic organic materials used as plastic or resin.

- ✓ Mono means "one". Poly- means "many" and -mer means "part.“ So, monomers are tiny molecules that join together to make a long polymer chain.
- ✓ Their arrangement determines their physical properties.



A High Density Polymer can be stacked on each other, not allowing light through and creating an opaque product.

A Low Density Polymer is not easily stackable, creating a transparent product.

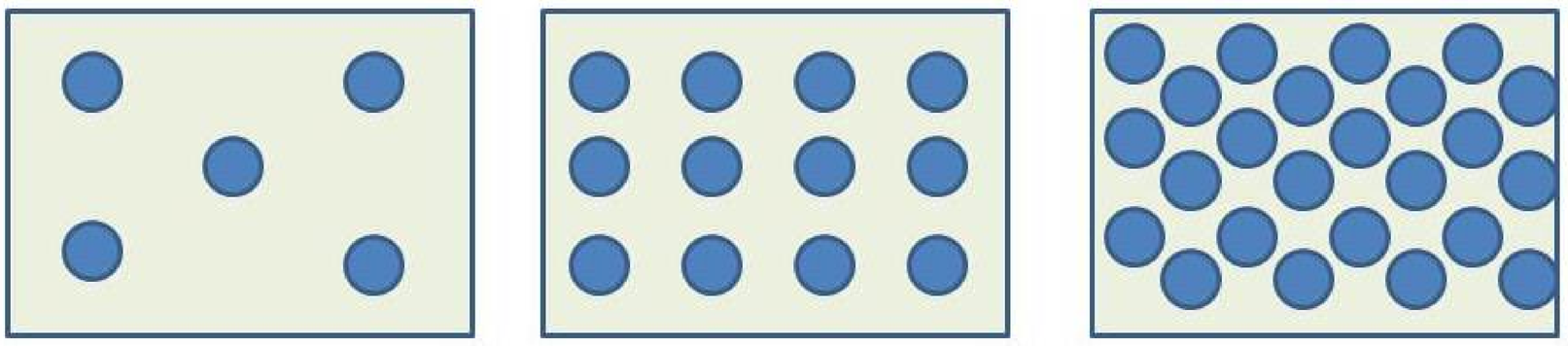
Density

Layered B-52 Test Tube Shots

Density = Mass per unit Volume $\rho = \frac{m}{V}$

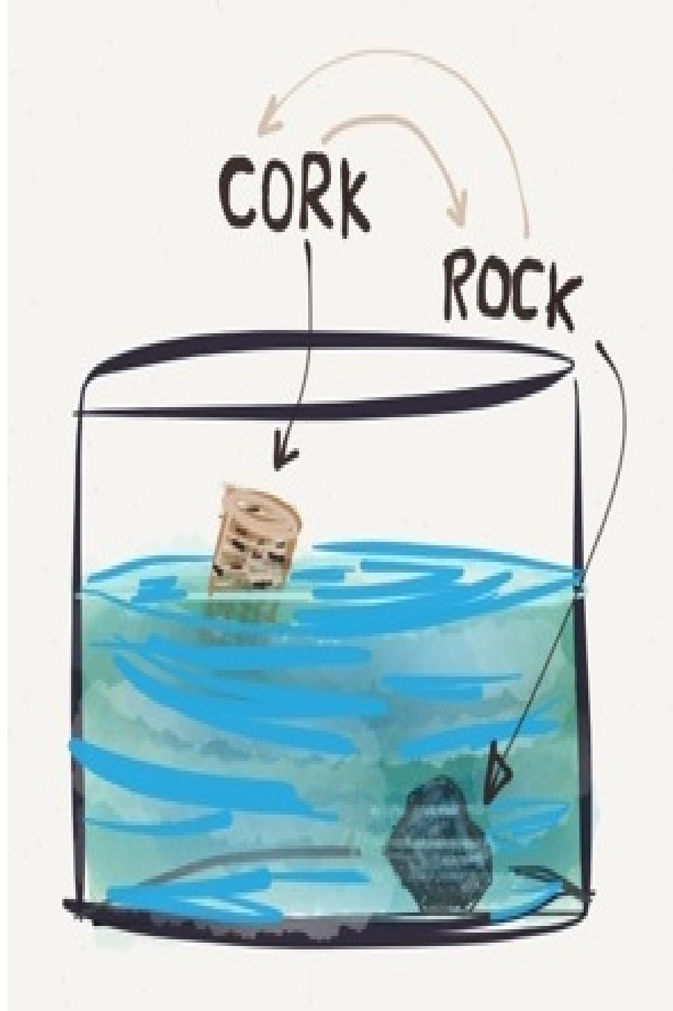
The amount of matter packed into a space

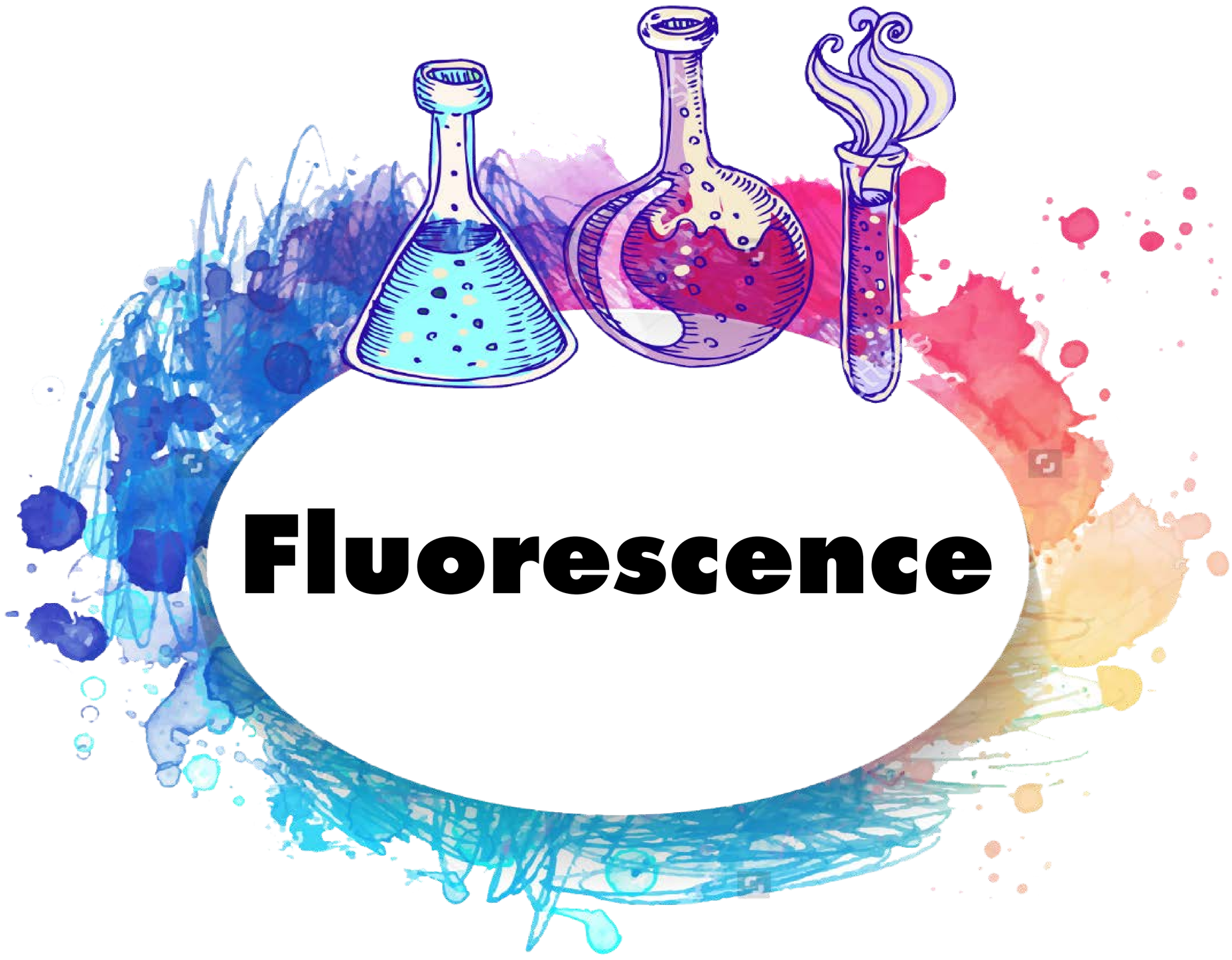
- ✓ Molecules spread out = less dense
- ✓ Tightly packed molecules = more dense



