Science 8 Note Package

Elgin Park Secondary

Name: _____

Block: _____

Science 8 – Biology

Vocabulary

Here is a list of new terms we will learn this unit. You should define these terms in your own words as we progress through the unit.

Antibiotic:_____

_____

Cell: _____

_____

Cell Theory: _____

_____

Diffusion: _____

_____

Eukaryotic Cell: _____

_____

Equilibrium: _____

_____

Field of View: _____

_____

Photosynthesis: _____

_____

Cellular Respiration: _____

_____

Concentration: _____

_____

Impermeable: _____

_____

Immune System: _____

_____

Inflammation: _____

_____

Micro-organism: _____

_____

Microbe: _____

_____

Multicellular: _____

_____

Organelle: _____

_____

Osmosis: _____

_____

Pathogen: _____

_____

Permeable: _____

_____

Prokaryotic Cell: _____

_____

Resolving Power:

_____

_____

Semi-Permeable: _____

_____

Unicellular: _____

_____

Vaccine: _____

_____

Virus: _____

_____

Unit 1: Life Processes are performed at the Cellular Level

How do we observe living things?

Date: _____

Examining Very Small Living Things

- _____ can be used to observe small organisms.
- One of the first microscopes was invented in the late 1600s by Anton van Leeuwenhoek.
- He was able to magnify objects up to _____.
- Robert Hooke constructed a microscope with a _____ on either end of a long _____. He studied thin slices of cork and named each subunit a _____.

Types Of Microscopes

a) Simple Microscope

- _____ lens
- i.e., magnifying glass
- ____ or ____ magnification

b) Compound Light Microscope

- Has 2 or more _____
- Magnification up to _____ (most <400x)
- Most _____ microscope in science classes and in medical laboratories.

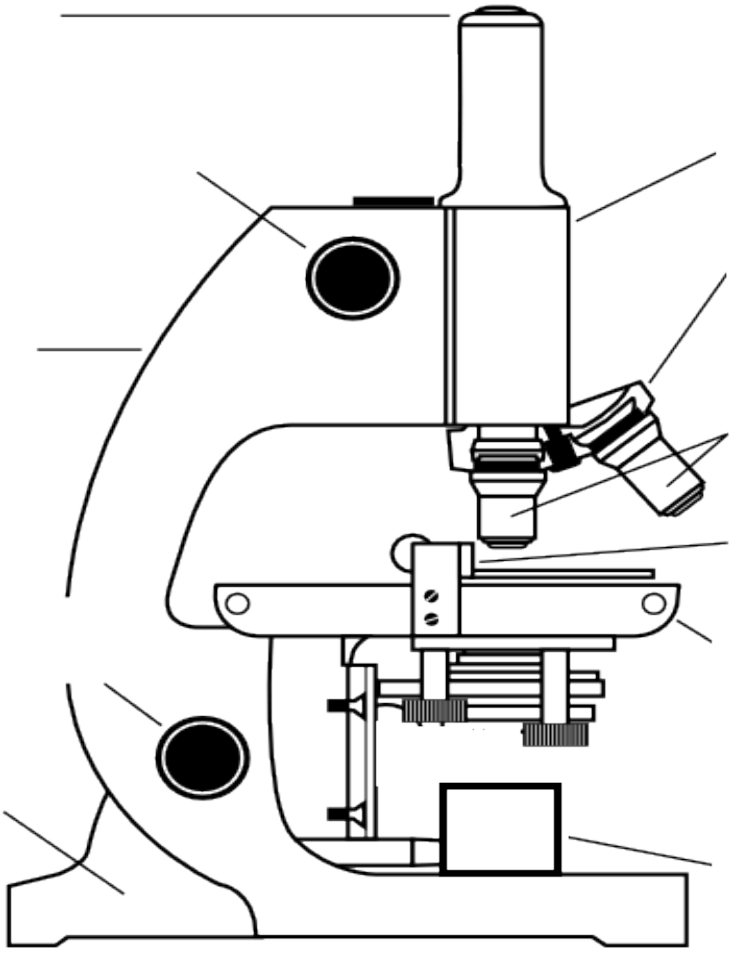
c) Electron Microscopes

- Powerful microscopes used for _____
- Magnification up to _____

The Compound Light Microscope

- Together, the_____ and _____ lenses _____, _____ and _____ an image.

LABEL THE FOLLOWING:



Magnification

The eyepiece has a magnification of _____

There are 3 objective lenses attached to the rotating nosepiece:

- Low-power objective lens: ____
- Medium-power objective lens: ____
- High-power objective lens: ____

Calculating Magnification

Multiply the objective lens by the eyepiece lens to get _____

e.g. 4X times 10X = 40X total magnification at low power

Calculate the Total Magnification at:

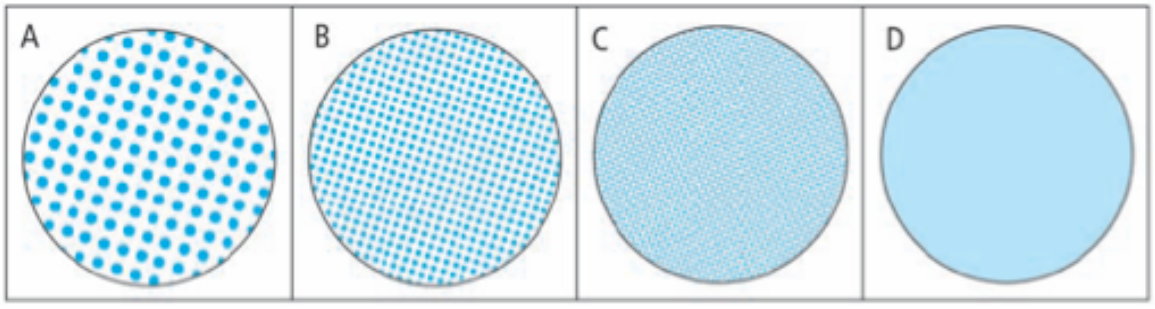
Low Power:

Medium Power:

High Power:

Resolving Power

- The ability to _____ between two objects that are _____ together.
- The human eye has _____ resolving power.
- Using a microscope, the resolving power _____ as we increase magnification.



Care of the Microscope

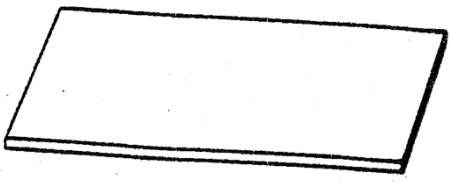
- Use _____ hands to carry the microscope. One hand on the _____ and one hand supporting the _____.
- Always carry your microscope in an _____ position.
- Before putting your microscope away, always rotate the ____ power objective lens over the stage.
- Replace the _____ and roll electrical cord around the _____.
- Avoid contact with the _____. Use lens _____ to clean the lens.
- When focusing, do not bring objective lens too _____ to the glass slide on the stage.
- Always adjust the focus on the _____ power objective lens first, and then change to higher power lenses. Adjust higher power lenses with only the _____ focus knob.

Making a Wet Mount

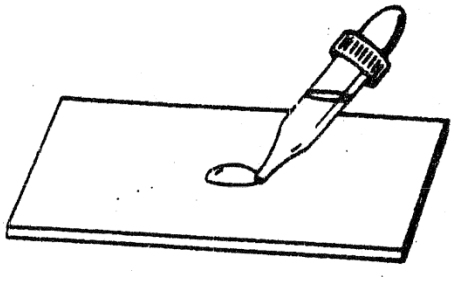
A wet mount slide is the name for the slide that you prepare yourself. It is called a wet mount because unlike the slides from the biological supply companies, yours is wet.

Follow the steps below:

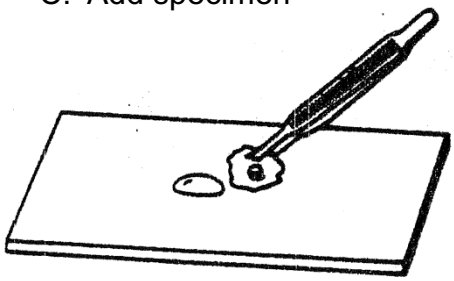
A. Clean Microscope Slide



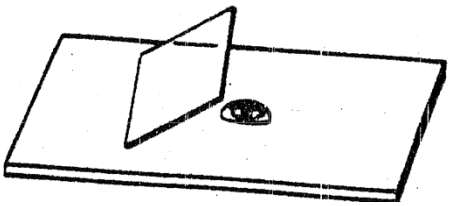
B. Add a drop of water



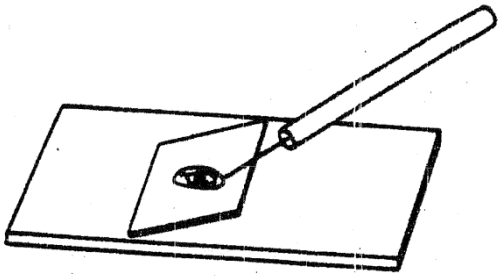
C. Add specimen



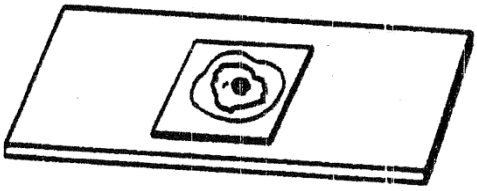
D. Place coverslip over specimen



E. Lower coverslip with dissecting



F. Wet mount prepared for observation



Remember:

1. Your specimen should only be one cell thick.
2. In Step "E" lower the cover slip very slowly and carefully so that no air bubbles are trapped underneath the coverslip.
3. Use lens paper to dry the area around the cover slip if the slide gets wet.
4. Tidy up the work station after you have finished making your wet mount.
5. When you are finished with the slide, carefully clean the cover slip and slide with soapy water. Dry with tissue paper. Return the cover slip and slide to the work station.

MICROSCOPE USE AND CARE

- Always carry the microscope with _____ hands, one hand on the _____ and one hand placed under the base for support.
- _____ cover, plug into_____, turn on light.
- _____ power objective lens in place use nosepiece
- Stage should be in the "all the way up" position. Use coarse adjustment knob.
- Place slide on _____
- Move slide around to find image
- Using the _____ **adjustment knob** focus to obtain the clearest image possible.
- Using the **fine adjustment knob**, bring the object into the clearest image possible; _____ object in the field of view.
- Bring the medium power objective into place using the _____
- Focus the object using minor adjustments with the **fine adjustment knob**.
- Center object in field of view; adjust_____ source if needed.
- Bring the _____ power objective into place.
- USING ONLY THE FINE ADJUSTMENT KNOB, BRING THE OBJECT INTO THE CLEAREST FOCUS POSSIBLE—adjust light if needed and center object in the field of view.

High	Low	Coarse	Two	Nosepiece	Arm	Center	Light	Stage	Outlet	Remove

When finished with your microscope:

- ✓ Remove slide
- ✓ Center the mechanical stage holder
- ✓ Place the low power objective in place
- ✓ Return stage to the all the way up position
- ✓ Turn off light
- ✓ Fold up and tie cord
- ✓ Replace cover
- ✓ Return microscope to the cabinet

THINGS TO REMEMBER

- NEVER use the coarse adjustment knob when on HIGH power.
- If you lose your object (microscope gets bumped, slide is displaced) always start from the beginning (red scanning objective, stage all the way up) to relocate your object.

Microscope Review

Date: _____

Each _____ lens has a different _____ _____. You can determine the power by looking on the _____ lens. Standard powers on most compound light microscopes, include the ones found at the school are:

- 4x - _____
- 10x - _____
- 40x - _____

On top of this, the eyepiece, also known as the ocular lens, is _____ magnification.

To determine the total magnification of an object viewed under the microscope you use the following formula:

For example, if viewing an object under MEDIUM power, the total magnification would be

_____ x _____ = _____.

As you increase the magnification, it becomes easier to distinguish two dots or objects that are very close together. This is known as the _____ _____.

FIELD OF VIEW AND ESTIMATING THE SIZE OF OBJECTS UNDER A MICROSCOPE

The field of view is the circle of light seen through a microscope. It is the area of the slide that you can observe. Each magnification has a different field of view:

MAGNIFICATION	FIELD OF VIEW (μm)

You can use the field of view to calculate the approximate size of the object you are looking at.

Approximate size = field of view X fraction of field taken up

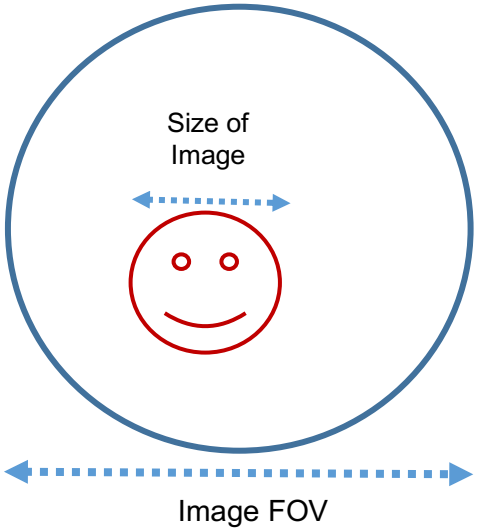
Example: If your field of view is 4.8 mm (on low power) and the object you are looking at takes up a quarter (1/4) of the field of view, the approximate size is…

Size = field of view X fraction of field taken up
= 4.8mm X .25
= 1.2 mm

Estimating the Size of an Image

When looking at an image of a microscope field of view, we can estimate the actual size of the object/cell using the following formula.

Actual size = $\frac{Size\ of\ IMAGE\ in\ field\ of\ viem\ (mm)\ \ X\ \ REAL\ Diameter\ of\ the\ \ field\ of\ view}{Diameter\ of\ the\ IMAGE\ field\ of\ view}$



<u>Real Diameter of the field of view (FOV)</u>

(For MOST compound light microscopes, measures might change for different microscopes)

Low Power: 4.8mm

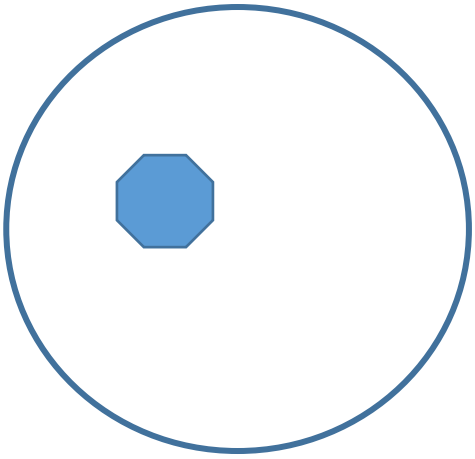
Medium Power: 1.78mm

High Power: 0.45mm

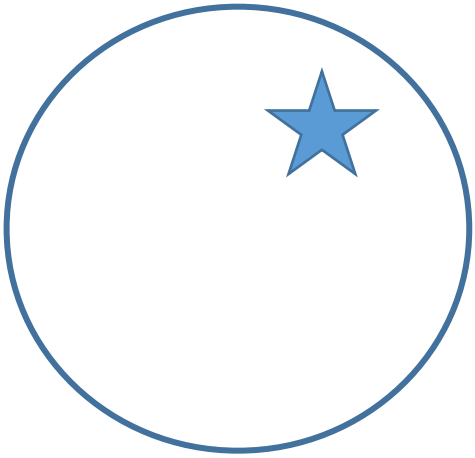
PRACTISE: Calculate the actual size of the image in each field of view.

The following images are being viewed under <u>low</u> power.

Field of view diameter: _____



Size of Actual Image _____ mm

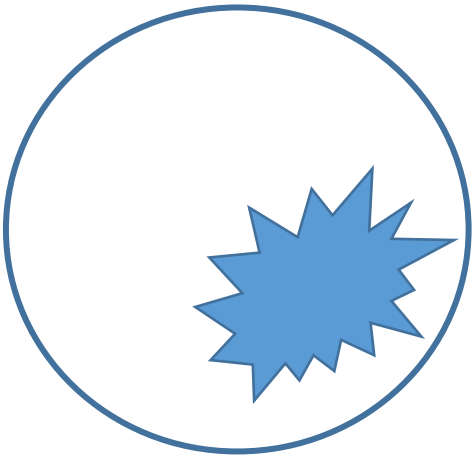


Size of Actual Image _____ mm

The following images are being viewed under <u>medium</u> power.

Field of view diameter: _____

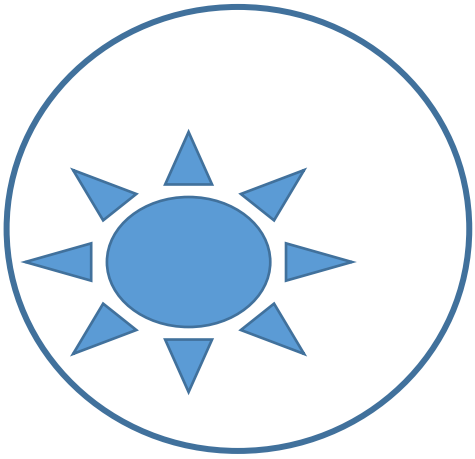
Size of Actual Image _____ mm



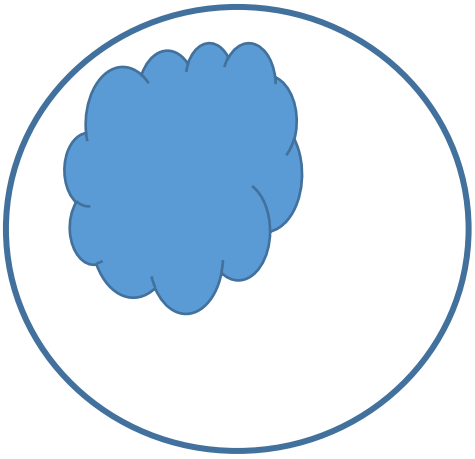
Size of Actual Image _____ mm

The following images are being viewed under <u>high</u> power.

Field of view diameter: _____



Size of Actual Image _____ mm

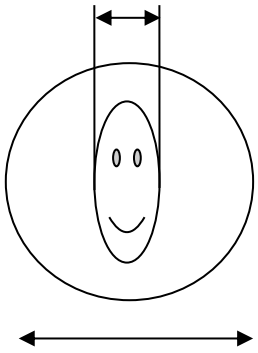


Size of Actual Image _____ mm

SAMPLE PROBLEMS

(a) If nine fresh water protists fit across the field of view of a compound microscope when they are viewed at LOW power, what is the approximate size of each protist?

(b) In the following drawing, what is the approximate width of the object? The microscope is set on medium power.



(c) If human muscle cells are approximately 120μm in size, how many would you expect to find across the diameter of the field of view under MEDIUM power when using the compound microscope?

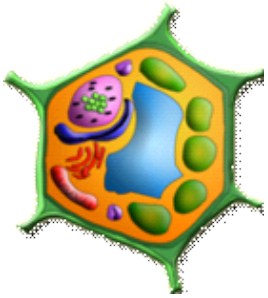
Observing Living Things and Cell Theory

Date:_____

1.1 Characteristics of Living Things (p.6)

All living things have the following characteristics:

1. Are Made Up of _____
2. Take in _____
3. Need _____
4. _____
5. Respond to _____
6. _____
7. _____



Read _____, then do Check Your Understanding on p.13 #1-8

1.2 Cell Theory (p.14)

Where does life come from? Up until ~1600s, most scientists thought that life developed _____ from non-living things. For example, leaving a piece of meat alone for a couple of weeks develops maggots. Therefore, maggots developed spontaneously from the meat!

The scientific process and proper experimentation allowed scientists to refute the idea of spontaneous generation. Over time the _____ was developed.

How would you design an experiment to test spontaneous generation??

The _____ is how biologists gauge whether or not an object is living. It states that:

1. ALL LIVING THINGS ARE MADE UP OF ONE OR MORE _____

2. ALL LIVING CELLS COME FROM _____ CELLS

3. THE CELL IS THE _____ UNIT OF LIFE.

Why was the development of the cell theory important for the progress of science?

- SCIENTISTS FINALLY HAD A WAY TO DESCRIBE WHAT _____ WAS!

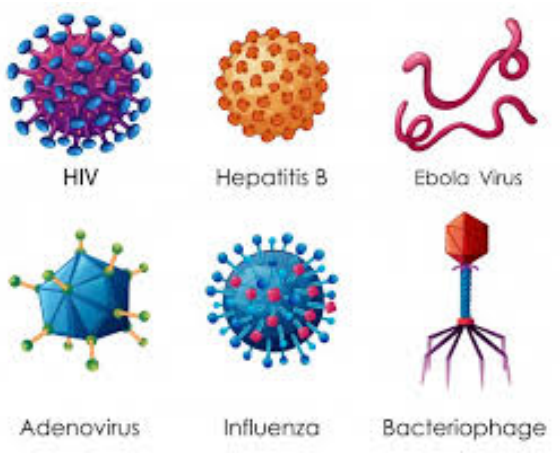
What would have been the limitations of this "new science" when cells were discovered?

- MICROSCOPES WERE NOT _____ ENOUGH TO SEE THE INNER WORKINGS OF THE CELL

Viruses

Viruses are extremely small – they can only be seen by _____ microscopes. They consist of a piece of _____, covered by a protective _____ coat.

Viruses reproduce by injecting their DNA into a host _____, tricking it into manufacturing new _____. The viruses _____ in the cell, preventing it from functioning properly (causing disease).



Read pg. 18 – 19 in your textbook. Would you consider a VIRUS to be a living organism? Why or why not?

Do Check Your Understanding #1-5, p. 21

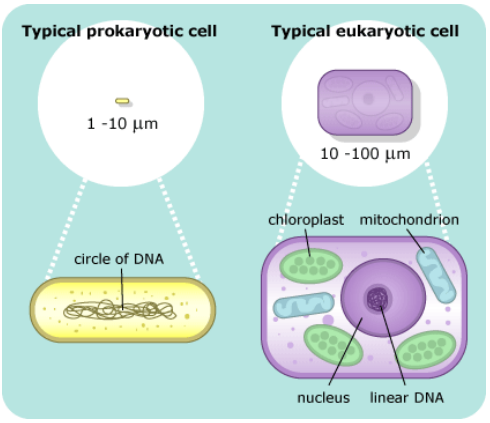
1.3 Types of Cells (p.24-29) Date: _____

Cell Theory

1. All organisms are made up of one or more _____.
2. The cell is the _____ unit of life.
3. Cells are _____ from other cells.

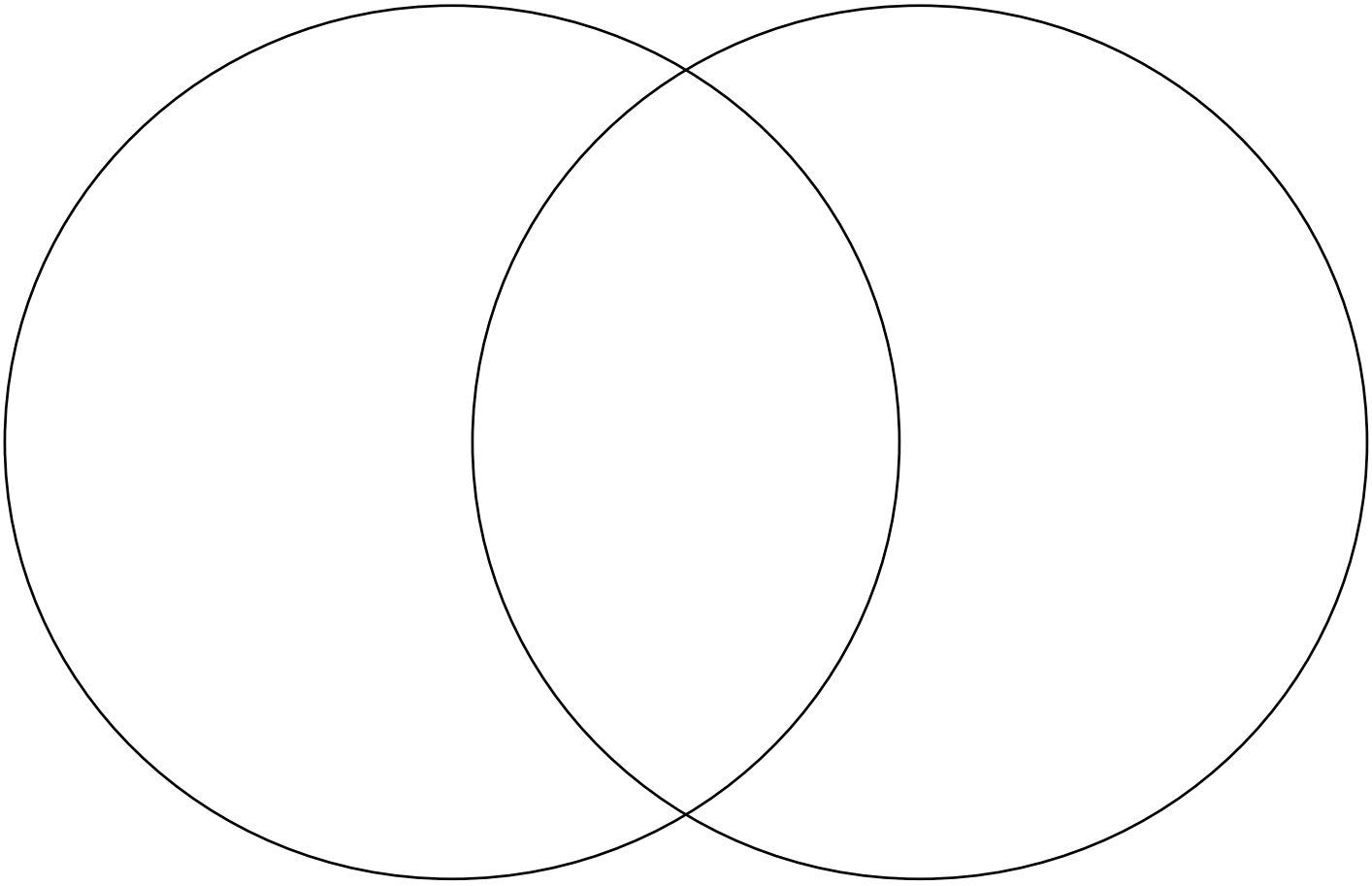
Unicellular: describes a _____-celled living thing.

Multicellular: describes a living thing made up of _____ cells.



Two main types of cells:

- _____ Cells
- _____ Cells



Read p.27 to complete the Venn Diagram

Organelle Structure and Function (Eukaryotic Cells)

_____: smaller structures within cells that carry on life functions.

The organelles inside the cell serve many functions together including:

1. PROVIDING _____ AND _____
2. FORMING A _____ BETWEEN THE CELL AND THE ENVIRONMENT
3. BUILDING AND _____ CELLS
4. _____ MATERIALS
5. STORING AND RELEASING _____
6. GETTING RID OF _____ MATERIAL
7. _____ IN NUMBER

Most cells share similar characteristics. It is these characteristics that we are going to learn about although there are some major differences between animal and plant cells.

Cell Structures

Three Major Cell Parts

1. ***Cell Membrane*** – thin flexible structure that _____ the cell. Regulates what _____ and _____ the cell.

2. ***Nucleus*** - "_____" of the cell. Controls functions of the cell. Contains genetic information – **D**eoxyribo**n**ucleic **a**cid (_____)

3***. Cytoplasm*** – jelly-like _____ in which organelles are found. This is where many chemical _____ take place within the cell.

Other Major Organelles:

4. ***Mitochondrion*** – converts the energy _____ in food into usable energy for the cell (the "_____") - cellular respiration

5. ***Ribosome*** – manufacture _____, the building blocks for structures in the cell.

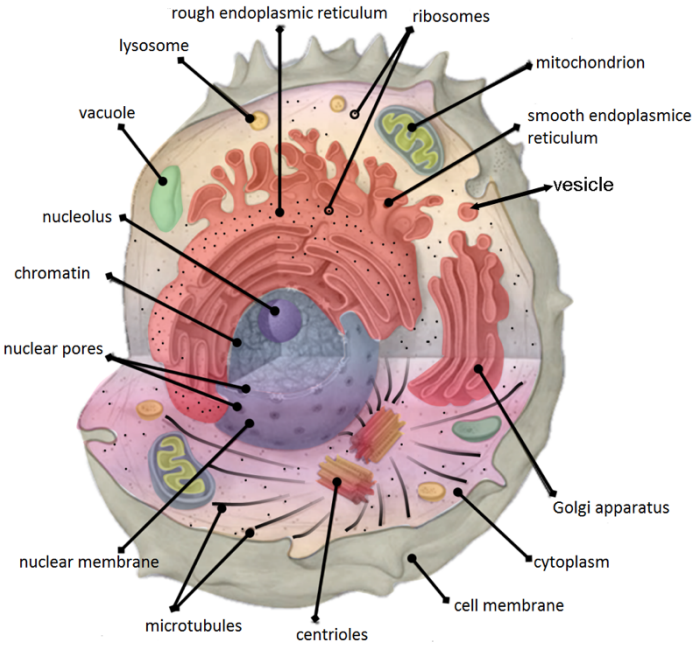
6. ***Endoplasmic reticulum*** – network of flattened tubes that _____ proteins within the cell. Two types: rough ER (has ribosomes) and smooth ER (no ribosomes).

7. ***Golgi Body*** – sorts and packages proteins in membrane-wrapped structures called _____.

8. ***Vesicles*** - small packages containing _____, _____ and _____ into, out of, and around the cell.

9. ***Vacuoles*** – temporary _____ areas; assist in regulating _____ (usually bigger in _____ cells)

10. ***Lysosomes*** – contain _____ chemicals that break down food particles, cell wastes, and worn-out cell parts.



Read p.24-29, do worksheet. Quiz on microscopes tomorrow

Plant vs Animal Cells (p.30-32)

Date: _____

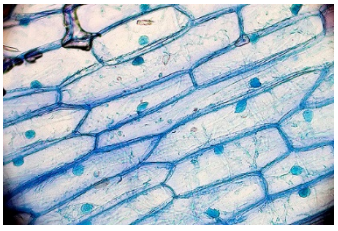
Prepared slides – Animal Tissue, Fern Prothalium (slide #25), Blue Algae (#2)

Have a look through the animal tissue slide sample and then the plant sample under the microscope. Draw what you see for each cell type below:

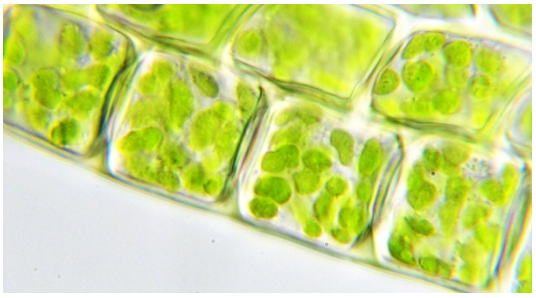
What differences and similarities do you notice under the microscope?

Organelle Differences

_____ - Rigid outer wall that provides protection, support and shape. Contains pores to allow substances to pass.



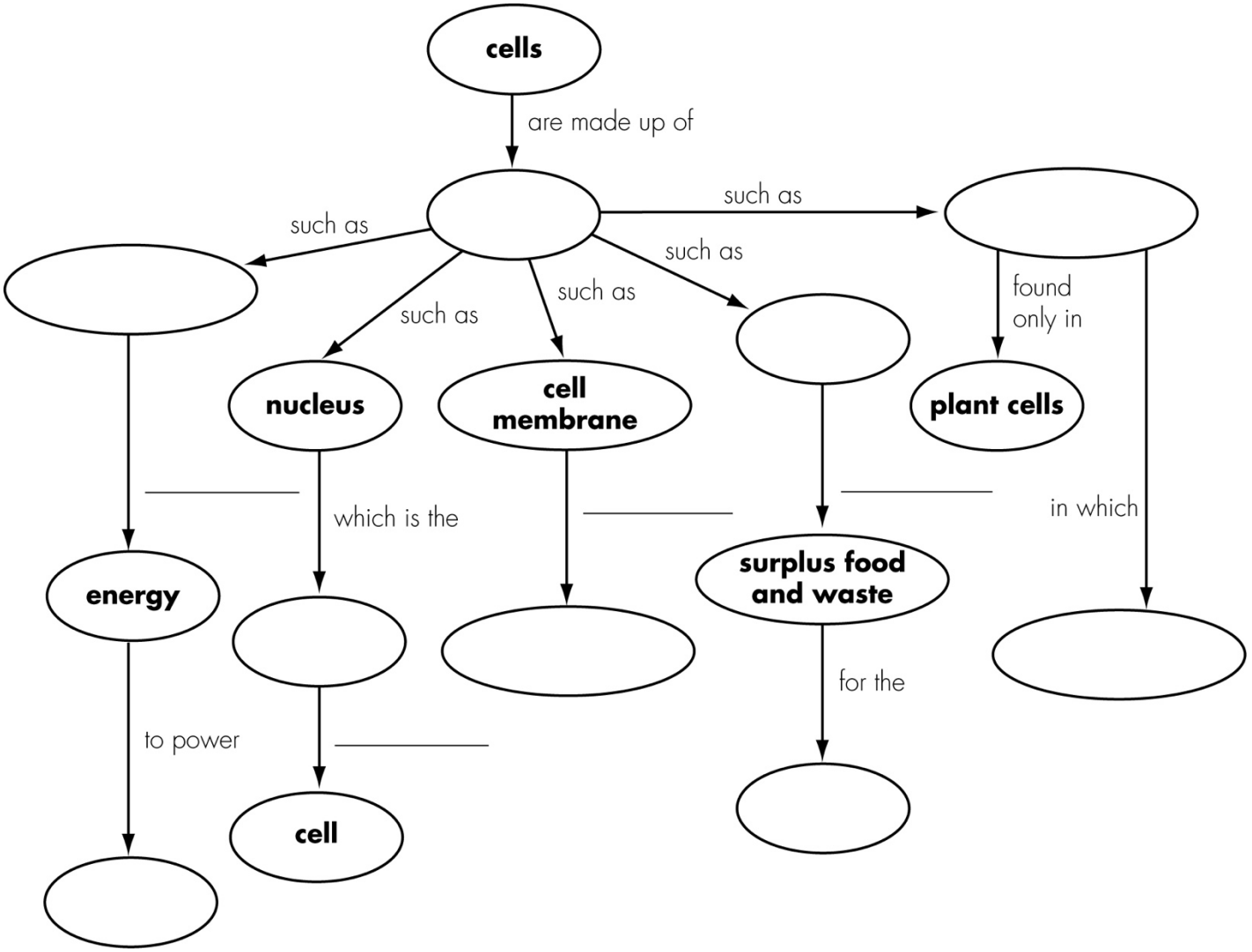
_____ - Captures light to synthesize food energy. Contains green pigment chlorophyll.



Organelles Flow Chart

Fill in the following flow chart with using terms below:

Word List			
the cell	of the	the contents of the cell	that protects
organelles	control centre	mitochondrion	cell
that stores	that produces	chloroplast	vacuole
photosynthesis occurs			

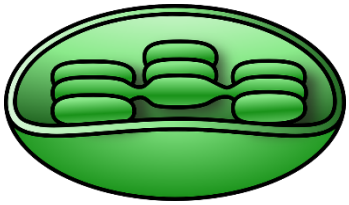


Plant vs. Animal Cells

Summarize the key similarities and differences.

	Plant Cell	Animal Cell
Similarities		
Differences		

Other Differences



Photosynthesis

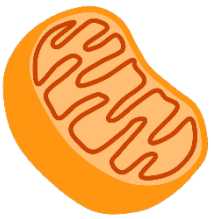
- Process where plants manufacture their own food.
- Occurs in the chloroplasts, which contain the pigment chlorophyll
- Chlorophyll absorbs light and converts it into chemical energy:

Light
_____ + water ----------> _____ + oxygen

- The sugar is then stored for use later.

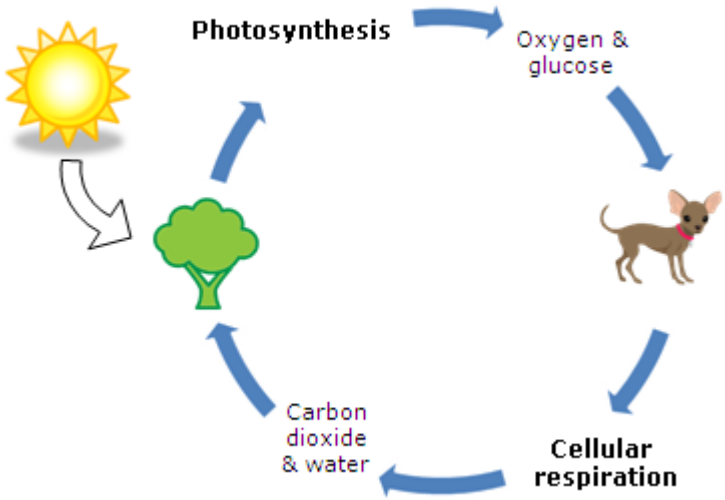
Cellular respiration

- Process that converts stored energy (sugar) into useable energy for the cell.
- Takes place in the mitochondrion.
- Occurs in both plants and animals.



_____ + _____ ----------> carbon dioxide + water + energy

- The energy released can then be used by the cell.

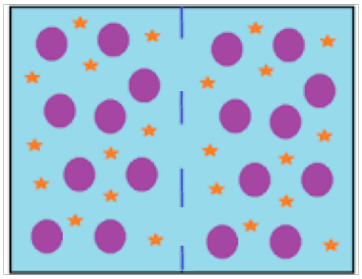
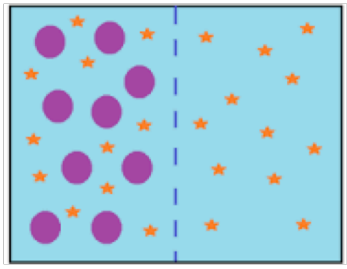
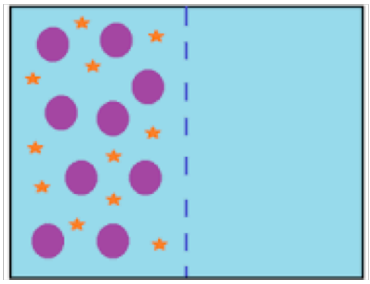


Do Check Your Understanding p. 33 #1, 3-5, 7

Diffusion, Osmosis and the Cell Membrane

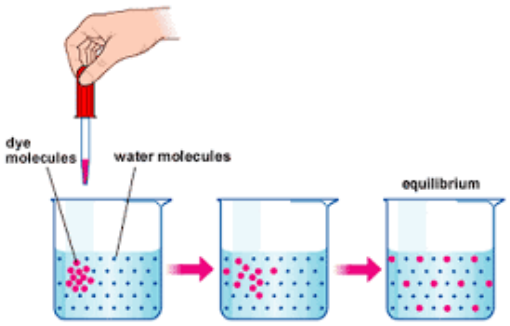
Date: _____

Membrane Permeability

Permeable	Semi-Permeable	Impermeable
• Lets everything through	• lets only some things through	• lets nothing through
		
i.e., cheesecloth is permeable to _____	i.e., a sieve is selectively permeable to _____ and _____	i.e., a plastic bag is impermeable to _____

Concentration is the amount of substance in a given volume. The more you have in a given space, the _____ the concentration.

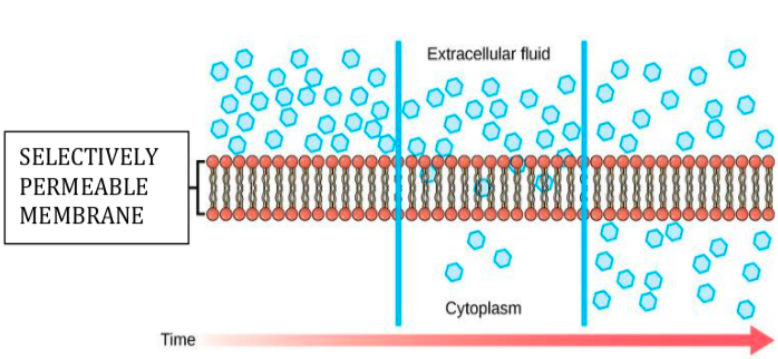
Diffusion is the movement of molecules from an area of _____ concentration to an area of _____ concentration.