Less Dense More Dense

Density

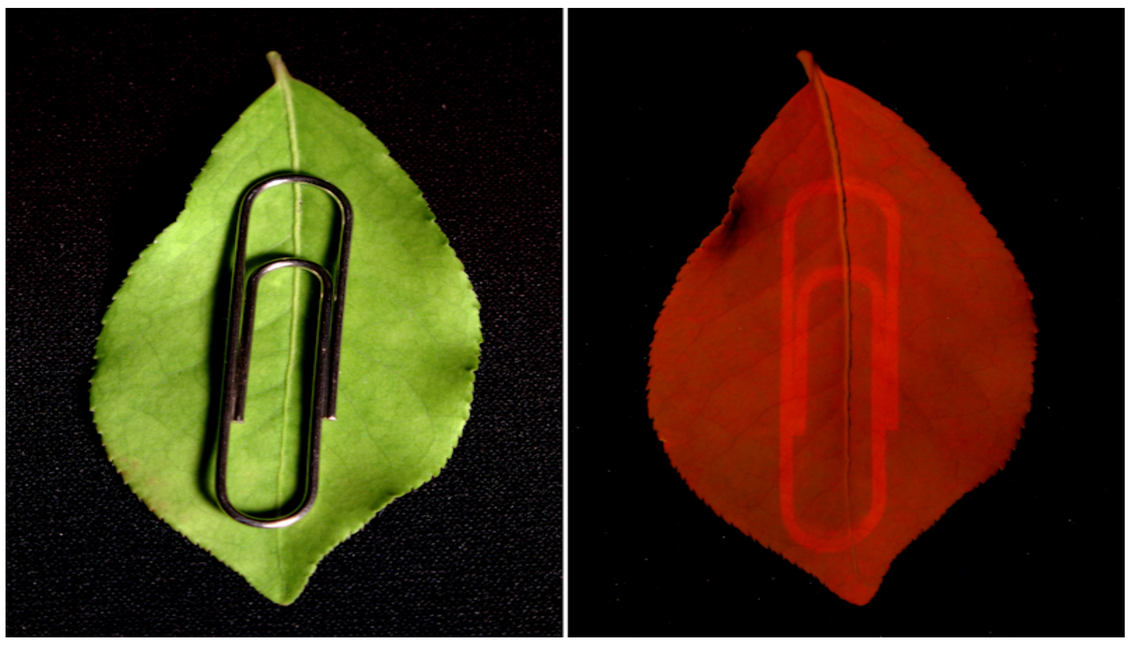




Fluorescence

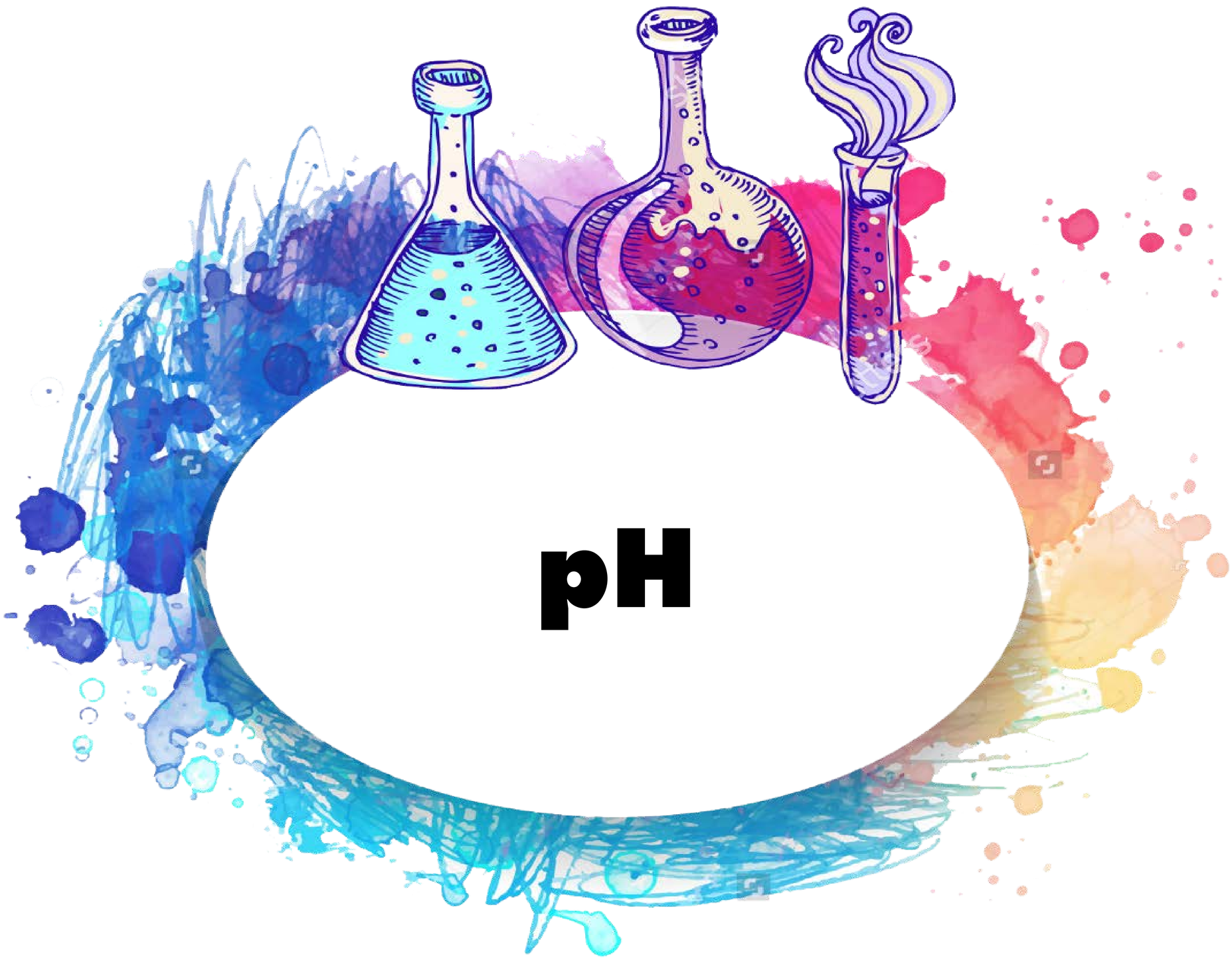
Glowing Gin & Tonic

Fluorescence = the emission of light from a substance when exposed to shorter wavelengths such as Ultra Violet (UV)



Chlorophyll (green pigment in plants and algae) fluoresces **red** under Ultra Violet (UV) light

Tonic water fluoresces blue under Ultra Violet (UV) light due to quinine it contains

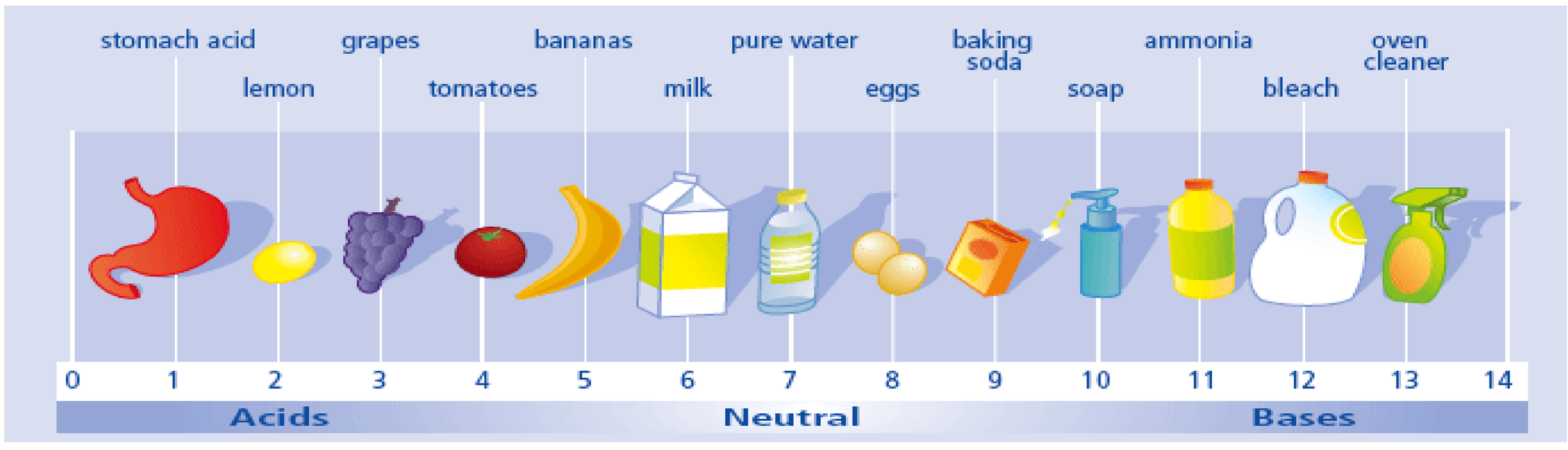


pH

Color-changing Vodka & Soda

Butterfly Pea flower extract contains powerful anti-oxidants which changes color to indicate a pH change.

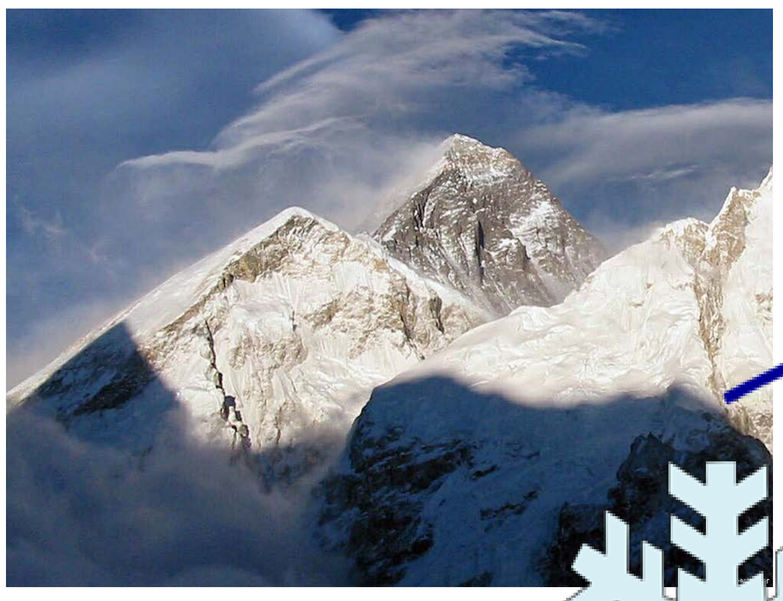
- pH = the level of acidity (acid) or alkalinity (basic) in a substance
- pH Indicator = an added substance that changes color based on pH