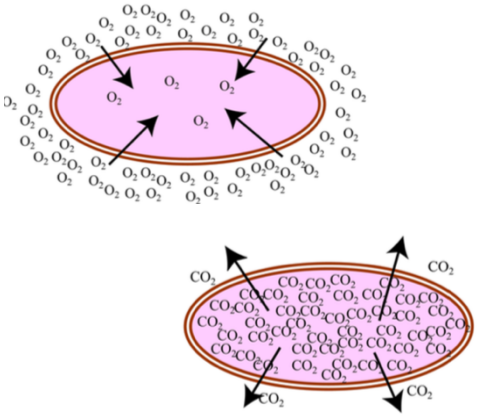


Equilibrium is reached when there is an _____ number of particles on either side of a membrane. Particles will still move back and forth, but the _____ of particles on each side stays the same.

Movement of Substances in and Out of a Cell

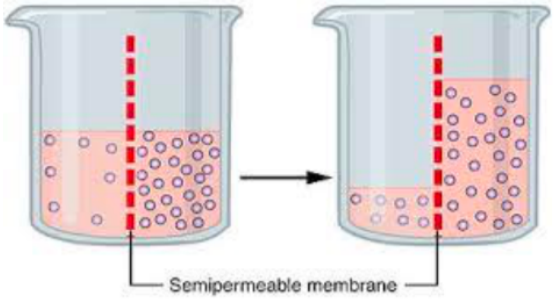
Nutrients and waste materials must move into and out of the cell. The cell membrane regulates the passage of substances in and out of the cell. It is 'selectively permeable' – it only permits certain molecules to enter or leave (semi-permeable).





Osmosis

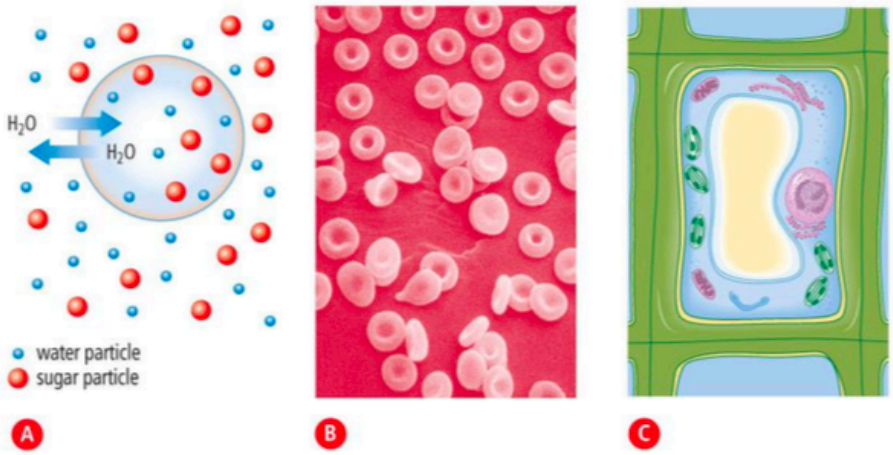
- Process by which _____ moves across a membrane.
- Water moves across the cell membrane depending on the _____ concentration of water inside and outside the cell.
- Water moves from _____ water concentration to _____ water concentration
- Osmosis is really just a special type of _____



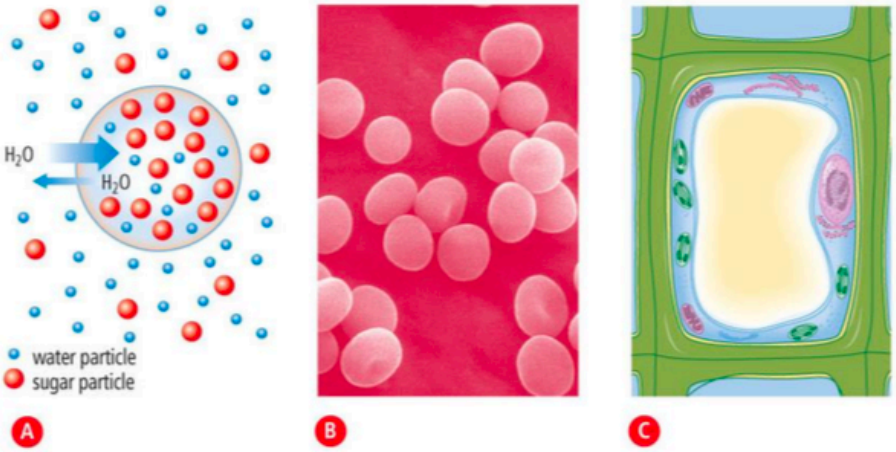
	Diffusion	Osmosis
What type of material is/are transported?		
How is it used by the cell?		
Which direction is the flow of material?		

Using what you have learned, explain what is happening in the cells below:

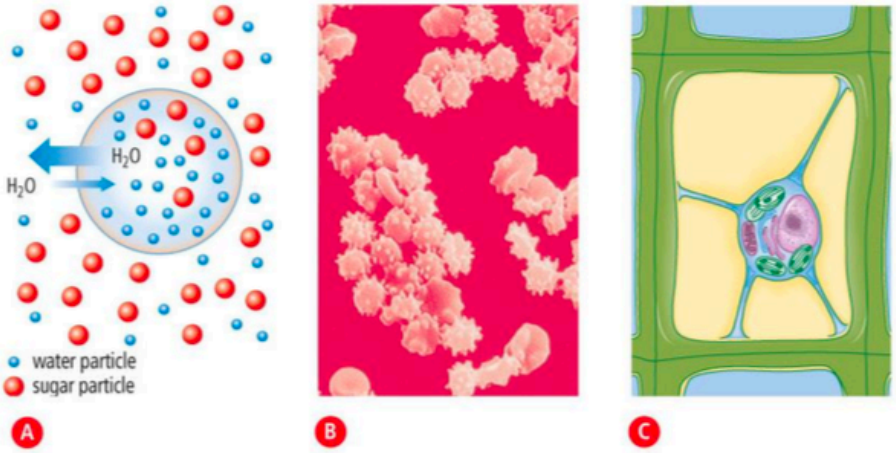
What is happening here?



What is happening here?



What is happening here?



Crossing the cell membrane

Vocabulary
diffusion concentration osmosis a selectively permeable membrane

Use the terms in the vocabulary box to fill in the blanks. Each term may be used as often as necessary.

1. _____ refers to the amount of a substance in a given space.

2. _____is the movement of particles from an area of higher concentration to an area of lower concentration.

3. _____ allows some materials to pass through it but keeps other materials out.

4. _____ is the diffusion of water molecules through a selectively permeable membrane.

5. _____ moves wastes from inside a cell to outside a cell.

6. _____ can be compared to a window screen.

7. _____ happens when water particles move from a place where their concentration is higher to a place where their concentration is lower.

8. _____ is the process by which oxygen is moved into a cell.

9. _____ is the process by which carbon dioxide is moved out of a cell.

Use with textbook pages 40–45.

Diffusion, osmosis, and the cell membrane

Circle the letter of the best answer.

1. Diffusion is

A. the movement of particles from an area of low concentration to an area of high concentration

B. the movement of particles to the inside of a cell only

C. the movement of particles from an area of high concentration to an area of low concentration

D. when the particles do not move through the cell membrane at all

2. Osmosis is

A. the movement of water from an area of low concentration to an area of high concentration

B. the movement of water to the inside of a cell only

C. the movement of water from an area of high concentration to an area of low concentration

D. when the water does not move through the cell membrane at all

3. A selectively permeable membrane

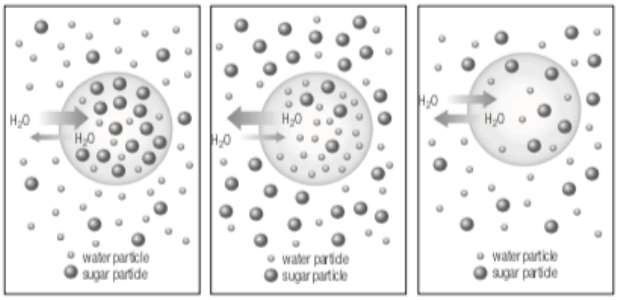
A. keeps substances out of the cell

B. keeps substances in the cell

C. has many small openings

D. allows only water to pass through it

Use the following diagram to answer questions 4 and 5.



4. In which diagram(s) does water move into and out of the cell at the same rate?

A. A

B. B

C. C

D. both A and B

5. In which diagram(s) will the cell begin to swell?

A. A

B. B

C. C

D. both A and C

Match each Term on the left with the best Descriptor on the right. Each Descriptor may be used only once.

Term	Descriptor
6. _____ concentration	**A.** moves oxygen into cells
7. _____ diffusion	**B.** moves water into and out of cells
8. _____ osmosis	**C.** allows some substances through
9. _____ selectively permeable membrane	**D.** surrounds the cell with water
	E. amount of a substance in a certain place

1.4 Microbes

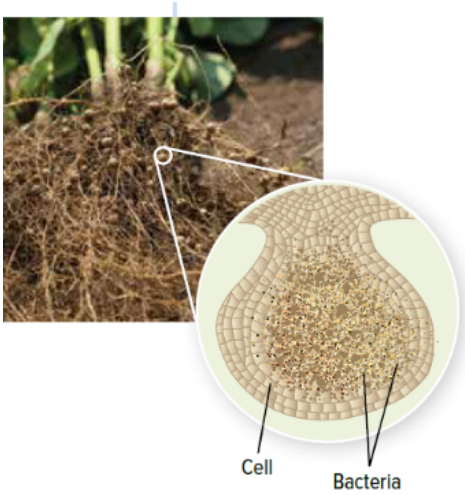
Date: _____

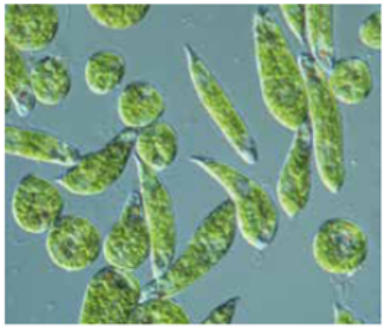
Microbes or microorganisms are organisms that require _____ to be seen (smaller than _____). Microbes exist **everywhere**!

- About _____species of bacteria live in your mouth
  - Some cause tooth _____
  - Some bacteria keep your mouth healthy by _____ disease-causing bacteria

- There are microbes in soil to help break down or _____ dead materials such as rotting wood.

- Bacteria also help plants grow by bringing _____ into the soil.





- Microbes are also found in fresh water._____ are small, single-celled organisms found in fresh water such as ponds.

There are microbes that are beneficial to humans and others that cause disease. Microbes that cause people to get sick are called _____.

Read page 42-43 of your textbook and complete the T-chart below. Give examples of positive and negative interactions between humans and microbes.

Positive interactions between humans and microbes	Negative interactions between humans and microbes

1.5 The Immune System (p.46-49) Date: _____

Our body possesses the immune system, which helps to protect our bodies. We have many layers of defense that protect us from pathogens and infection.

There are 4 general ways that infectious diseases are transmitted:

Direct Contact – Shaking hands, sharing body fluids

Indirect Contact – Sneezing, coughing

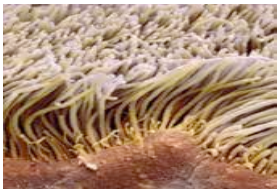
Water and Food – Eating foods or drinking water infected with pathogens

Animal Bites – being bitten by an animal carrying rabies virus, for example

First Line of Defense: Skin and linings of internal body systems.

- _____ – provides a physical barrier
- _____ and _____ – slightly acidic, preventing some pathogens from growing

- _____ juice – secreted by the lining of the stomach.



- _____ and _____ – line the nose (and other openings) prevent pathogens from entering the body.

Entry Point	Entry Blocked By…
Eyes	Tears, eyelashes
Ears	Ear wax
Nose	Mucus, cilia
Mouth (and stomach)	Gastric juice

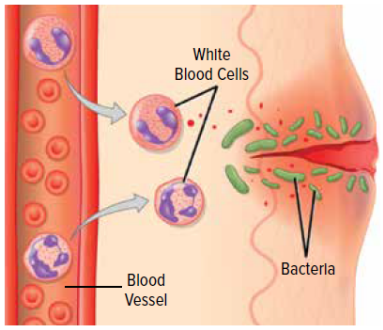
Second and Third Line of Defense

Once an invader gets into your body, your body will mount an immune response. There are 2 types of responses:

Innate Immune Response (Second Line)

- General, non-specific (same for any invader)

1. Swelling occurs due to _____ blood flow in the area of infection. This is called _____. Fever and redness occurs as well.



2. Increase in blood flow brings more white blood cells (WBCs) to the infected area.

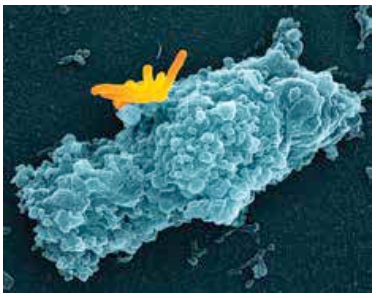
3. _____ (a type of WBC) swallow whatever is invading the body.

Acquired Immune Response (Third Line)

- A more specific attack on a particular pathogen

Your body has special white blood cells and antibodies that can memorize the specific pathogen by its _____, unique substances on the surface of pathogens and invading cells.

If your body has seen this pathogen or virus before, it will easily fight it off, essentially giving you _____.



Read pg. 37 and complete pg. 38-39 in workbook.

Disease Outbreaks (p. 50-55)

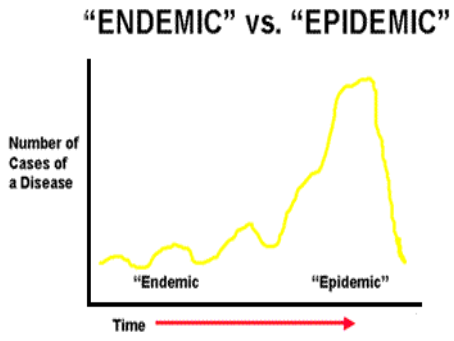
Date: _____

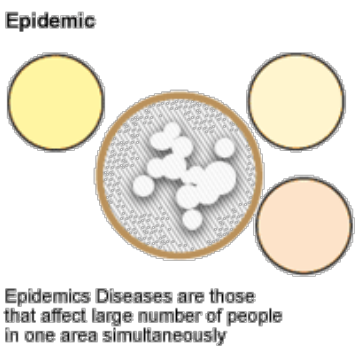
Ebola Virus Disease:

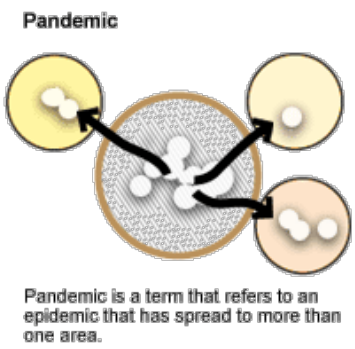
- Largest and longest outbreak occurred in 2014 in West Africa
- Symptoms: Fever, muscle pain, diarrhea, vomiting, internal bleeding
- Transmission: _____ _____ with an infected person
- _____ cases were reported; _____ people died in six countries

Terms used to describe disease occurrence:

Endemic	Epidemic	Pandemic
• The occurrence of disease cases at a constant, _____ amount within a _____ area	• The occurrence of disease cases _____ the normal amount expected for a population in a _____ area **Outbreak:** term used for an even _____ • geographic area	• An epidemic that has spread over _____ countries or continents, or around the _____



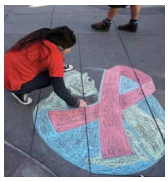




Was Ebola virus disease (EVD) an outbreak, epidemic or pandemic?

Epidemics and pandemics can have both **social** and **economic** impacts on human populations.

Read Figure 1.21 on pg. 51 in your text. Classify each of the four cases as a social impact, an economic impact, or both.

It is possible to naturally build up _____ to pathogens over a longer period of time. For example, _____populations built up some immunity to measles and smallpox since 300CE. When they came over to North America, large numbers of _____ peoples died because they had never been _____ to the disease. (acquired immune response!)

Do Check Your Understanding p.55 #2-5, 7

1.6 Medicines

Date: _____

We will be looking at 3 different types of medicines to keep people healthy from _____ (microbes, viruses): Traditional Medicines, Vaccines and Antibiotics.

Traditional Medicines

A lot of medicine originally comes from plants and knowledge from First Nations and other Native peoples. There are numerous examples:

Description	Comes From…
_____, used to treat headaches, fevers.	Bark of the willow tree 
Cancer fighting drug (_____) used to treat breast and ovarian cancers	Bark of the pacific yew tree 
Able to kill _____ that have become resistant to antibiotics. Heilsuk First Nation has traditionally used the clay to treat ulcers, arthritis, burns, and skin disorders.	Kisameet _____ from Kisameet Bay, BC. 

Issues

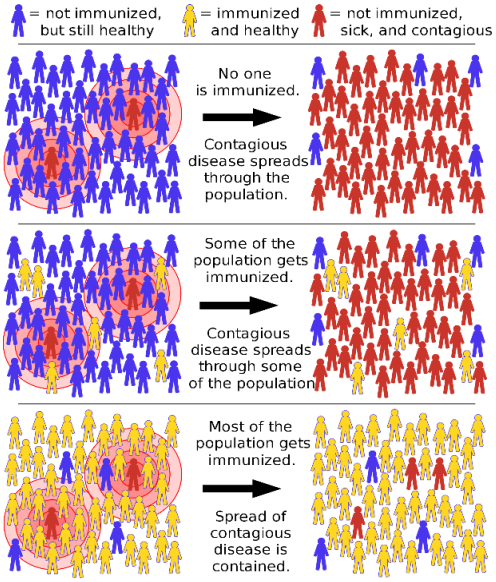
- _____of plants can cause extinction of the plant.
- Yet to be discovered medicines are under threat due to _____ change and _____.

Vaccines

Vaccines are substances that causes a _____ in the body that protects it against a specific disease/pathogen (activates _____ line of defense).

There are many types of vaccines:

Vaccine Type	How it works	Example
Live, attenuated vaccine	• Contains _____ versions of microbes. • Provides a strong, usually _____immunity after 1-2 doses.	• Measales • Mumps • Chickenpox • Yellow fever
Inactivated Vaccines	• Contains microbes that have been _____. • Provides immunity for a shorter period. Needs booster shots periodically.	• Hepatitis A • Rabies • Whooping Cough
Subunit Vaccines	• _____of microbes are used for the vaccine. • Immunity provided after multiple doses.	• Hepatitis B • Hib flu vaccine
Toxoid Vaccines	• Made up of inactivated toxins that bacteria produce. • Needs periodic booster shots to keep immunity.	• Tetanus • Diphtheria



<u>Effect of vaccines on populations</u>

If a large enough portion of the population is immunized, _____ immunity develops.

This helps to prevent outbreaks from turning into an _____or a _____.

Antibiotics

Antibiotics are substances that are able to kill off _____. They are not effective against _____ or other microbes.

A lot of antibiotics are discovered in nature from various sources, such as _____ (moulds, mushrooms).

Issues

- Overuse of antibiotics has led to antibiotic-resistant bacteria.
- "_____" are bacteria that are resistant to a large number of antibiotics.
- _____ your antibiotic prescriptions! Surviving bacteria pass on their resistance to their offspring or to other bacteria!