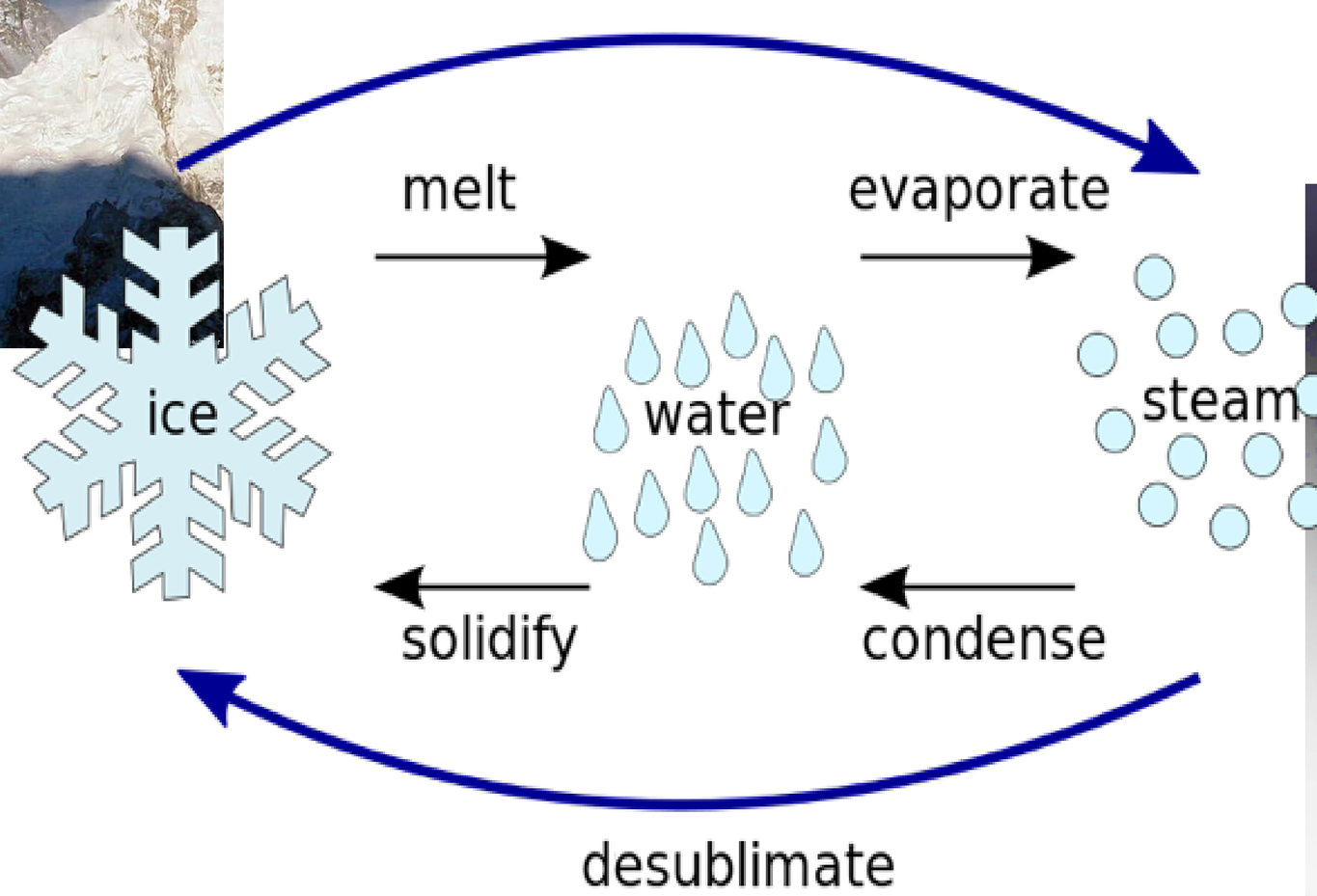


Sublimation

Smokin' Punch

Sublimation is when a substance changes from a solid to a gas, skipping over the intermediary liquid phase.

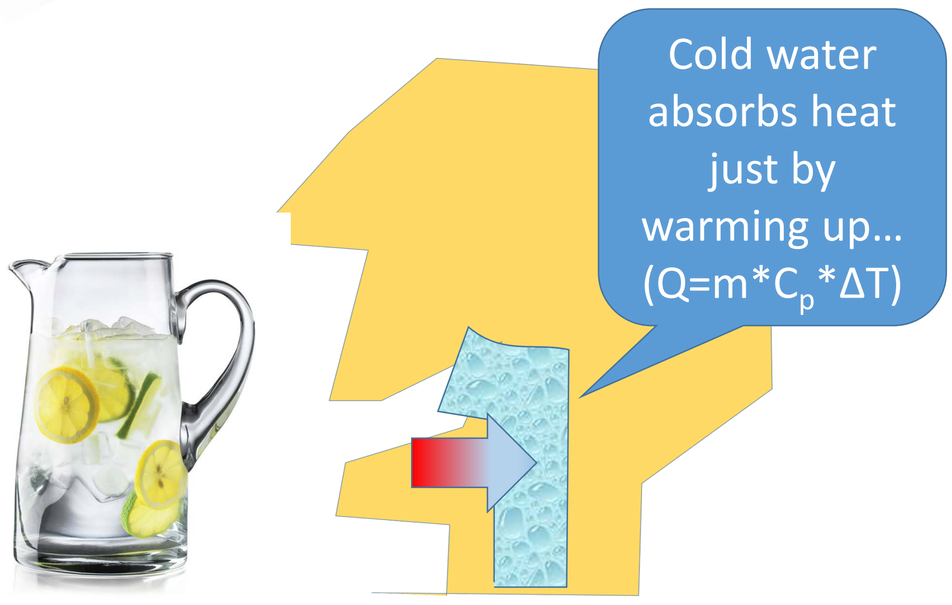


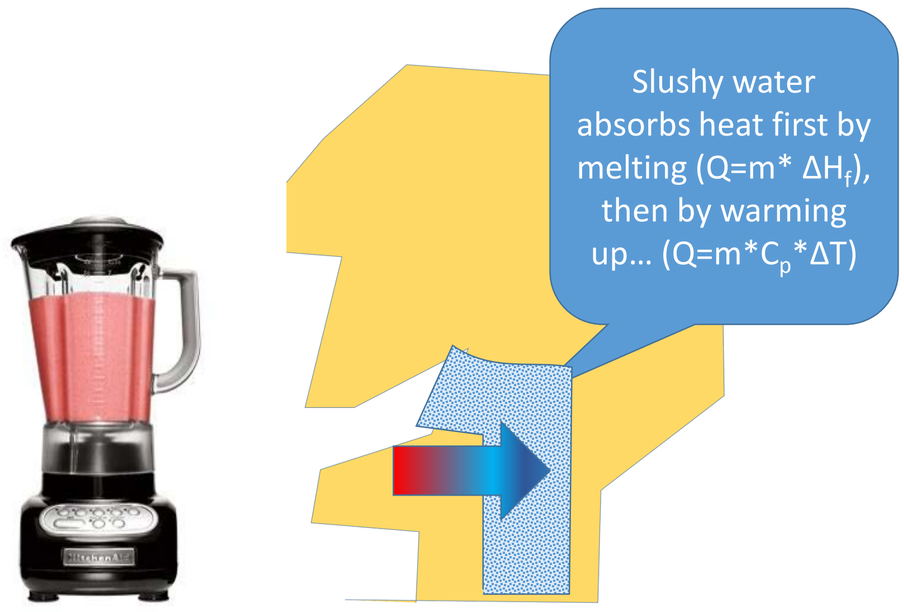


Latent Heat

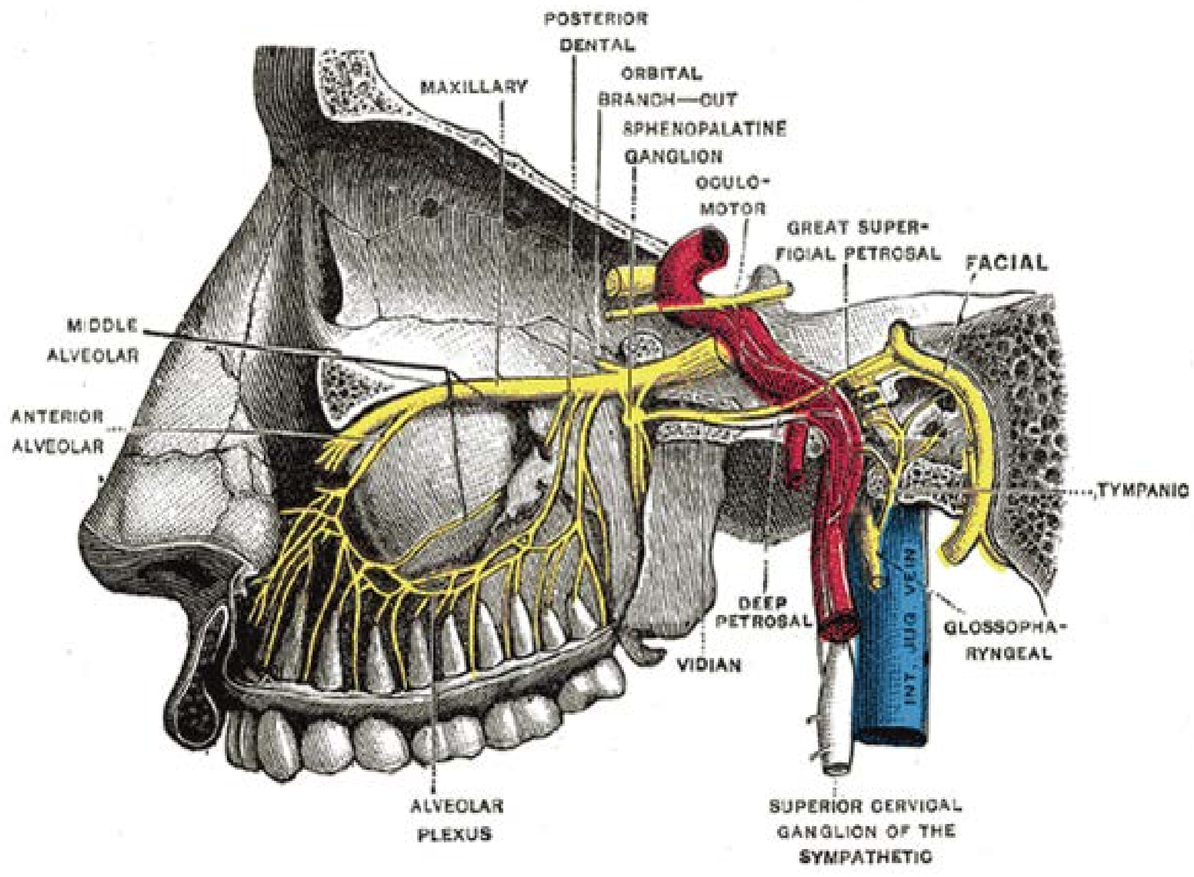
"Sphenopalatine Ganglioneuralgia"
Margarita

- Heat is energy that moves from hot to cold. Heat transfers through conduction, radiation, or convective circulation.
- Latent heat melts, evaporates, or sublimates water.
- Colligative properties lower freezing points, like antifreeze.



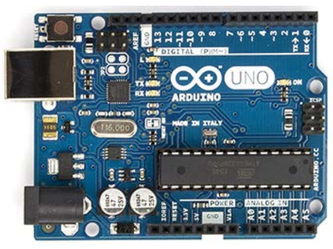


***BRAIN FREEZE*:** When you drink a very cold (e.g. slushy) beverage, the rapid cooling of the sphenopalatine ganglion causes the constriction and swelling of blood vessels. This causes blood to rush to your brain causing "referred" pain to your head.



DIY Alcohol Breathalyzer

A breathalyzer is a device for estimating blood alcohol content (BAC) from a breath sample.



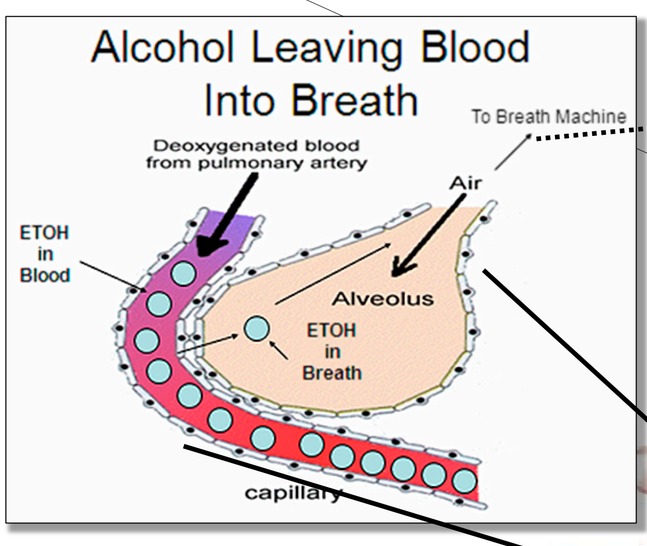
<u>Test yourself using an arduino microcontroller</u>

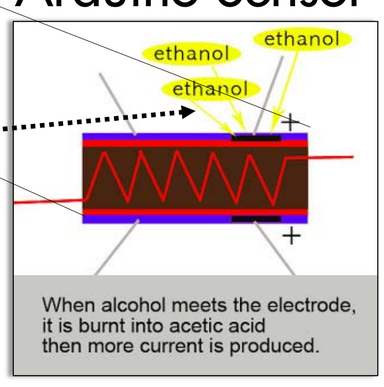
- When the user exhales into a breath analyzer, any ethanol present in their breath is oxidized to acetic acid at the anode. $CH_3CH_2OH(g) + H_2O(l) \rightarrow CH_3CO_2H(l) + 4H+(aq) + 4e-$
- At the cathode, atmospheric oxygen is reduced. $O_2(g) + 4H+(aq) + 4e- \rightarrow 2H_2O(l)$
- The overall reaction is the oxidation of ethanol to acetic acid and water.
  $CH_3CH_2OH(l) + O_2(g) \rightarrow CH_3COOH(l) + H_2O(l)$
- The electric current produced by this reaction is measured by a microprocessor and displayed as an approximation of overall blood alcohol content (BAC) from the sensor.