HW: Read p.66-74, Do Check Your Understanding p.75 #1-5, 8-9

Science 8 Biology Review

The biology unit test matches sections 1.1 to 1.6 in your textbook. The following topics will be covered on the test:

1. Characteristics of living things
    - Are viruses considered to be living things?
2. The Cell Theory
3. Cell Comparisons
    - Prokaryotic vs eukaryotic cells
    - Organelles and their functions
    - Plant vs animal cells
4. Microorganisms
    - What are microorganisms? Positive and Negative interactions with them.
5. Immune System
    - Lines of Defense
    - Disease outbreaks (outbreaks, epidemics and pandemics)
6. Medicines
    - Traditional medicine, vaccines and antibiotics

In order to prepare, make sure to go over the homework/assignments, read through the textbook and try the following questions:

Unit Review Questions p.82 #3-16, 19, 21-23a, 25

Unit 2: Behavour of Matter

2.2 Describing Matter (p.112-115)

Date: _____

Matter – Any physical substance that has both _____ and _____.

Physical Properties

- Characteristics of matter that can be observed or measured without changing its chemical _____ (what type of matter it is).

We can describe physical properties as being either a qualitative or a quantitative physical property:

- **Qualitative property** – can be described and compared using _____.

  Examples: Colour, odour, texture, state

- **Quantitative property** - can be measured _____

  Examples: boiling point, melting point, mass, volume, density

Identify each of the physical properties as qualitative or quantitative:

Physical Property	Quantitative or Qualitative?
Butter is solid at room temperature	
Glass is rated 5.5 on Mohs Hardness Scale.	
The density of cooking oil is 0.93g/cm^3	
Silver is a lustrous (shiny) metal.	
Oxygen is a colourless gas	
The freezing point of water is 0˚C	
Water is a solid (ice) at its freezing point.	

Density – A Derived (Calculated) Quantitative Property

All matter have 2 things in common: _____ + _____.

Mass – How much _____ an item has.

Typical unit = grams (g), kilograms (kg) or milligram (mg)

Volume – How much _____ it takes up.

Typical unit = Litres (L), millilitres (mL) or cubic centimetres (cm^3)

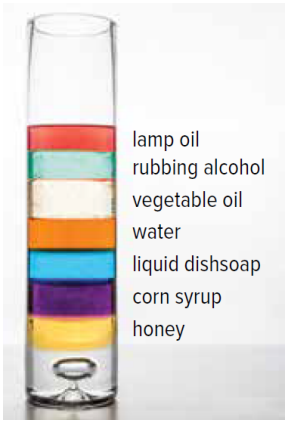
If we know the value of these two terms, we will be able to calculate density. Density is the mass of a material that occupies a certain volume. Knowing the density can help us predict which substances will layer upon another.

Density = $\frac{\text{mass}}{\text{volume}}$ Mass = Density x volume Volume = $\frac{\text{mass}}{\text{density}}$

Example

If a sample of jet fuel has a mass of 8.30g and a volume of 10.3mL, what is its density?

1. Identify and underline known numbers.
2. Find out the wanted value.
3. Pick the correct formula.
4. Replace numbers and calculate.



Example 2

What is the volume of an object whose density is 2.5g/mL and mass of 5.0 grams?

Try:

What is the mass of an object that has a volume of 10.4cm^3 and a density of 12.3g/mL?

Try #2:

A sample of a metal has a mass of 2.5 grams and a volume of 0.75cm^3. What is its density?

Homework: Do density worksheet, come dressed for lab

Comparing Density

Comparing the densities of substances can help us predict how substances will behave when they interact with each other.

For example, many species of wood have a density that is _____ _____ the density of water. This would cause a log to _____ on a lake.

Most rocks have a density that is _____ the density of water. Therefore, rocks tend to _____ in lakes.

Most substances are **more dense in** _____ than liquid form…**except** _____.

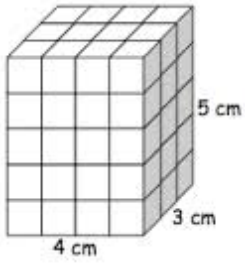
This is why ice _____ on water.

Less dense material floats on top of more dense material

Therefore; If an object:

- floats in a fluid – _____
- hovers in place – _____
- sinks in a fluid – _____

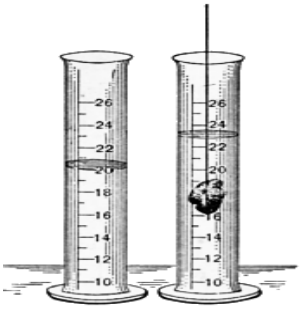
Measuring Volume



Use a ruler for regularly shaped objects

Volume = length x width x height (measured in cm^3)

Use Displacement for irregularly shaped objects



- _____object in a fluid and measure the change of **volume** in the fluid
- the volume of the object is the same as the _____ in fluid volume

Measuring the Mass of a Liquid

- Record the mass of a graduated cylinder.
- Add the liquid to the graduated cylinder and record the new mass.

Mass of the Liquid =

_____

Note This method also makes it very easy to find the volume of a liquid**

Sample Problems

1. If compound A had a mass of 5.6 g and a volume of 8.3 mL, what would be the density in (g/mL)?

2. If compound B had a mass of 9.5 kg and a volume of 8.3 L, what would be the density in (g/mL)?

3. If you had both compound A and B in a beaker of water, which compound would float? The density of water is approximately 1.00 g/mL. Explain your answer.

4. A 215.0g block of solid copper is 3cm wide, 2cm long and 4cm tall. Would you expect copper to float or sink in liquid mercury, which has a density of 13.6g/cm^3?

CALCULATING DENSITY

Date: _____

Density = $\frac{\text{mass}}{\text{volume}}$ Mass = Density x volume Volume = $\frac{\text{mass}}{\text{density}}$

*** Remember the units of density: **g/cm^3** or **g/mL**

1. Identify and underline known numbers.
2. Find out the wanted value.
3. Pick the correct formula.
4. Replace numbers and calculate.

1. A block of aluminum occupies a volume of 15.0 mL and weighs 40.5 g. What is its density?

2. Mercury metal is poured into a graduated cylinder that holds exactly 22.5 mL. The mercury used to fill the cylinder weighs 306 g. Calculate the density of mercury.

3. What is the mass of the ethanol that exactly fills a 200.0 mL container? The density of ethanol is 0.789 g/mL.

4. A rectangular block of copper metal weighs 1896 g. The dimensions of the block are 8.4 cm by 5.5 cm by 4.6 cm. What is the density of copper?

5. What volume of silver metal will weigh exactly 2500.0 g? The density of silver is 10.5 g/cm^3.

6. A block of lead has dimensions of 4.50 cm by 5.20 cm by 6.00 cm. The block weighs 1587 g. Calculate the density of lead.

7. 28.5 g of iron is added to a graduated cylinder containing 45.50 mL of water. The water level rises to the 49.10 mL mark. From this information, calculate the density of iron.

8. Which is denser, a 15.0 mL sample of tap water with a mass of 15.0 g, or a 20.0 mL sample of ice with a mass of 18 g?

9. Look at the container containing several layers of liquids. Suppose the top red layer has a density of 0.7 g/mL, the green layer below it has a density of 0.8 g/mL, and the colourless layer below that has a density of 0.9 g/mL.

   If an 8.8 g candy with a volume of 10.0 cm^3 were dropped into the container, where would the candy come to rest?

Date: _____

Chemical Properties and Chemical/Physical Change (p.118-121)

A chemical property is the ability of matter to _____ with another substance to form one or more _____ substances with _____ properties. It can only be observed when a substance chemically _____ with another substance.

This is different than physical property, which are properties we observe _____ changing its chemical content.

Reactivity with _____

- Some substances react vigorously with acids and others do not.
- Example: baking soda and vinegar produce a gas.

Reactivity with _____

- Substances in some foods react with oxygen when exposed to air.
- Example: avocadoes turning brown.

Combustibility

- Ability of material to catch fire and _____ in the air.
- Example: burning wood

Lack of _____

- Substances that do not react with other substances are “inert”
- Example: helium in balloons

In addition to chemical and physical properties, matter can also go under:

- Physical changes
- Chemical changes

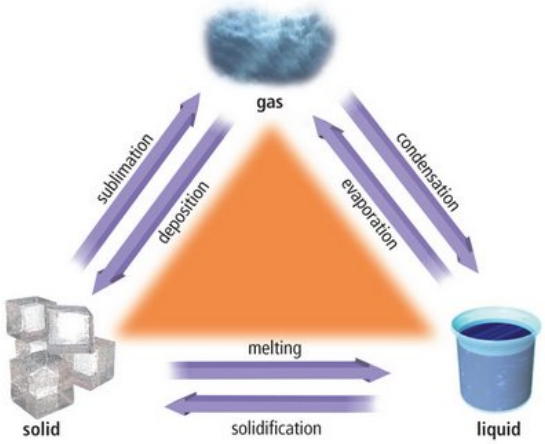


Figure 7.5A Changes of state

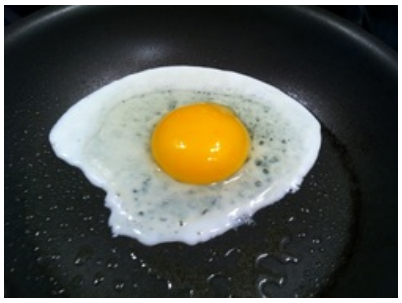
Physical Changes

- Change of matter that does _____ alter its chemical identity or composition
- Example: Freezing of water (liquid) to form Ice (solid)

Chemical Changes (chemical reaction)

- Change of matter that produces _____ substances
- Example: toasting bread.
- Indicators of new substance forming: _____, texture, formation of _____(solid) without cooling, _____ forming without heating, change in smell.

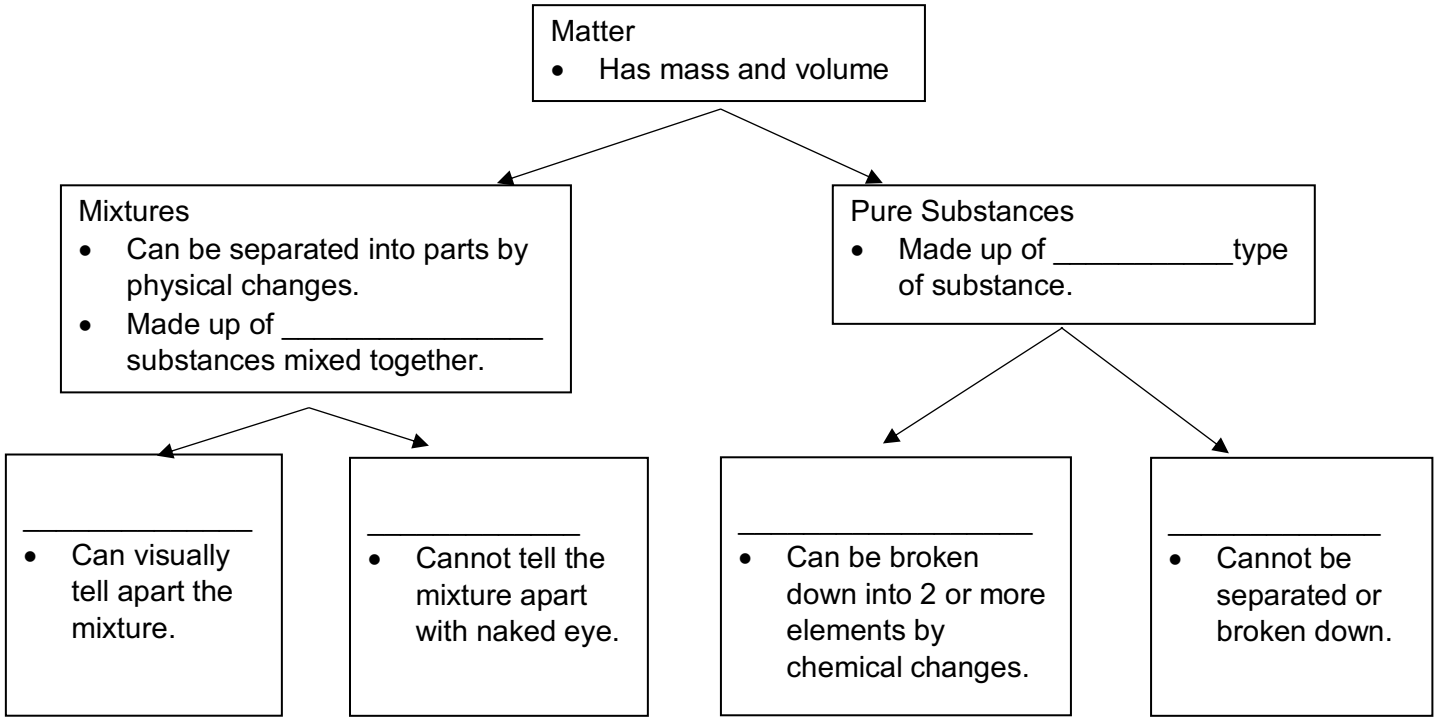
Try: Classify the pictures below as either a physical or chemical change.



Read p.112-121, do p.125 #1-6

Classification of Substances/Matter (p. 124-135) Date: _____

Matter can be classified as the following:



TRY

Write the following examples under the appropriate classification in the flowchart above (mechanical mixture, solution, compound or element)

Gold	Water	Glass	Salt Water
Air	Red food colouring in water	Iron nail	Oil in water
Sand and water	Carbon dioxide	Steel	plastic

States of Matter

Matter can go through change in states:

Gas

- Takes shape and volume of its _____.

Solid

- Holds its own _____
- Has a _____ volume

Liquid

- Takes shape of container
- Has a _____volume

Fourth State: Plasma

- Does not have a defined shape or volume. (similar to gas)
- Have different electrical properties than gases.

Questions – Answer the following questions on a separate sheet of paper.

1. Give two examples of solids, liquids and gases.

2. If we are somehow able to see individual molecules or atoms, what would the difference be like between the three states of matter? Illustrate in the boxes below.

solid liquid gas

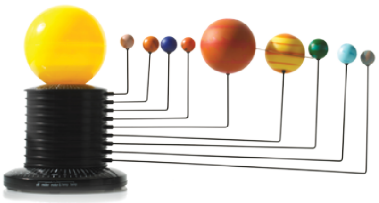
3. In front of the class is a mixture of cornstarch and water. Experiment with the substance and make careful observations about its properties. Is it a liquid? Is it a solid? How do you know?

Kinetic Molecular Theory

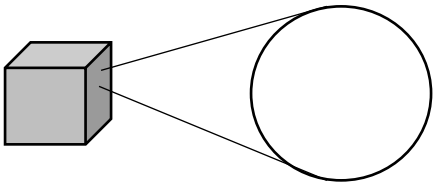
Date: _____

Scientists use a model to develop a theory about the behavior of all states of matter.

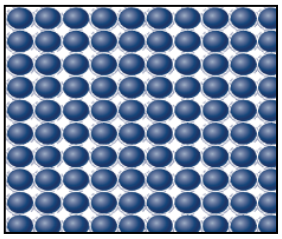
Model	Theory
• A verbal, mathematical or _____ representation of a scientific structure or process	• A scientific explanation that has been supported by consistent _____ experimental results
• Models are sometimes used as a basis for creating _____.	• Can be _____ if new experimental data arise.
Example: A model of the solar system	Example: Theory of gravity that explains the movement of planets

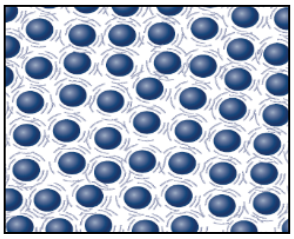


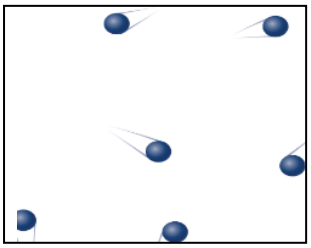
Explaining Properties of the States of Matter

Particle Model of Matter	Kinetic Molecular Theory
• All matter made up of very small _____	• All matter is made up of very small particles
• Particles are so small, they cannot be seen even with a microscope.	• The particles exist in empty _____ and are constantly _____
	• Energy makes particles _____. ○ More energy → faster movement → move farther apart.
	• Explains the properties of solids, liquids and gases.

Applications of Kinetic Molecular Theory (KMT)







Solid

- Very close together
- _____ but do not move
- _____ each other strongly in rigid structure

Liquid

- Very close together
- Slip and _____ past and revolve around each other.
- Attract each other _____ strongly than in solids.

Gas

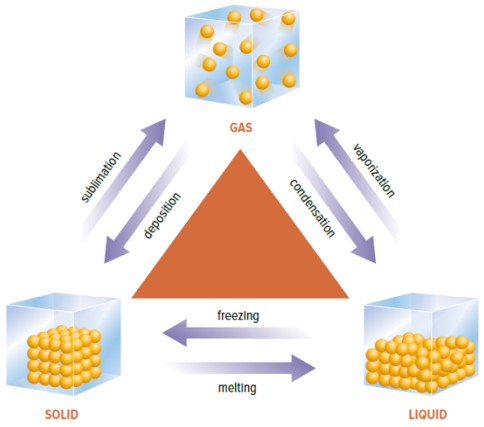
- Very far apart compared to size
- Move _____ and quickly in lines
- Attraction to each other is almost _____

We can use KMT to explain changes of state. But before we do that, we need to note a few things about temperature:

- Temperature is a measure of the **average** kinetic energy of particles in a substance.
- Adding or removing energy from matter changes the temperature of the matter.
- Increasing temperature of matter means that particles are gaining energy.

Vaporization (boiling)

- Liquid particles move freely around each other. Particles are still close and _____ to each other.
- As temperature increases, kinetic energy _____.
- Particles move _____. Some gain enough energy to overcome attractive forces and escape into the air.



Freezing (liquid to solid)

- Liquid particles lose kinetic energy as temperature _____.
- They move slower, attractive forces between particles _____.
- They slow down to the point where they _____ beside each other.

*****KMT can be used to explain many other phenomena such as diffusion or thermal expansion!*****

Do Worksheet

Atomic Theory (p. 154-159)

Date: _____

Early Greeks

Democritus

- Matter is made up of tiny particles called _____ ("uncuttable") because they could not be created, destroyed or divided.
- This idea was based on a thought experiment (philosophical), and not backed up by _____.

Aristotle

- Everything is made up of 4 major elements: _____, _____, _____, _____
- Criticized Democritus' theory because it could not explain the various properties matter can possess.
- Also, it could not explain chemical changes.

Denial of existence of atoms lasted for _____ years!!

Dalton's Theory of the Atom

- All matter is made up of extremely small particles called _____.
- Atoms cannot be created, destroyed, or divided.
- All atoms of the same element are _____ in size, mass, and chemical properties
- Atoms of a specific element are different from those of another element
- Different atoms combine in simple whole-number ratios to form compounds.
    - In a _____ reaction, atoms are separated, combined or rearranged.

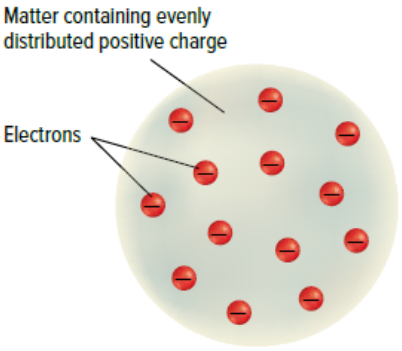
JJ Thompson and the Electron

In 1897, JJ Thompson studied electric currents in a cathode ray tube. He performed a series of experiments that showed the existence of _____charged particles. These particles are called _____.

Plum-Pudding Model

Thompson came up with the "_____" model of the atom.