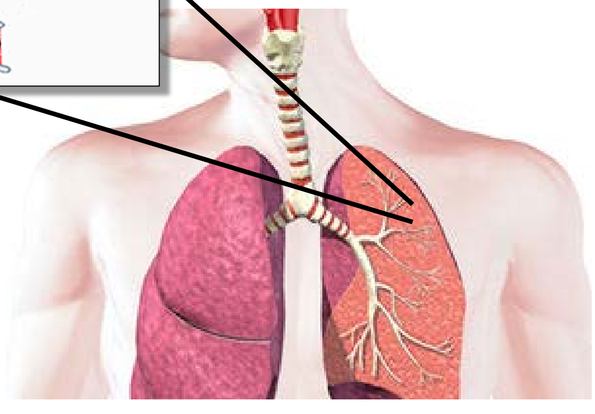
<u>Henry's Law</u>:

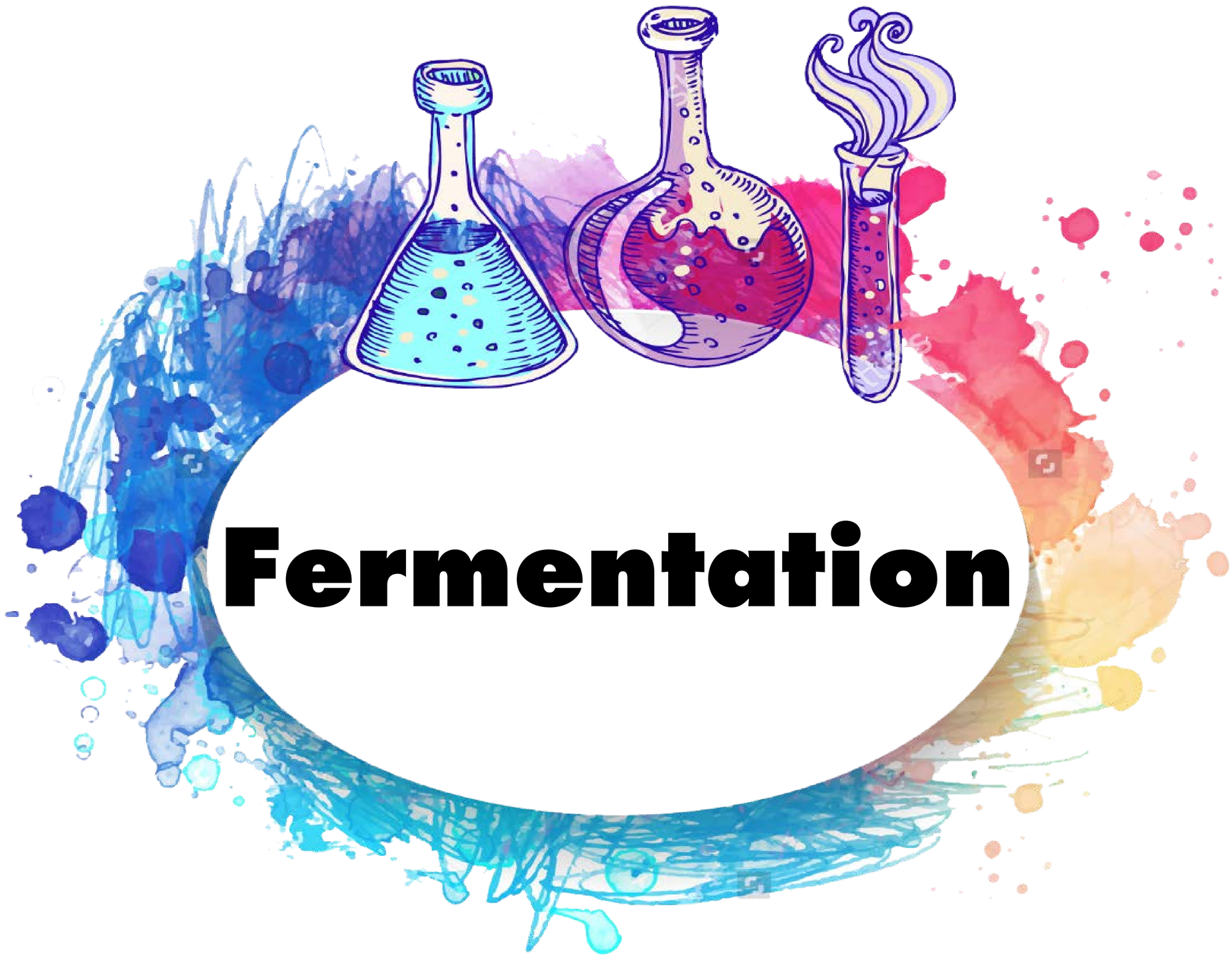
The amount of gas dissolved in a solution is directly proportional to the pressure of the gas over the solution.

- There is a 2,100 to 1 ratio for blood alcohol to air in the alveolar.
- 1 ml of blood will contain nearly the same amount of alcohol as 2,100 ml of breath.







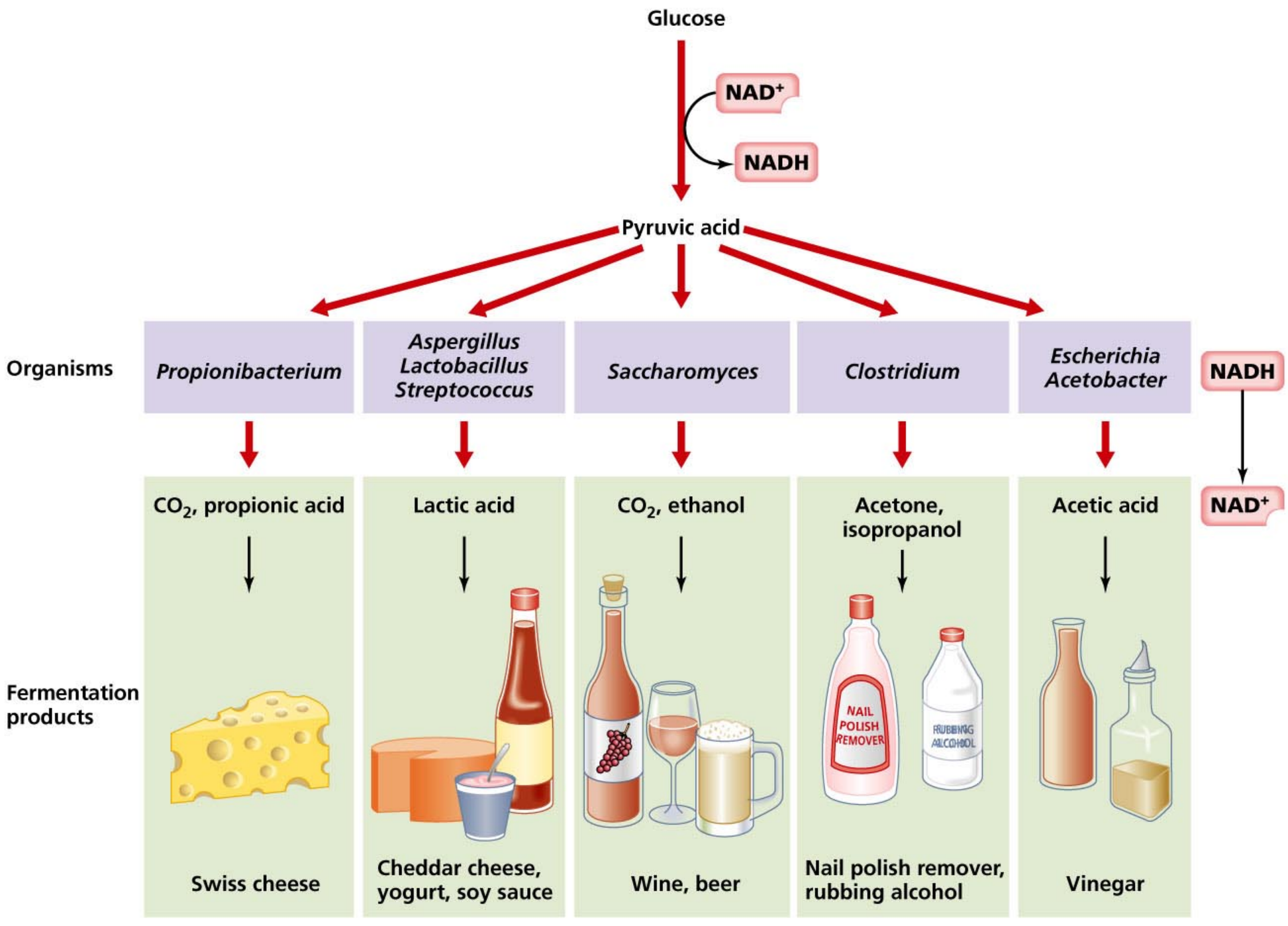


Fermentation

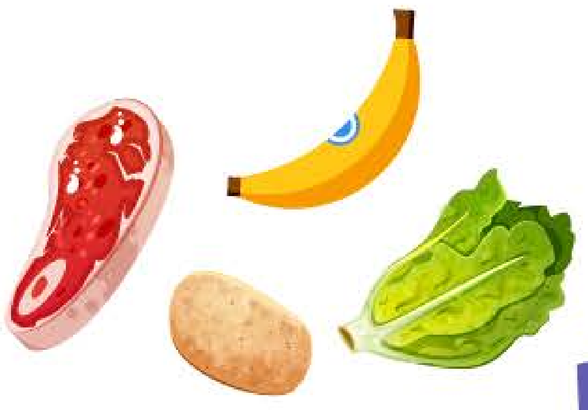
Double Bond Wine

DOUBLE
BOND

Fermentation is a metabolic process in which an organism converts a carbohydrate, such as starch or a sugar, into an alcohol or an acid. For example, yeast perform fermentation to obtain energy by converting sugar into alcohol.

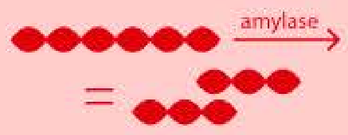


THE DIGESTIVE SYSTEM

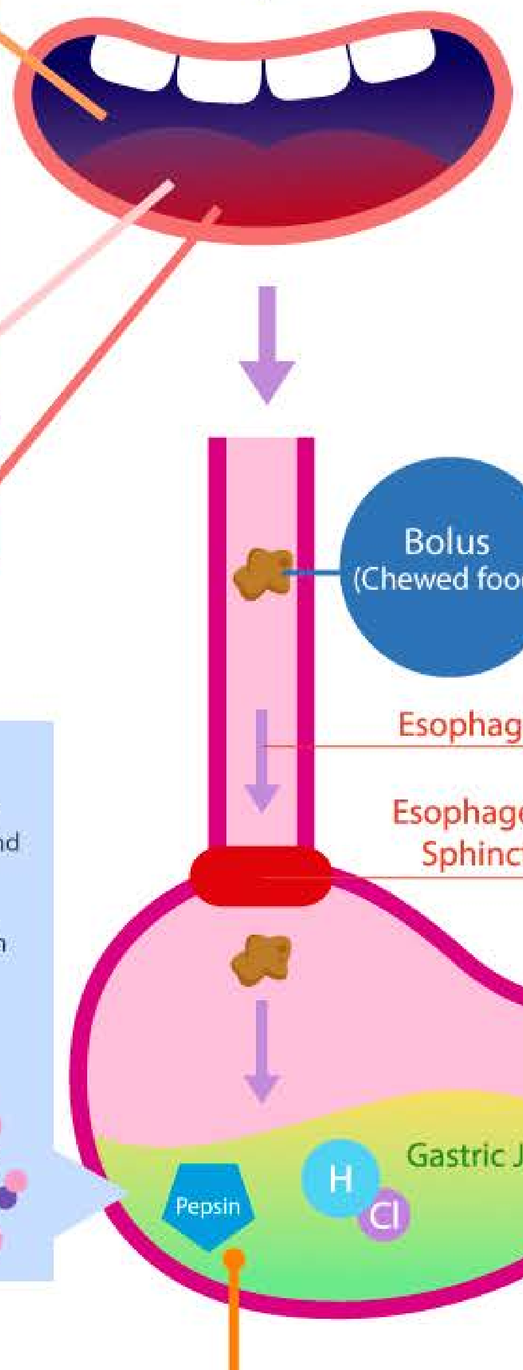


Mastication or chewing is the first step of digestion. Chewing increases the surface area of foods to allow more efficient break down by enzymes

Salivary amylase begins digesting starch into polysaccarides.