- The atom is a positively charged ball with negatively charged _____ embedded.
- Atoms are _____ indivisible.
- Atoms contain smaller, negative charged particles known as _____

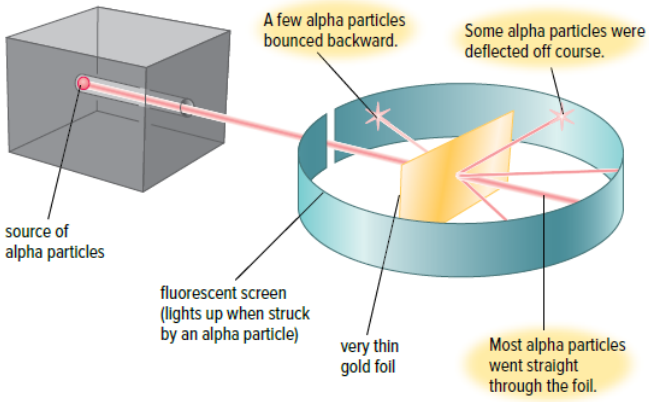


Ernest Rutherford and the Nucleus

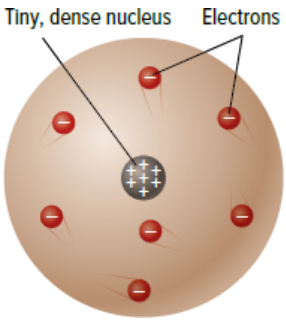
In 1909, Ernest Rutherford designed an experiment to find out more about the structure of the atom. Rutherford's Gold Foil Experiment led to the discovery of the atom's nucleus.

Gold Foil Experiment

- Around his time, people had discovered substances that gave off radiation. Rutherford gathered a substance that gave off _____ charged alpha radiation and directed it towards a thin sheet of gold foil.



- When he shot the alpha particles, most of the alpha particles went _____ the foil but some bounced _____.
  - These alpha particles must have hit a tiny, _____ structure in the gold atoms.
  - This structure is the _____: _____ charged center of the atom
  - Most of the atom's volume is _____ space with tiny _____ moving around

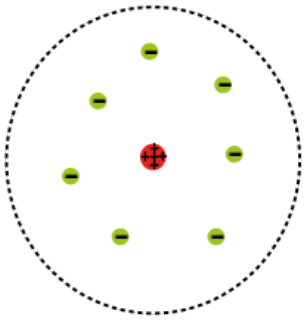


- In 1920, Rutherford and James Chadwick discovered that the nucleus contains positively charged particles (_____) and neutral particles (_____).

Atomic Theory and the Bohr Model

Date: _____

Last time we left off at the Rutherford Model of the atom:



- Nucleus has most of the _____.
  - Made up of _____ and neutrons
- Electrons (_____ charge) are found around the nucleus
- The atom is mostly _____ _____

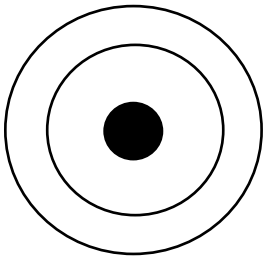
The Rutherford model did not really describe how electrons are arranged around the nucleus.

Bohr Model

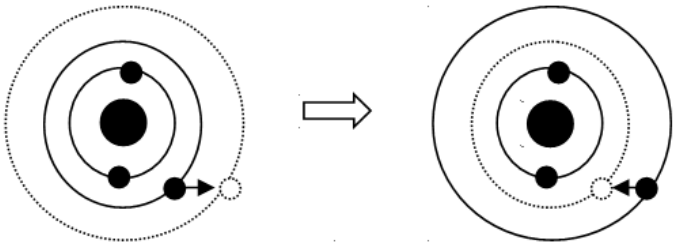
In 1913, Niels Bohr:

- Studied electrons
- Performed experiments on _____ released by different gases
- It was found that each gas produced a unique _____ of light (line spectrum)
- The colour of light emitted by gases is due to high-energy electrons releasing _____

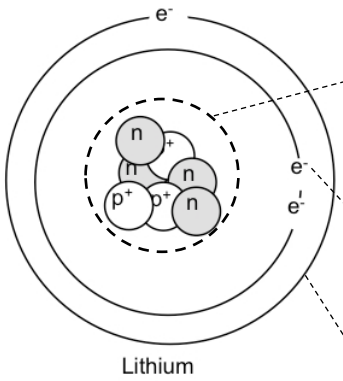
In order to explain this observation, the Bohr model of the atom was developed:



- Electrons surrounding the nucleus can only occupy specific "energy _____" or "energy _____"
- The larger the shell, the higher the energy of an electron occupying it.
- The pattern of colours seen on from gases/elements is due to electrons _____ energy then coming back down to its _____ shell.



Subatomic Partlcles (p. 162-163)



Bohr model of Lithium (Li)

Nucleus

- Small region at the _____ of the atom. Contains most of the atom's _____ and is made up of protons and neutrons.
- Protons have a _____ charge, Neutrons have _____ charge.
- Protons and neutrons have a mass of _____ atomic mass unit.
- The _____ _____ keeps nucleus together.

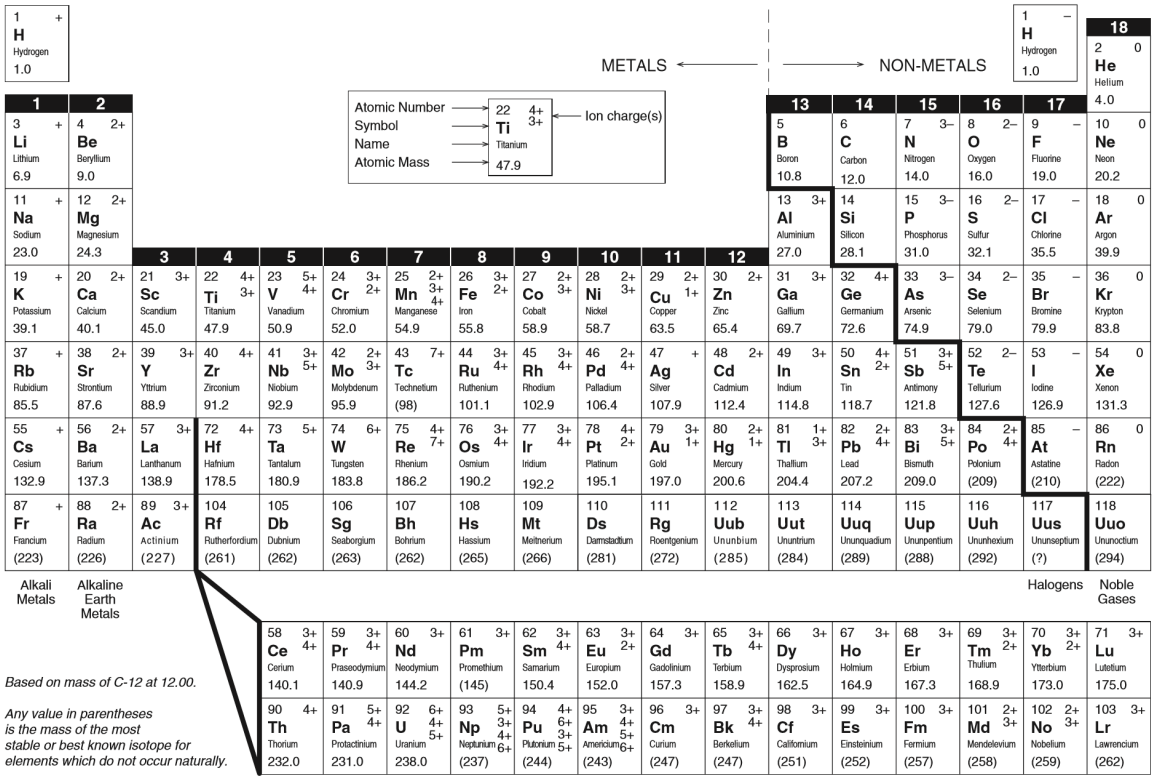
Electrons

- Moves around the nucleus and has a _____ charge.
- The region that electrons occupy make up most of the atom's _____.

Electron Energy Shell

- A shell is a space around an atom where electrons move around the nucleus. Each shell has a specific _____ level

Different elements have different numbers of _____. In other words, the number of protons (also called _____ _____) determines the type of element. This number can range from 1 to 118! We organize these elements in a _____ table:



Example:

Hydrogen =

Uranium =

- The mass of an element is calculated by adding the number of _____ and _____together.
- When an element has an _____ number of protons and electrons, it has _____ charge. We call it an _____.
- When an element has an unequal number of protons and electrons, it develops a charge. We call it an _____.
    - When an element has a greater number of electrons than protons, it has a _____ charge. We call it an _____.
    - When an element has a greater number of protons than electrons, it has a _____ charge. We call it a _____.

Note: Only electrons are added or removed to produce an ion!!

Example – Fill in the table below!

Element	Symbol	Number of Protons	Charge	Number of Electrons
Hydrogen			+1	
Carbon			Atom	
		7		10
	Mg			12
Sulfur			-2	

TRY – Fill in the Table Below!

Element	Symbol	Number of Protons	Charge	Number of Electrons
Lithium			+1	
Neon			Atom	
		11		10
	O			10
Chlorine				18

Homework: Do subatomic particle worksheet!

Science 8 - Chemistry Review

Topics Covered in The Unit:

- Quantitative property vs qualitative property
    - Be able to differentiate between the two.

- Density calculations (density formulae will be provided)
    - Be able to calculate a value if given two of the three variables: density, volume and mass.
    - Be able to calculate density using indirect methods (water displacement, volume calculation)

- Chemical vs physical changes
    - Be able to understand the difference between chemical and physical changes
    - Be able to differentiate between them

- Classification of matter
    - Be able to correctly classify substances as either a mechanical mixture, solution, compound or element.

- Kinetic molecular theory
    - Be able to identify the difference change in states of matter
    - Explain the difference between a model and a theory
    - Use KMT to explain various phenomena

- Atomic theory
    - The various models of the atom throughout history.
    - Have an understanding of why they developed or modified existing ideas.

- Subatomic particles
    - Identify the characteristics of the 3 subatomic particles
    - Correctly provide the numbers of electrons and electrons of ions and atoms.

To prepare…

- go over your notes,
- go over your homework
- do the practice test
- do p. 174 #4-12, 14, 19a-d, 20.

***Density formulae and periodic table will be given to you for the test.

Unit 3: Energy as a Particle and a Wave

Name: _____

Last unit we learned about matter (Chemistry). This unit we will be learning about **energy** (Physics). Energy and matter interact with each other in many ways. For example, energy can be stored in matter (like in food) and energy can change matter (like boiling water).

We have talked about a few different types of energy already. How many different types of energy can you think of?

-
-
-
-
-
-
-

-
-
-
-
-
-
-

Do the types of energy have anything in common?

How would **<u>you</u>** (not the internet) define energy?

Light and Electromagnetic Radiation

One type of energy is known as electromagnetic radiation. Visible light is one type of electromagnetic radiation and it allows our eyes to see the matter that exists around us.

When light is combined or separated it can form different types of light and different colours. For example, a yellow light and a blue light can be combined to make a green light.

A spectroscope is a device that is used to separate light. Using a spectroscope, we can see that light from different sources can be separated.

Using the Spectroscope

Natural Light

Look out of the window using the spectroscope and colour what you see in the box below.

Now look at three other sources of light and colour what you see in the box below.

Light source: _____

Light source: _____

Light source: _____

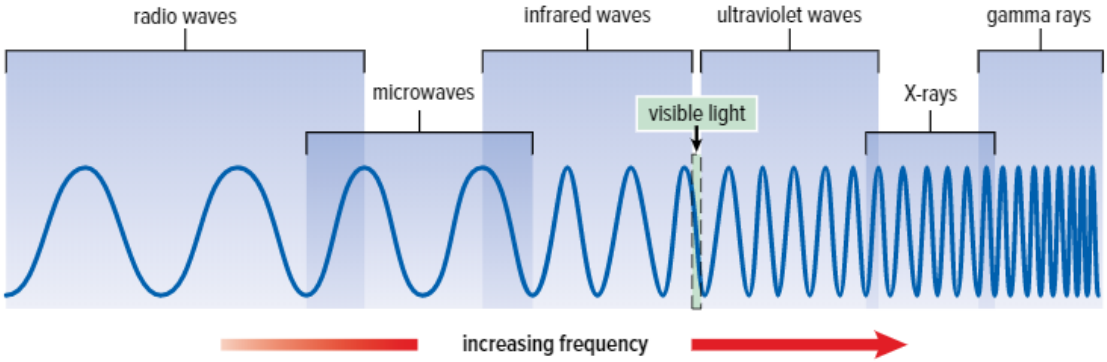
What differences do you see between the different sources of light?

Did any of the light sources give a unique or familiar spectrum of light? Why do you think this happens?

Energy can be defined as the ability to cause change or to do work. Light is a type of energy. Describe a way light can be used to cause change or do work.

3.1 Electromagnetic Radiation

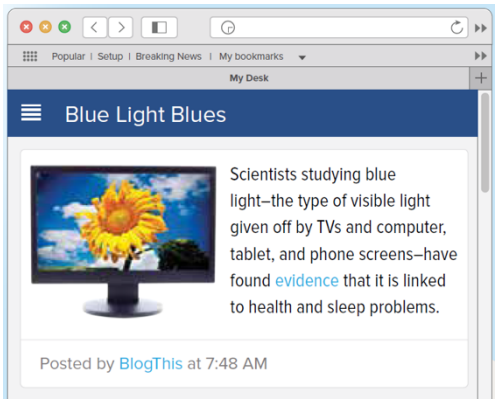
- Electromagnetic radiation is a form of _____.
  - Given off by different sources on earth and in the universe (most comes from the sun)
  - Some types are harmful, and other types are essential to survival of life on earth

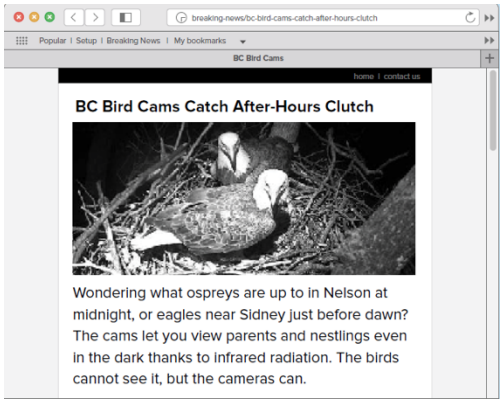


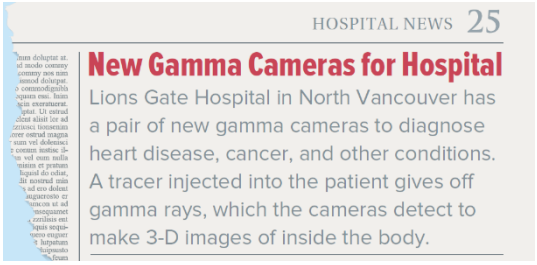
Seven different types of electromagnetic radiation:

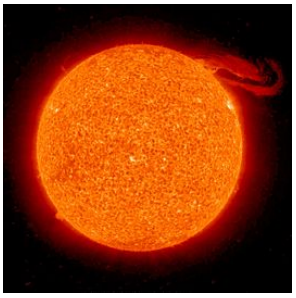
- Radio wave
- Microwave
- Infrared
- Visible light
- Ultraviolet
- X-ray
- Gamma-ray

Electromagnetic Radiation Affects Our Lives and is all around us!







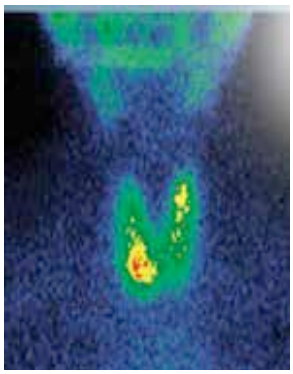


- The sun gives off all types of electromagnetic radiation.
- Visible light, _____, etc.

- Cell phone towers create _____ that carry information from cell phone to cell phone

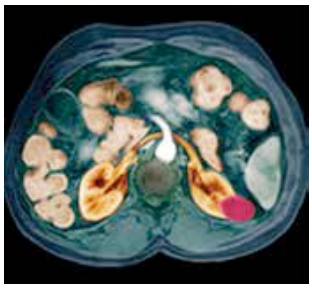
- Female anglerfish have a lure that gives off _____ light.
- Bacteria in the lure produce the light.

- Light bulbs gives off _____ radiation and visible light.

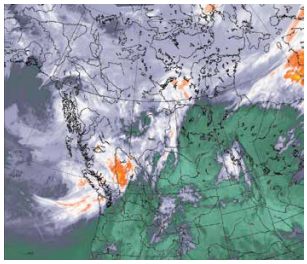


- We can use atoms that give off radiation for medical imaging.
- This is a _____ camera image of a thyroid gland injected with radioactive iodine.

- We can measure different types of radiation to study the universe.



- Radio waves and magnets work together to produce a MRI-image.
- This MRI is a cross-section of a human abdomen.



- We can use satellites to measure visible and infrared radiation to monitor the earth.

Read p.188-196, do p.199 #1-4, 7

Explaining Electromagnetic Radiation Pt. 1 (p. 204-209) Date: _____

Properties of electromagnetic radiation:

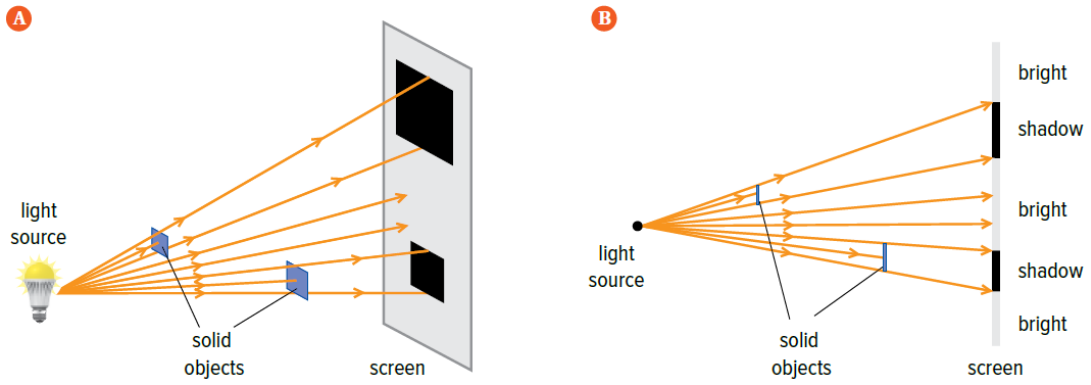
- Invisible as it travels
- Involves the transfer of _____ from one place to another
- Can travel through empty space
- Travels through empty space at the speed of _____ (3.00×10^8 m/s)
- Has both electrical and magnetic properties

The seven types of electromagnetic radiation have a lot in common.

- Studying one type can tell you a lot about the others.
- Visible light is used as a _____ to study electromagnetic radiation.
  - Easy and safe to study
  - Becomes _____ when it interacts with matter

Ray Model of Light

- The idea that light travels in straight lines
- Ray: an arrow that is used to show the direction of the straight-line path of light
- We can use ray diagrams to study and predict how light behaves
- We can use it to predict the location, size and shapes of shadows.