Lingual lipase begins breaking down fat.



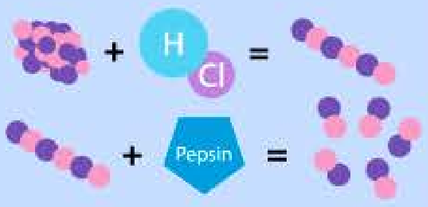
Pancreatic juices containing digestive enzymes are secreted into the small intestine to continue digesting macronutrients.

Polypeptides are broken down into Amino Acids.

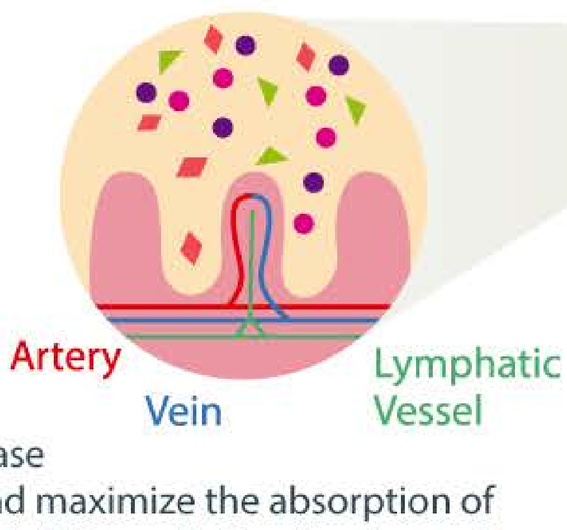
Bile, a digestive juice manufactured by the liver and stored in the gallbladder, is released into the small intestine to emulsify fats.

Pancreatic lipase breaks down fats.

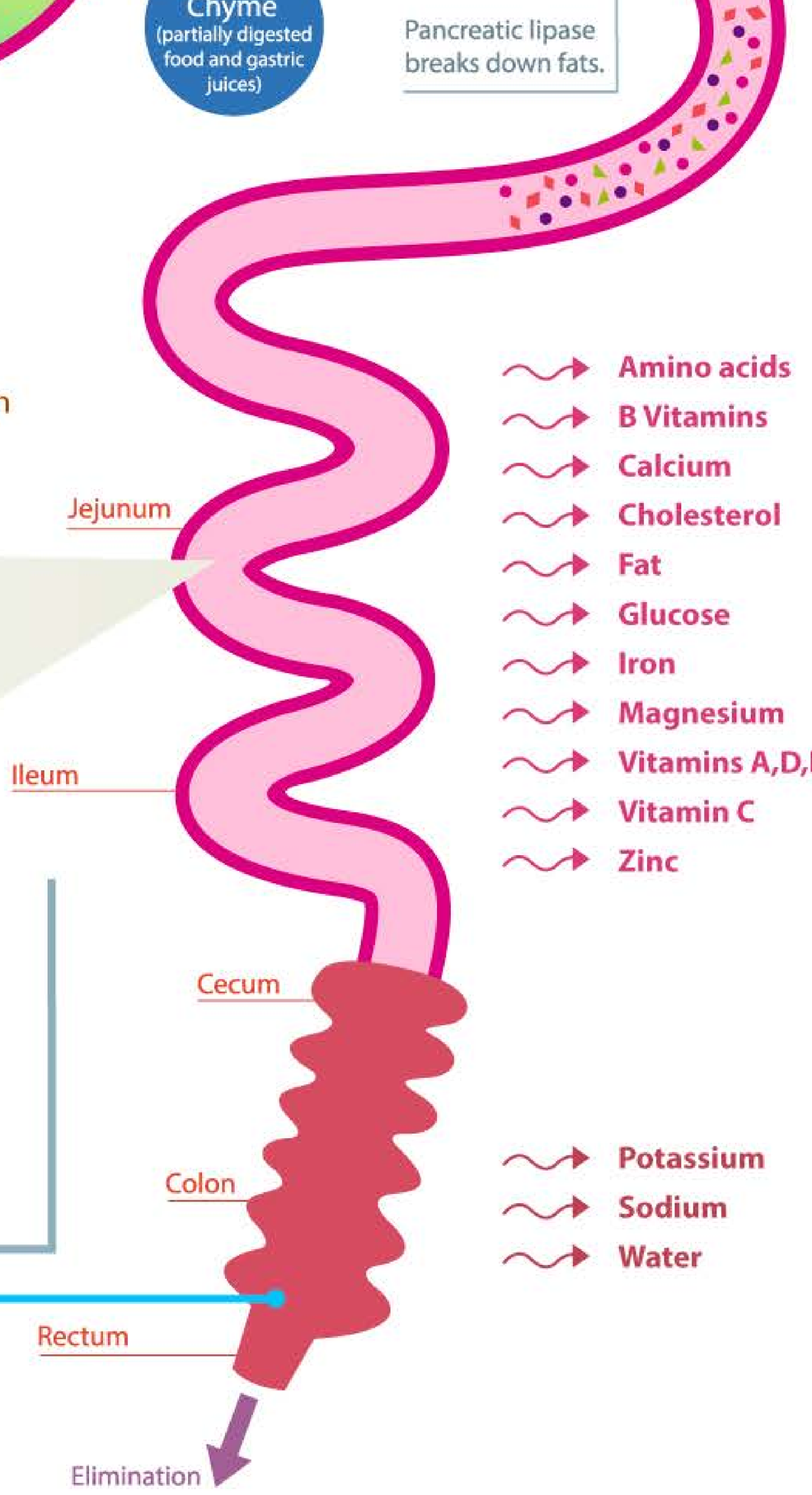
The digestion of proteins in the stomach occurs mainly due to the action of hydrochloric acid (HCl) and an enzyme called pepsin. Pepsin forms in the stomach when pepsinogen reacts with HCl. Pepsin breaks down proteins into polypeptides.



Hydrochloric acid produced by parietal cells present in the lining of the stomach increases the acidity of the bolus to pH=2.0 . This deactivates de salivary amylase and stops the digestion of carbohydrates until they reach the small intestine.



Villi and microvilli of the small intestine are tiny structures that cover the walls and look like fingers. They increase the surface area and maximize the absorption of nutrients from food. Water soluble vitamins and minerals are absorbed into the bloodstream. Bile is needed for the absorption of fat-soluble vitamins. Fat-soluble vitamins enter the lymph vessels before making their way into the bloodstream.



No further digestion occurs in the large intestine except for the digestion of a small amount of fiber by the colon's bacteria population.