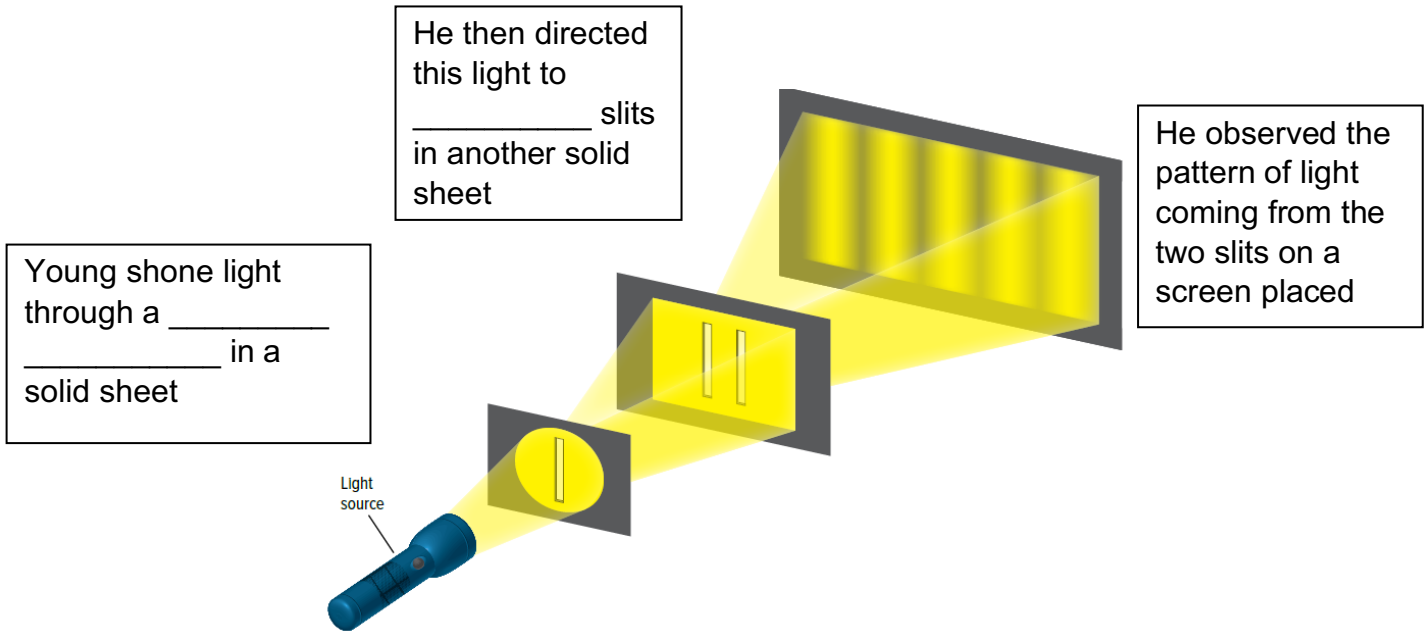


The _____ to the light source, the bigger the shadow. The farther the light source, the _____ it gets.

Is Light a Particle or a Wave?

Some scientists thought that light was a stream of particles that had particle-like properties (_____ model of light)

- In the early 1800s, Thomas Young performed an experiment that supported the idea that light has properties of a wave
- _____ model of light: the idea that light has wave-like properties

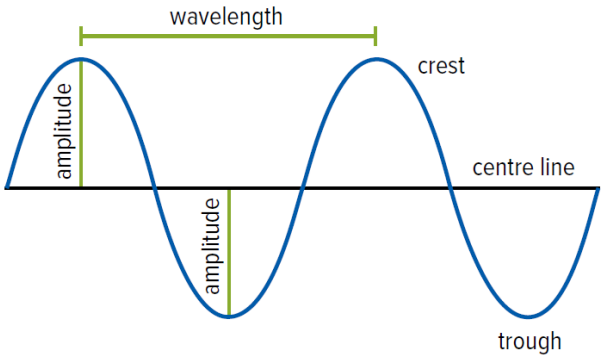


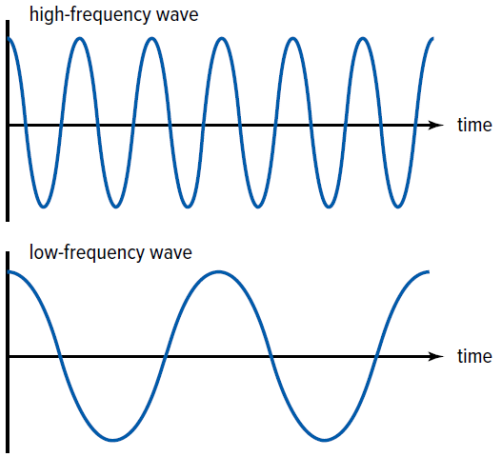
- If light was a particle, the pattern would be _____ lines.
- If light was a wave, light would spread out into a _____ of lines.
    - Young saw that the light spread out into a series of lines when it passed through the two narrow slits.
    - Therefore, light had _____ properties.

Properties of Light Waves

Light waves have some things in common with water waves:

- Both move _____ from one place to another
- Both have wavelength, amplitude and frequency.





Crest: highest point of a wave

Trough: Lowest point of a wave

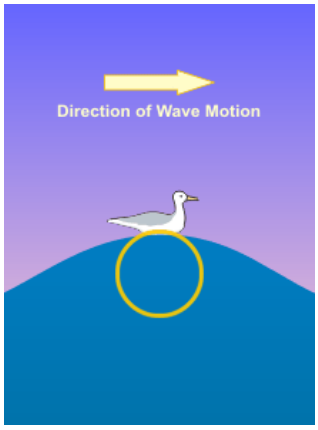
Wavelength: distance from one crest (or trough) of a wave to the next crest (or trough)

Frequency: the number of complete _____ that pass a point in one second as the wave goes by.

Explaining Electromagnetic Radiation Pt. 2 (p.210-215) Date: _____

Remember…

Only _____ is carried in a wave.

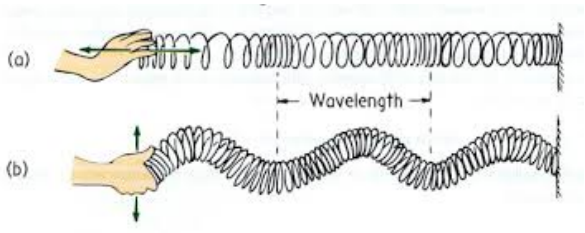


Think of a wave in the ocean. You bob up and down, but not forward.

Two Wave Types

Transverse – Particles of the medium vibrate _____ to the direction of the wave.

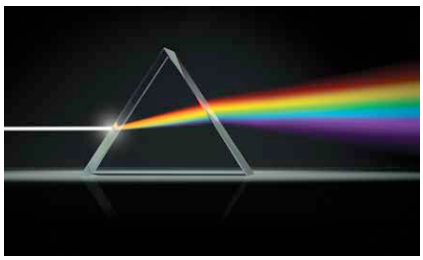
Compression – Particles of the medium vibrate in the _____ direction as the wave.



Light, Wavelength, Colour

Colours of light are different wavelengths of visible light (visible light _____)

- Colours of the spectrum are in a certain order (**ROY G BIV**)
  - **R**ed (_____ wavelength)
  - **O**range
  - **Y**ellow
  - **G**reen
  - **B**lue
  - **I**ndigo
  - **V**iolet (_____ wavelength)



The Particle Model of Light

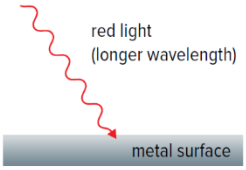
One property of light could not be explained with the wave model of light: **the photoelectric effect**.

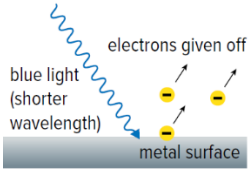
The photoelectric effect:

- When light shines on a metal surface, the surface **can** (but not always) give off _____

If light was a wave:

- Any wavelength of light (including red) could "_____"
  enough energy when it hits the metal to cause electrons to be given off by the metal
- The wave model of light could not explain the photoelectric effect





Red light (longer wavelength) shone on metal surface:

Electrons are **never** given off, no matter how bright or how long the red light shines on the metal

Blue light (shorter wavelength) shone on metal surface:

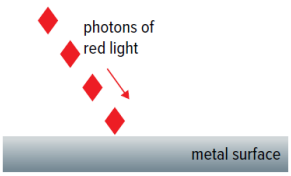
Electrons are **always** given off, no matter how dim or how briefly the blue light shines on the metal

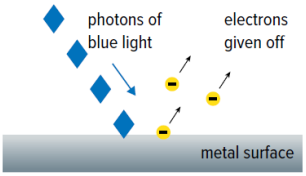
Albert Einstein:

- Realized that the wave model of light could not explain the photoelectric effect
- Some difference between red and blue light must cause the effect

To explain this, Einstein imagined light as _____ called _____.

- Each photon carries an exact amount of energy that is enough to make the metal give off electrons
- Otherwise, nothing will happen when the photon hits the metal





Red light

Has a lower frequency and longer wavelength

Photons carry _____ energy

Blue light

Has a higher frequency and shorter wavelength

Photons carry _____ energy

So what is light? Is it a wave or a particle?

Light has properties of _____ a wave and a particle! Therefore so does electromagnetic radiation!

Read p.204-212, Do Check Your Understanding p.215 #1-5, 10a

How Does Light Interact with Other Materials?

Use pages 222-225 in your textbook to define the following terms:

Reflection:

_____
_____
_____
_____

Refraction:

_____
_____
_____
_____

Absorption:

_____
_____
_____
_____

Transparent:

_____
_____
_____
_____

Translucent:

_____
_____
_____
_____

Opaque:

_____
_____
_____
_____

Activity

How Is Light Transmitted?

Inspect the materials your teacher gives you. Predict what happens to light as it strikes each one. Use a flashlight to test your predictions. Use your observations to refine your original predictions.

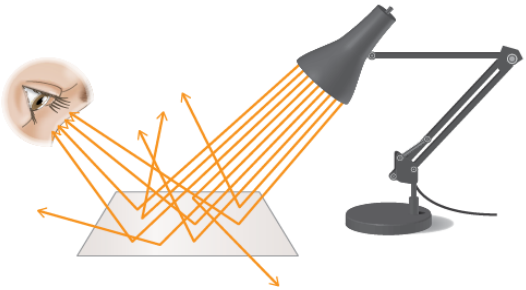
Material	Prediction	Observation

How Does Light Interact with Different Materials? (p.222-227)

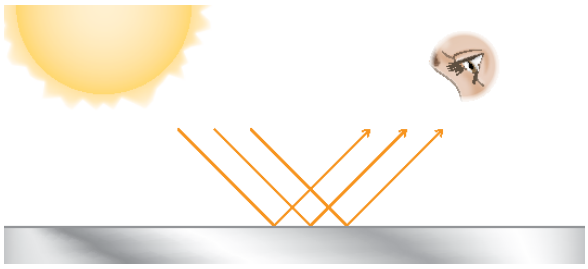
Light can be reflected, absorbed, transmitted, or refracted.

Reflection

- The process in which light “bounces off” a surface and changes direction.
- Two types of reflections:



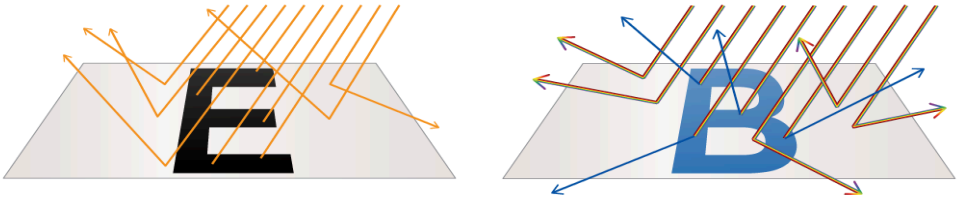
Reflection off rough surfaces do not form images but does make an object visible.



Reflections off extremely smooth surfaces, which produces a clear image.

Absorption

- When light is trapped in an object and is transformed to heat.
- Dark colours absorb more than light colours and are hotter.



Transmission

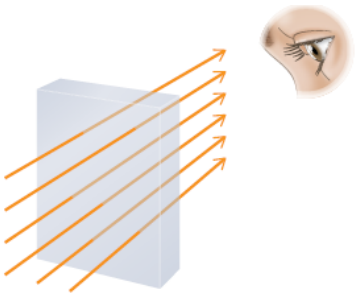
- When light passes through an object, such as glass.

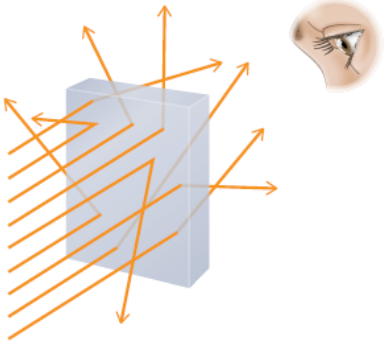
Refraction

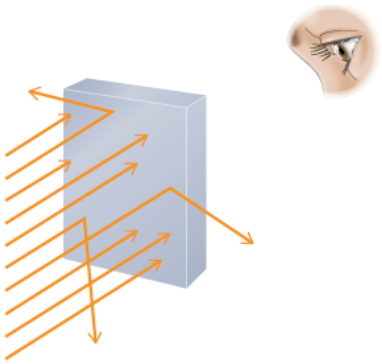
- When light bends as it is transmitted from one medium to another, such as air to water.

A material can be **transparent, translucent** or **opaque** depending on:

- How much light it lets pass through
- How the light behaves
- If you can see through it







Transparent Materials

- Transmits almost all light rays
- Objects can be seen clearly through them.

Translucent Materials

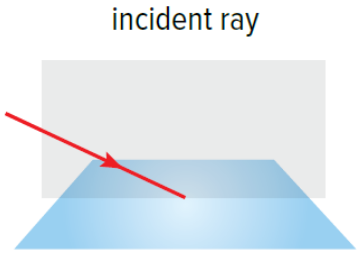
- Allows most light to pass through them.
- Light is scattered in many directions as it passes through
- Objects seen through them are blurry

Opaque Materials

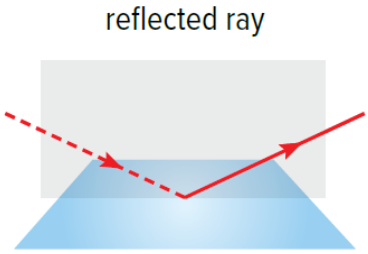
- Reflect and absorb light
- Do not allow any light to pass through them
- Objects cannot be seen through them

Light Interaction with Mirrors (p.232-239)

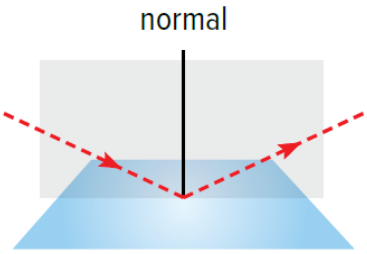
In order to see how light interacts with mirrors, we can use the _____ model of light. Light follows a predictable path. When light bounces off a polished surface, we say it reflects:



- The_____ ray is called the incident ray

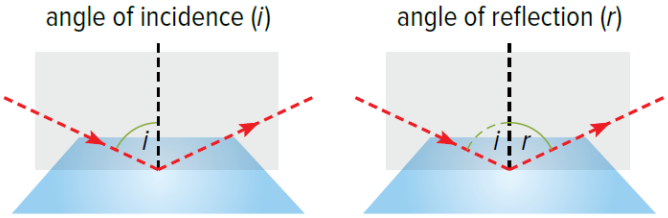


- The _____ ray that bounces off the object, is called the reflected ray.



- A (usually dotted) line is drawn that is perpendicular (90 degrees) to the surface of the object; this is called the normal.

The angle between the incident ray to the normal is the _____ as the angle of the reflected to the normal.



The 3 Laws of Reflection

- Angle of incidence _____ angle of reflection
- The reflected ray and the incident ray are on _____ sides of the normal.
- The incident ray, the normal, and the reflected ray lie on the same _____ (flat surface)

Plane Mirrors

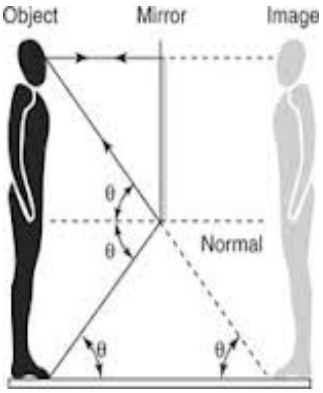
Plane Mirror = flat mirror, like a bathroom mirror.

When light shines on an object, it reflects on all points of the object in all directions.

Image always appears "_____" the plane mirror. (virtual image)

In a plane mirror, the image is always upright and _____ size.

The image is inverted _____, but not vertically

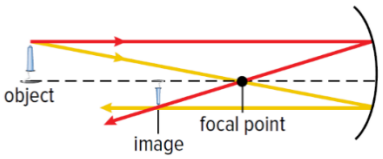


Four characteristics of images

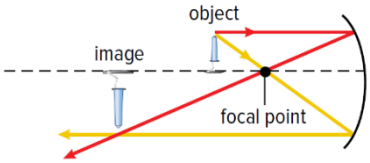
- Location: how close the image looks from the mirror compared to the object.
- Orientation: upright or upside down (inverted)
- Size: same size, larger or smaller than object
- Type: real or virtual.
    - Real = when reflected rays meet.
    - Virtual = when reflected rays do not meet.

Concave Mirrors

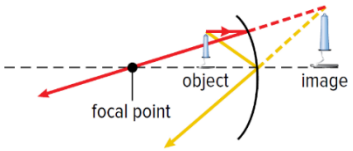
- Reflects light like a plane mirror but reflected light rays meet at a single point called a _____ point.
- These light rays that come together are called _____ rays
- Images formed by concave mirror have different characteristics, depends on where it is located compared to surface of mirror and focal point.



If object is far from focal point, the image is small, real and upside



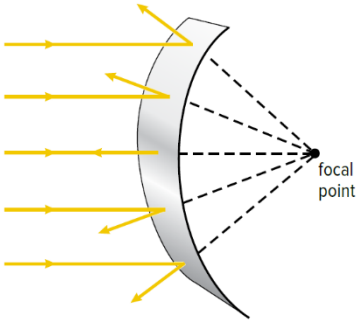
If object is closer to the focal point, the image is larger, real and upside

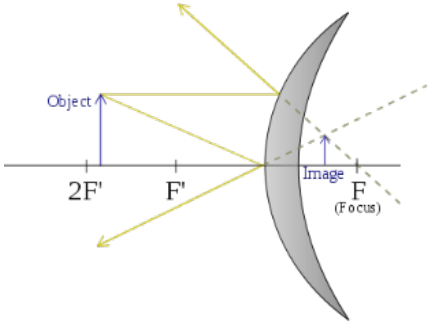


If object is between the focal point and the mirror, the image is larger, virtual and upright.

Convex mirrors

- Curved outwards. Reflects parallel light as if it were coming from a focal point _____ the mirror.
- Since no reflected rays converge, a virtual image is _____ produced.
- Image gets _____, especially at the edges.





- Virtual image is _____, closer to the mirror and _____.
- Useful for security mirrors!

Read p.232-241, do p.243 #1-4, 6

How Does Light Behave When it Moves From One Medium to Another (p.248-251)

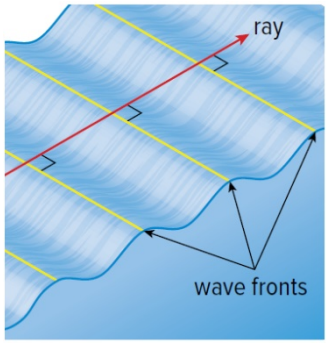
Date: _____

Light travels in a straight line through the same medium. Light refracts (_____) when it travels from one medium to another (example: air to water). What causes this refraction?

Refraction occurs because light travels at different _____ in different media.

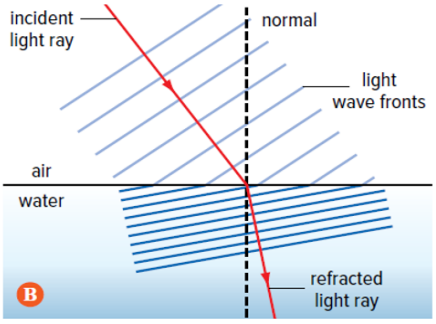
Example: Light travels at different _____ through air than it does through water.

When light changes speed as it moved from one medium to another, the _____ also changes. We can use the ray and wave model of light to visualize why the path of light changes when light changes speed.



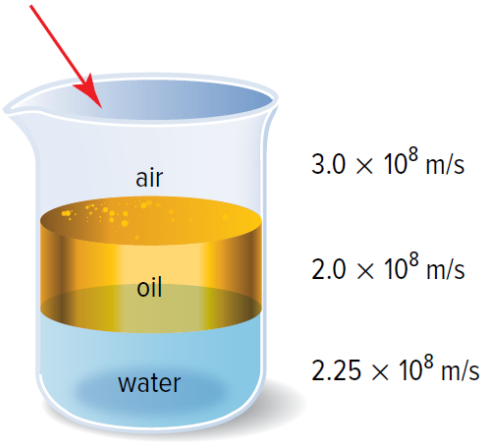
_____: a specific part of a wave that can be followed. Crests of the waves are wave fronts.

_____: Shows the direction in which waves are traveling. Perpendicular to the wave fronts.



- As the wave front approaches another medium, the part of the wave that enters it changes speed (_____).
- This changes the direction of the wave front. The direction is bent more _____ the normal.

- Light travels more _____ in a dense medium than in a less dense medium.
- If light travels from a less dense medium to a more dense one, the ray bends _____ the normal.
- If light travels from a more dense medium to a less dense one, the ray bends _____ from the normal.

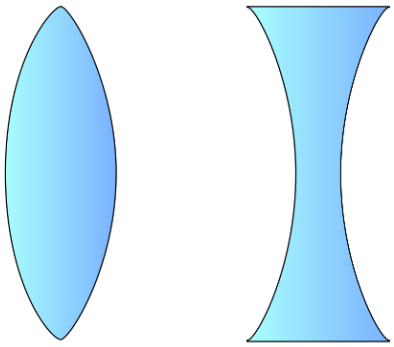


What happens to light as it passes through lenses?

Lenses are made up of many different types of materials – glass, plastic, liquid being some examples.

Lenses have two sides – either side can be plane, concave, or convex. At least one side must be curved.

There are two types of lenses – _____ and _____ lens.



- When light enters the lens, it is coming from a less dense medium (air) into a _____ dense one.
- Light will bend _____ the normal when it enters the lens.
- Light will then bend _____ from the normal when it exits the lens.

Concave lenses will always _____ the rays. The image from a concave lens always appears _____and smaller than the actual object. The image also gets _____. Concave lenses are commonly used in eyeglasses to correct _____ (myopia).

Convex lenses bend parallel light towards a _____point. The image formed from these lenses are more complicated. Generally, the image gets enlarged and gets a little more _____. Convex lenses are used in glasses to fix _____ (hyperopia). Also in _____ glasses.

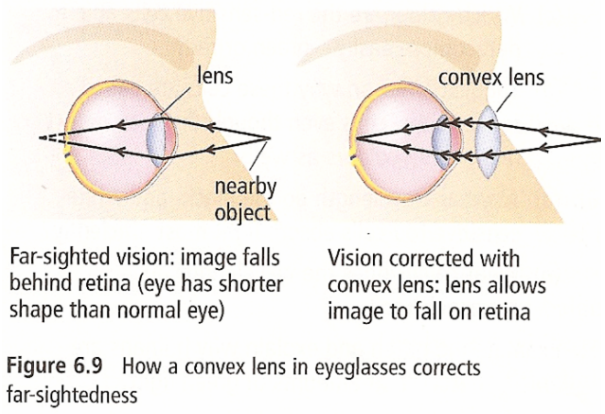


Figure 6.9 How a convex lens in eyeglasses corrects far-sightedness

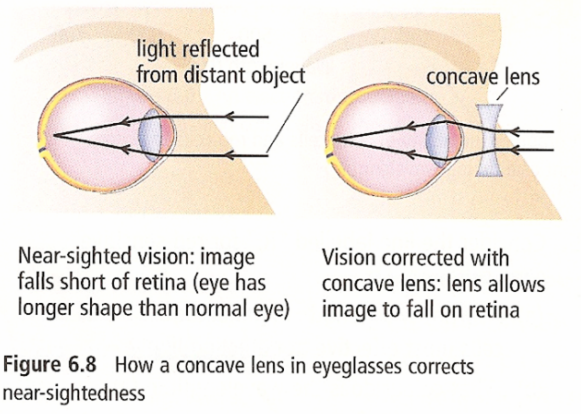
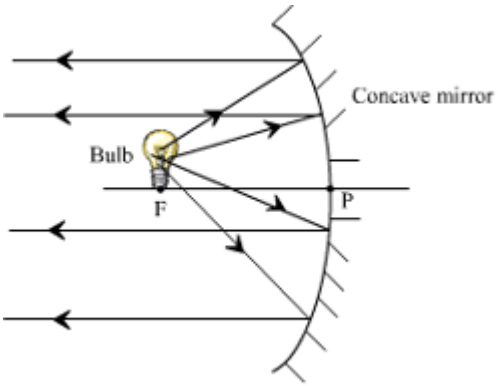


Figure 6.8 How a concave lens in eyeglasses corrects near-sightedness

Applications of Mirrors and Lenses

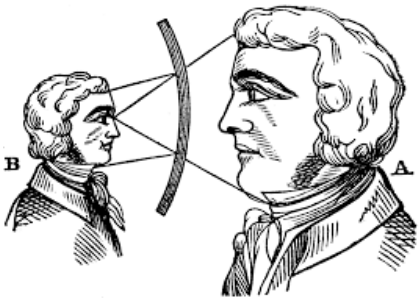
Concave Mirrors

Flashlights/Headlights



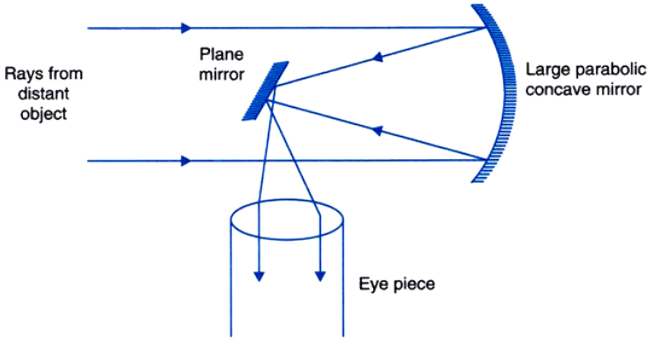
Flashlights and car headlights use concave mirrors to _____ light rays in the _____.

Make-Up Mirrors



Make up mirrors are made using concave mirrors to _____, _____, _____ when viewed from a short distance. create a image

Telescopes



Some telescopes use concave mirrors to converge light rays from _____ _____.

Convex Mirrors

Security Mirrors/Side View Mirrors

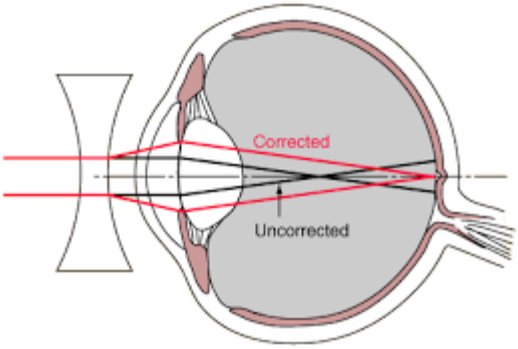
Convex mirrors are good for seeing large areas and are mainly used for _____ and _____.

Concave Lenses

Peepholes

Peepholes use concave lenses to create a clear image that is _____ and _____ when viewed from a short distance.

Eyeglasses (Correcting Near Sightedness - Myopia)



Near sightedness (myopia) is a condition that results when the eye lens focusses light _____ the retina.

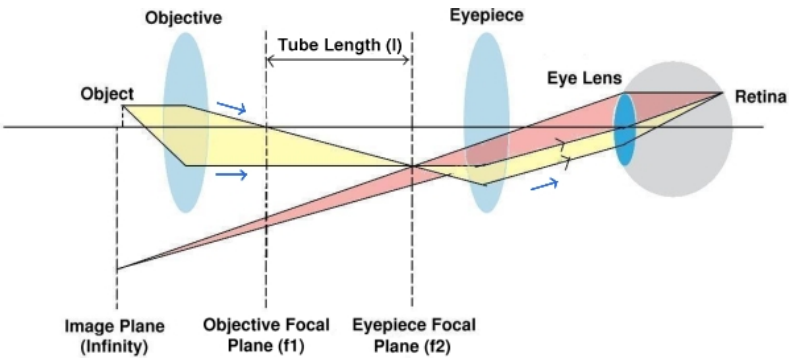
Glasses with concave lenses can _____ light rays before they enter the eye. This helps to correct myopia.

Convex Lenses

Magnifying Glasses

Magnifying glasses use a _____ convex lens to enlarge images at a short distance.

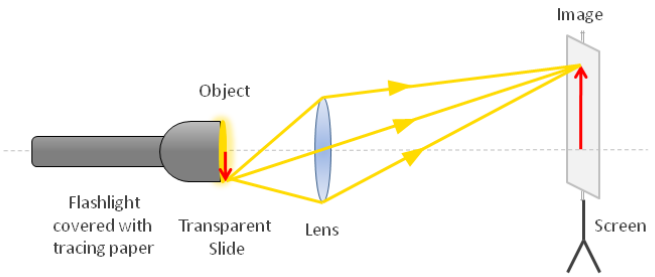
Microscopes



Light microscopes use a pair of convex lenses to _____ and _____ small objects/specimen.

Projectors

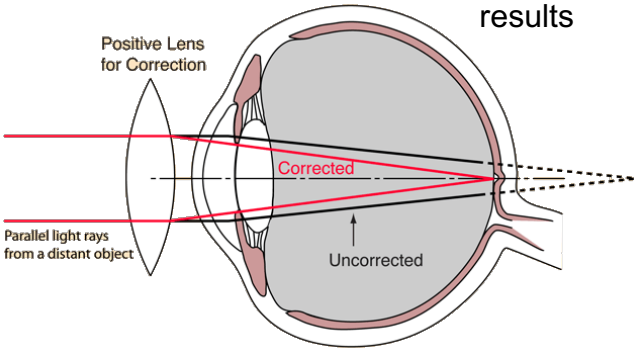
Projectors use a convex lens to _____ and _____ images onto a screen.



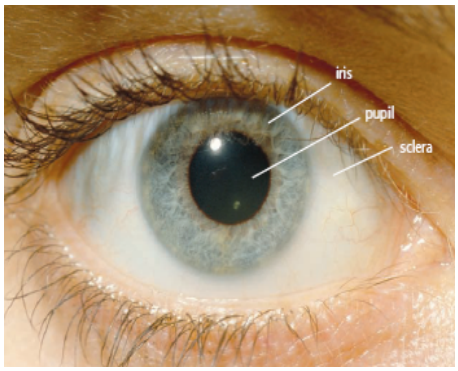
Eyeglasses (Correcting Far Sightedness – Hyperopia)

Far sightedness (hyperopia) is a condition that results when the eye lens focusses light _____ the retina.

Glasses with convex lenses can _____ light rays before they enter the eye. This helps to correct hyperopia.

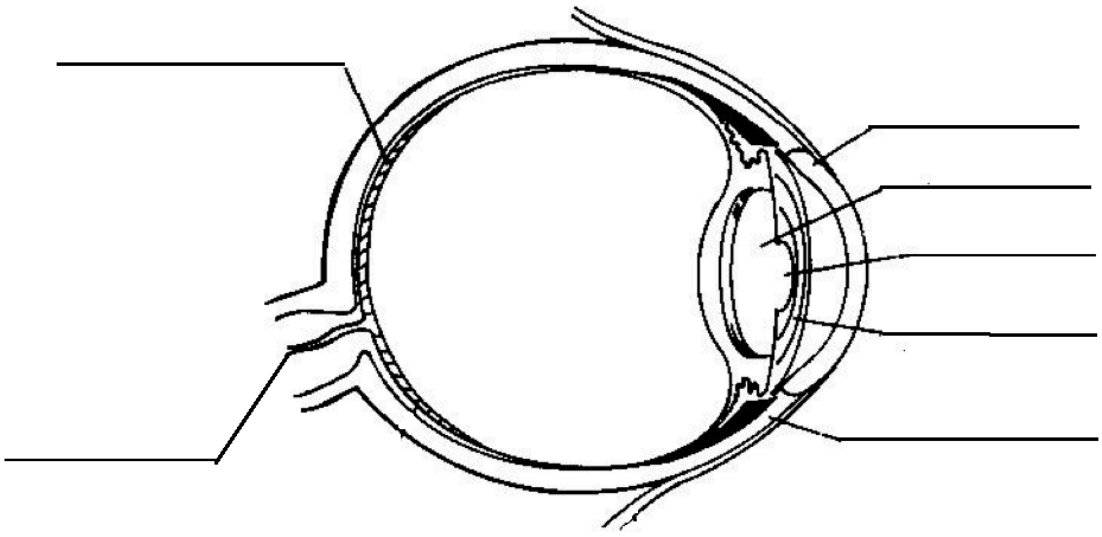


Human Vision

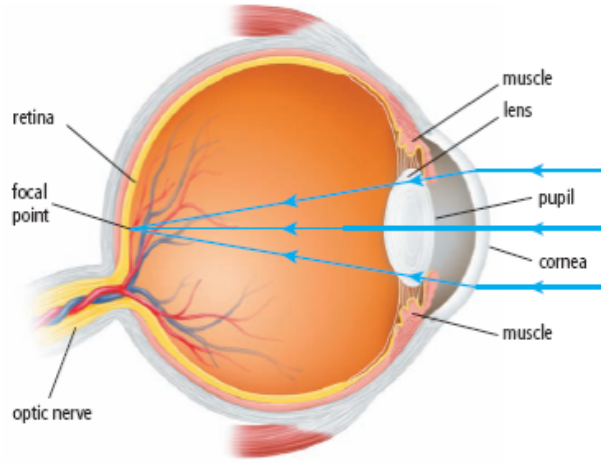


Parts of the eye:

- The _____ is the dark transparent region in the centre of the eye where _____ enters
- The _____ is the coloured circle of _____ surrounding the pupil
- The iris _____ the amount of _____ entering the eye
- The _____ is the white part of the eye surround the _____
- The _____ is the transparent _____ covering the iris and the pupil
- _____ the pupil is a flexible _____ lens
- The _____ focuses light onto the _____ located in the _____ of the eye
- the _____ is covered with _____ sensitive cells that convert light energy into _____ energy.
- _____ _____are sent to the brain by the _____ _____



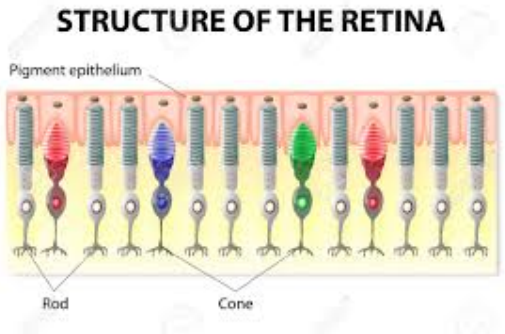
The cornea-lens-retina system:

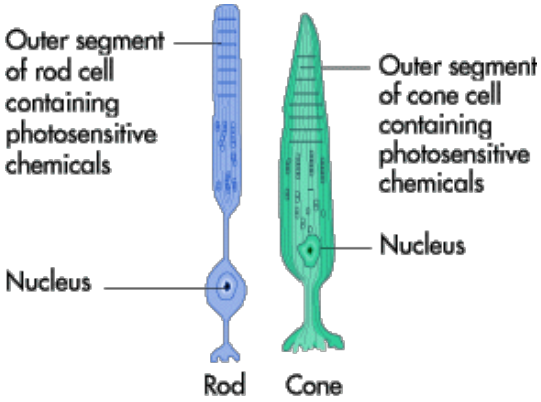


- light rays first entering the eye are _____ by the _____ so that they _____ toward the retina.
- light then _____ through the _____ which “fine-tunes” the focus
- the _____ that forms on the retina is _____
- the area where the _____ enters the _____ is called the blind spot
- the blind spot has no _____cells

Black-and-white vision and colour vision:

- the _____ contains two types of light-sensitive cells called _____ and _____
- _____ cells are _____-shaped cells that allow us to see images in _____ of light and dark when the light is _____
- _____ cells are _____-shaped cells that allow us to see _____ in _____ light





Astigmatism

- _____ vision due to a irregular shaped _____
- causes the image to _____ on more than one point on the _____
- corrected by using _____, contact lenses, or _____surgery.

Science 8 – Optics Review

Topics Covered in the Unit

- Types of Electromagnetic Radiation (Workbook p. 100-108)
    - Know the 7 main types of electromagnetic radiation
    - Be able to recognize and describe ways that we can use electromagnetic radiation

- Properties of Electromagnetic Radiation (Workbook p. 109 – 119)
    - Understand the different properties of electromagnetic radiation and waves
    - Be able to describe and explain the three models of light

- Light Interactions with Matter (Workbook p. 120-125)
    - Be able to describe the different ways light can interact with matter (i.e. Reflection, Absorption, and Transmission)

- Light Interactions with Mirrors (Workbook p. 126-133)
    - Understand the Laws of Reflection
    - Be able to predict how light will reflect off plane mirrors
    - Be able to recognize the characteristics of images in curved mirrors
    - Know some of the uses of curved mirrors in the real world

- Refraction of Light and Lenses (Workbook p. 134 – 142)
    - Be able to predict how light will behave when changing media
    - Know how light behaves when passing through concave and convex lenses
    - Know some of the uses of lenses in the real world

- Human Vision (Workbook p. 134 – 142)
    - Be able to recognize and label the different parts of the eye
    - Understand the functions of the different parts of the eye
    - Know the causes and corrections for hyperopia, myopia and astigmatism

To Prepare

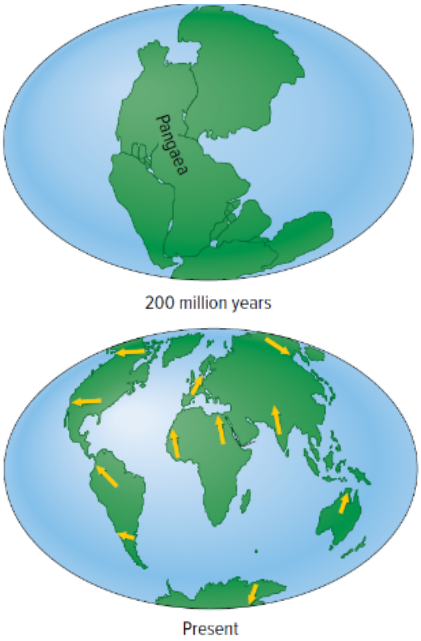
- Review your notes
- Go over your homework
- Review handouts
- Do the practice test
- Complete Textbook p. 262 #5-16, 20-21, 25, 27-28

Unit 4 Plate Tectonics (p.272-283) Date: _____

4.1 Why Do Continents have the shapes they do?

- Until the mid-1900s:
  - Geologists thought that continents had been in the _____ locations since Earth formed (fixism)
- 1912: Alfred Wegener
  - Noticed that some of the continents looked like they could fit together like a _____
  - Found evidence (_____, climate, and _____ information) to support the idea that the continents were once joined together

Continent Drift Theory



- Wegener proposed the _____ drift hypothesis
  - 200 million years ago: The continents were connected as a supercontinent called _____
  - Greek: *pan* means "all"; *gaea* means "world"
  - Over time, the continents _____ apart
- Scientists initially rejected Wegener's hypothesis
  - Wegener could not explain _____ continents could move
  - Scientists could not imagine what _____ could be large enough to make a continent move
  - Wegener's hypothesis was revisited decades later once information about the _____ was discovered

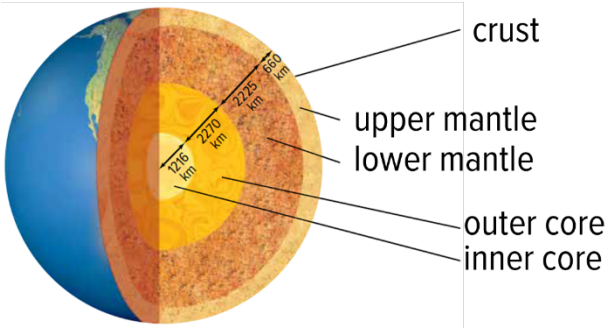
There were a couple of **key discoveries** that helped to develop the mechanism behind continent movement:

1. Learning what the _____ of the earth is made up of
2. Studies of the _____ _____

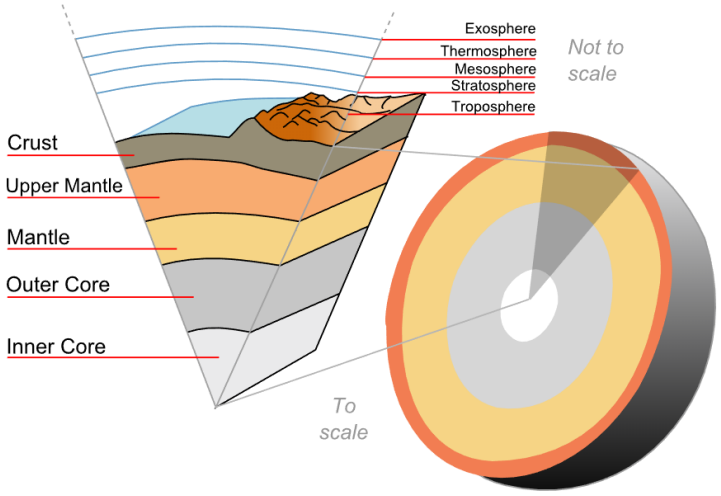
The above pieces of evidence (along with other modern discoveries) led to the creation of the _____ _____ Theory.

What is the Earth made up of?

- There is about 6350 km between you and the centre of the Earth
  - Scientists cannot observe the interior of the Earth _____ (no tools can probe that distance)
- To infer Earth's structure:
  - Scientists study energy _____ that travel through the interior during earthquakes
  - Speed and behaviour of waves are affected by the _____ they pass through
- Thin layer of solid rock surrounding Earth
  - _____ crust: thinner; mostly basalt
  - _____ crust: thicker; mostly granite
- Upper mantle:
  - Top part is solid. Bottom part is made of rock that is like soft taffy (can flow slowly)



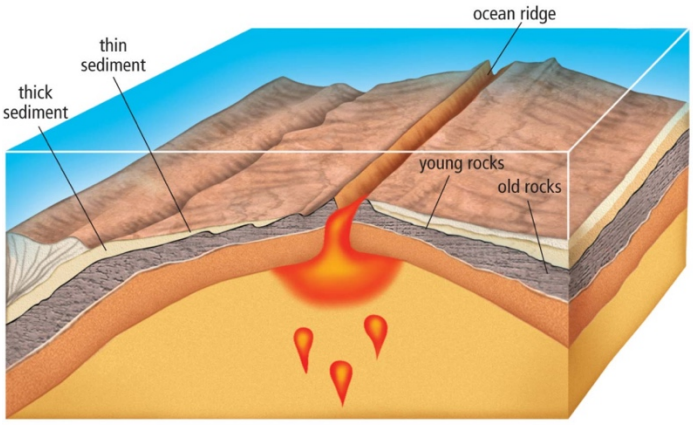
- Lower mantle:
  - Made of denser, more solid material than upper mantle



The temperature differences within the _____ create movement underneath the crust. This is called a _____ current and it is one of the mechanisms behind continental drift.

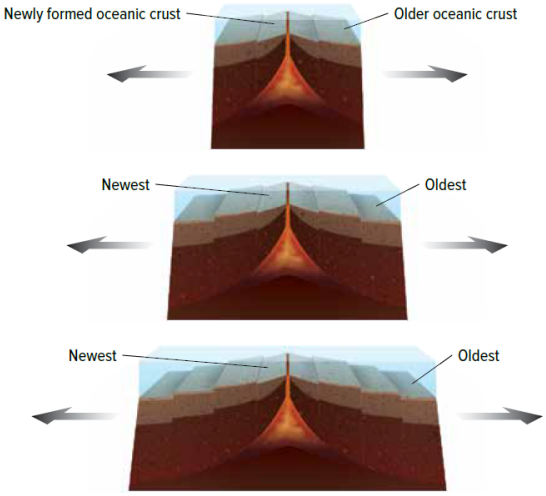
Studies of the Ocean Floor

- The ocean floor consists of
  - **Mid-ocean ridges**: _____ ridges along the ocean floor. As high as 3km above ocean floor.
  - **Trenches**: deep _____ in the ocean floor. Thousands of kilometers long and deep. (Marianas Trench)
- Ocean floor near mid-ocean ridges is _____ than ocean floor father away from ridges
- Sediment gets _____ as you move farther away from the mid-ocean ridge
- Suggests that ocean floor is _____ closer to the mid-ocean ridge



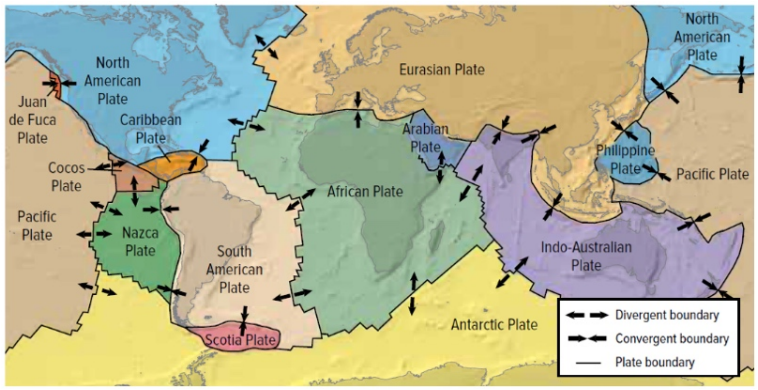
- **Sea floor spreading**: process of magma rising to the surface at mid-ocean ridges to form _____ ocean crust
- **Mid-ocean ridge:** higher than surrounding areas
- **Rift:** a crack in the valley at the _____ of the ridge; magma (molten rock) inside the Earth rises to fill the crack

- Magma erupts on the ocean floor and rises up the rift
- Magma cools, hardens into new _____, and pushes older rock _____from the ridge
- Process is repeated over millions of years
- Results in formation of new oceanic crust
- Sea floor spreading led to the understanding of how continents move and provided support for Wegener's continental drift hypothesis



Tectonic Plate Theory

- Earth's surface is made of huge slabs of rock called _____ _____
  - Large plates that float slowly on a layer of fluid-like rock in the Earth's mantle
  - Move very slowly (~2.5 cm per year, about the same right your fingernails grow)
- 12 major tectonic plates, and many smaller ones, that fit together:
- Activity of mid-ocean ridges and trenches is related to how the boundaries (edges) of the tectonic plates interact



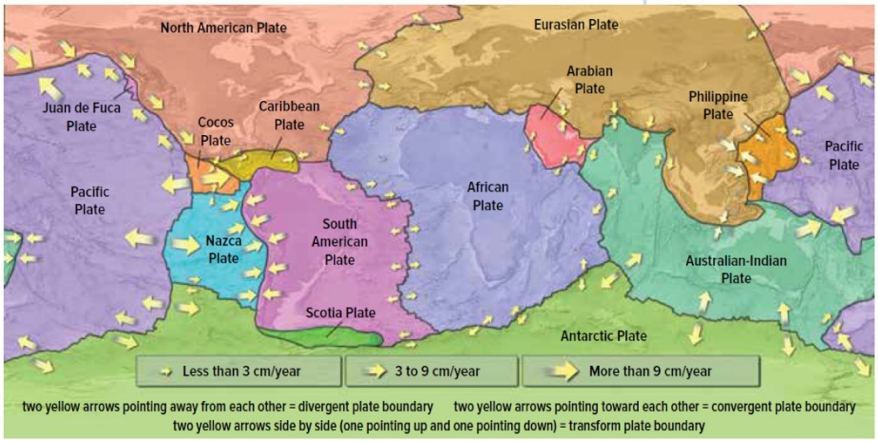
- **Theory of plate tectonics**: the lithosphere (crust + part of mantle) is broken into large plates that interact and cause geologic activities
  - Explains how and why continents move
  - Explains how and why sea floor spreading occurs
  - Explain how, why, and where _____, _____, and the formation of _____ occur

Do p.283 #1-3, 5-6

Why do Plates Move? (p.290-295)

Date: _____

The earth is made up of plates that move away, towards or slide against each other.

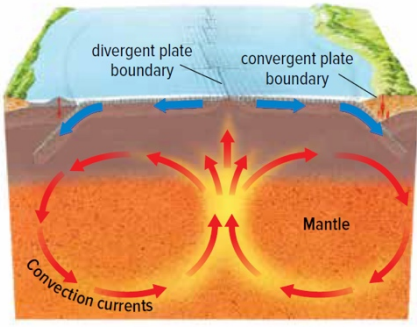


- Earth's lithosphere: outer layer of solid rock composed of crust and part of the upper mantle
- Consists of large slabs of rocky material called _____ _____
  - Some tectonic plates are only oceanic crust (Pacific plate)
  - Most tectonic plates are oceanic crust and continental crust (North American plate)
- Tectonic plates move in different _____ and at different rates relative to one another
- Plates interact with each other at their edges (plate _____)

What is the mechanism behind plate movement?

Earth's mantle is partially melted material.

- Energy from radioactive decay of some elements in Earth's interior and core heats up parts of the mantle

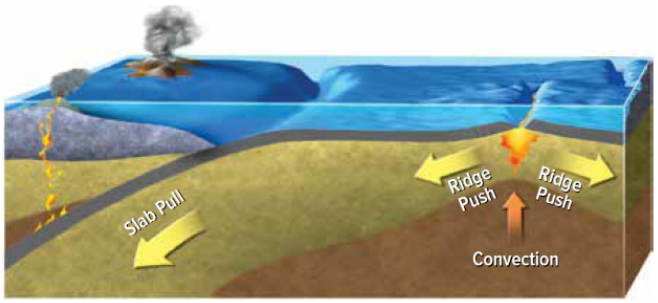


Mantle convection:

- Warmer, less dense material _____
- Cooler, denser material _____
- Causes large _____ currents in the mantle
- As the mantle material moves, it drags the tectonic plates above with it

Two processes that determine how mantle convection affects the movement of tectonic plates
:

- Ridge push
- Slab pull



Ridge push:

New material pushes older material aside, causing tectonic plates to move apart

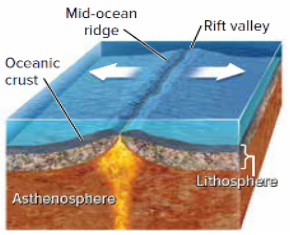
- Rising material spreads out as it reaches the upper mantle
- Causes the lithosphere to lift and push tectonic plates _____ at divergent plate boundaries

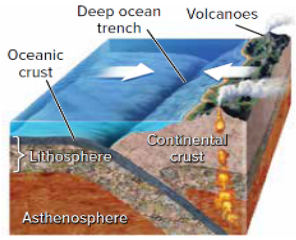
Slab pull:

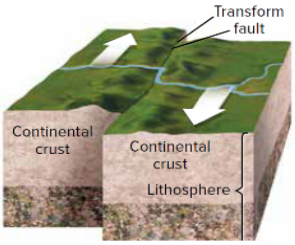
Pulling of a tectonic plate due to gravity and subduction

- As leading edge of a plate sinks, it pulls the rest of the plate with it as it goes under
- _____ and convection assist this movement

Three types of plate boundaries







Divergent plate boundary:

- Where tectonic plates move apart and create _____ oceanic crust
- Occurs where the sea floor spreads along a mid-ocean ridge
- Can also occur in the middle of continents (continental rifting)

Convergent plate boundary:

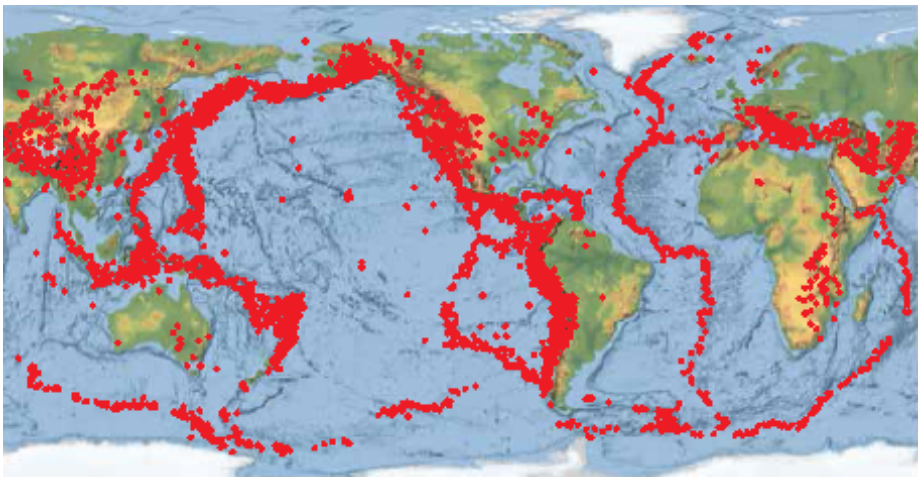
- When an oceanic plate goes _____ a continental plate.
- Denser oceanic crust eventually goes below less-dense crust in a process called *subduction*
- _____ and mountains form at these boundaries; earthquakes are common

Transform plate boundary:

- Where two tectonic plates slide past each other horizontally
- _____ are common

Earthquakes

Date: _____



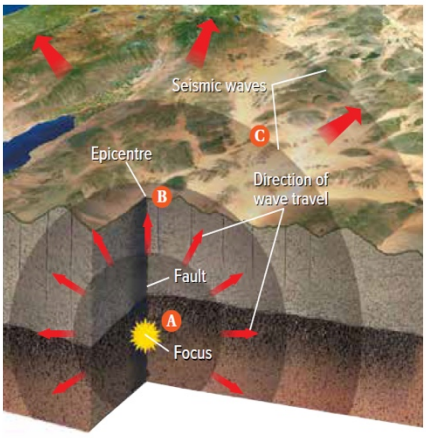
- Almost all earthquakes occur along plate boundaries
  - Location of greatest _____ on the rock in Earth's crust
- Movements in Earth's crust can squeeze, stretch, or twist the rock, which applies _____ to the rock - stored energy in the rock is released as an earthquake
- **Earthquake**: ground-shaking release of energy when a _____ in the crust occurs
  - Usually occur when rocks suddenly shift along a break in the rock (**fault**), releasing built-up pressure

What happens in the Earth's interior when an earthquake occurs?

- An earthquake starts at a location called the _____
  - The point where breakage of rock _____ Earth first happens

As the earthquake occurs, rocks along a fault move into a new position

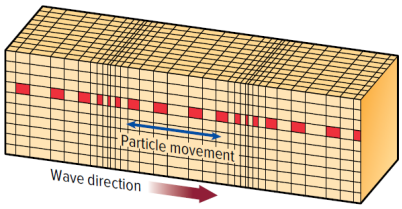
- Cause vibrations called _____ _____
- Seismic waves leave the focus in _____ directions

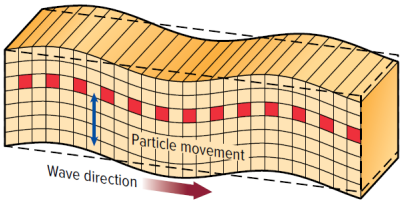


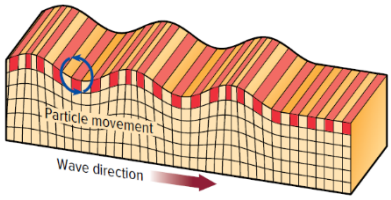
- **Epicentre**: the point on Earth's _____ above where an earthquake starts (above the focus).
  - People often refer to the epicentre when describing where an earthquake has occurred

Seismic waves: _____ caused by release of energy during an earthquake

Three types of seismic waves:







<u>P waves</u>

- Move the _____
- Are the _____ ones detected in an earthquake
- Cause rock particles to move forward and backward
- Can travel through liquids and solids

<u>S waves</u>

- Move _____ than P waves
- Cause rock particles to move up and down
- Can only travel through _____

<u>L waves</u>

- _____ of the three waves
- On the surface and often cause the greatest damage
- Cause rock particles to move up and down, and side to side
- Can travel along the _____ of Earth (not through Earth's interior)

How Earthquakes are Measured

- _____: instrument that measures and records seismic waves (ground vibrations)
- **Magnitude**: a number that represents the _____ of an earthquake
- **Richter scale**: a scale for reporting the strength of an earthquake (magnitude)
  - Based on the size of the largest seismic waves that are formed
  - Higher number means _____ strength of earthquake
- Each number on the Richter scale represents a _____ difference
  - Ex: a magnitude-8 earthquake is ____ times larger than a magnitude-6 earthquake
  - Earthquakes less than magnitude-4 do not cause damage

Volcanoes and Mountains (p.306-310)

Date: _____

What kinds of things are formed at plate boundaries?

Volcano: opening in Earth's surface where magma and other materials are released

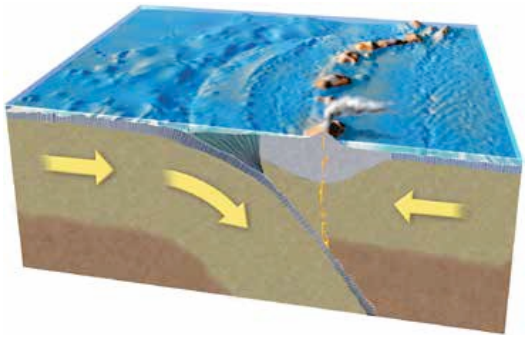
- Eruptions send _____ and _____ into the air

Lava: magma that has been released onto Earth's surface

Most volcanoes form at _____ boundaries

Two locations where volcanoes can form:

- Oceanic-oceanic convergent boundary
- Oceanic-continental convergent boundary



Oceanic-oceanic convergent boundary

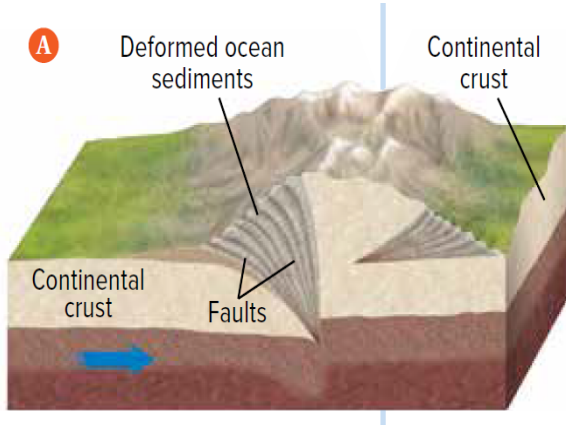
- Oceanic crust from one plate collides with oceanic crust from another plate
- One plate _____ beneath the other plate
- Oceanic trench forms where one plate subducts beneath another
- Magma rises to the upper plate and some is released onto the surface (lava)
- Over time, erupted lava and ash build up and form a curved group of volcanic islands (_____ _____ _____)

Oceanic-continental convergent boundary

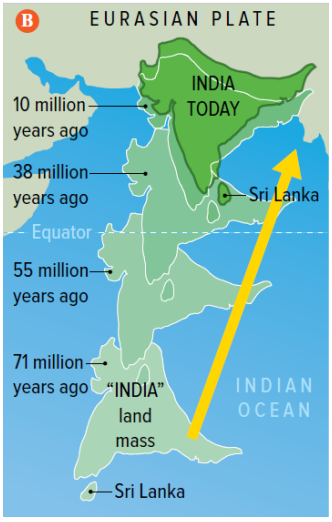
- Oceanic crust collides with _____ crust
- Plate of oceanic crust (more _____) subducts beneath the continental crust of another plate
- _____ form on the surface of continental crust
- Magma can rise to the surface and cause an eruption
-

Continental Crust Collisions

- Massive mountain ranges are formed when two plates of continental crust collide.
- One plate is _____ beneath the edge of the other plate (continental crust is not easily subducted beneath the other plate, like oceanic crust)
  - Impact causes a large area to be pushed _____, forming _____



- **Himalayan Mountain Range**
  - Tallest mountain range on Earth
  - Formed from a collision between the Eurasian plate and Indian plate
  - _____movement of the Indian plate would have caused a violent collision



Hot Spot Volcanoes

- Tectonic plates can move over _____ areas called hot spots, creating a _____ of volcanic islands
- Hot spots: hot regions of Earth's mantle where magma rises to the surface by breaking through _____ parts of the lithosphere
- Volcanoes can form above hot spots as the magma rises and melts through the crust