Living Environment

This belongs to _____

My teacher is _____. If you find this please return it to Holland Patent High School. Thank you.

Day 1 and 2
Introduction to Biology
Expectations of the teacher for the year are:

I must do the following things to be as successful as I can in this class:

- Homework assignments
- Study for all tests and quizzes
- Pass in all assignments on time
- Do all available test corrections
- Ask for clarification in class
- Stay after school for extra help if needed
- Be in class as much as possible

Grading is on a point basis

- Your grade = the number of points that you earn divided by the number of points that you could earn multiplied by 100

All lab assignments, reports, and test corrections must be typed
Materials needed for this class include a writing utensil, notebook, and binder

You are able to look at last year's student letters to you on what to expect in the class, from the teacher, and what to do to succeed

Books must be covered and should be brought to class unless otherwise told

Any other information you need to know or think is important should be placed below-

Books and book cards
Lab folders

Day 3

What is Biology?
Biology is the study of living things – fish, mammals, plants, bacteria, insects, fungi
Biology involves a search for solutions to medical problems such as:

-
-
-

Biology involves a search for answers to environmental concerns such as:

-
-
-
-

How do biologists find answers to these problems?
Think of some examples-

When do or have you used biology to make personal decisions?

-
-
-
-

How did you learn what you know about biology?

-
-

***Homework* = Read pages 3-9 and 10 - 15**
Do review questions 1 & 2 pg 9 and 2 & 3 pg 15
Key Terms – science, observation, inference, hypothesis, controlled experiment, independent variable, dependent variable, control group, data, theory, bias

Day 4
What is the Scientific Process?

You have used a similar process in the past and maybe even today.
How did you choose to wear what you are?

Hypothesis – a testable statement that can be proven true or false

Write a hypothesis of your own –

Is it correct – if not rewrite it so that it is.

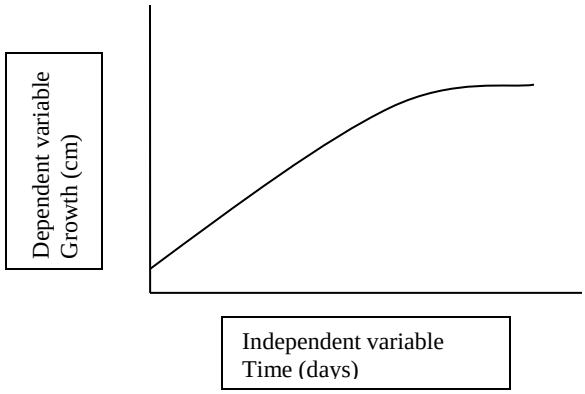
Write another example from the class.

Predictions are made about a hypothesis before the experiment is conducted.

How do we test a hypothesis?

- Controlled experiment
    - Everything is kept constant except what is being tested
    - Why is this important?
- Control – something that the experimental group can be compared back to
    - Without a control the results are meaningless
- Variables

- Independent – you control this directly such as time, light intensity, temperature, pH
- Dependent – changes according to the independent variable, such as growth rate, breathing rate, activity



- Inferring – trying to declare what happened or why something happened without being there directly
    - Circumstantial evidence – crime scene, murder weapon, blood type

Day 5

What is a theory?

Theory – biologists may formulate a theory if their hypothesis is tested in many ways and is supported by the results of many experiments.

- Plate tectonics
- Big bang
- Evolution

Some general concepts of Biology:

- All living things are made of cells
    - What about viruses?

- All organisms maintain **homeostasis –** a stable internal condition despite the external environment
    - Examples are –

- Instructions for development are passed from parent to offspring
    - How?
    - Families in school?
        - Why are they similar?

- Evolution is inherited change over a period of time
    - Polar bear used to be brown

- Living things interact with their environment

    - Example

- The physical principles that apply to the stars or computers apply to all living things
    - They only vary in degree
    - Energy flow, gravity, heat, chemical properties

Day 6
Finish notes
Quiz format
Questions
Review

Day 7
Questions about the information?
Quiz
Begin the next home work assignment

***Homework* = read pages 17 – 25**
Do all review questions 1,2,3 pg 25 .
Key Terms = biology, DNA, stimulus, sexual reproduction, asexual reproduction, homeostasis, metabolism, biosphere, cells, growth, nutrition

Day 8
Correct the quiz
Feedback on the quiz
How can we better prepare for the next quiz?
Continue on the homework assignment

Day 9 and 10
What makes something alive?
Characteristics of life

- Reproduction – 2 types sexual and asexual
- Cells
- Genetic information
- Homeostasis
- Metabolism
- Growth
- Nutrition

All living things use energy in a process called metabolism
Metabolism is all of the chemical processes that maintain an organism

Excretion is the removal of metabolic waste

- Sweating
- Urination

Chemically similar

- Diffusion – single cells
- Breathing – gas exchange and water vapor

- Nutrition
    - Ingestion – mouth, diffusion, endocytosis
    - Digestion – chemically, physically, biologically
    - Egestion – removal of indigestible materials

Diffusion – when something moves from an area of higher concentration to an area of lower concentration through random molecular movement

Examples –

Demo outside

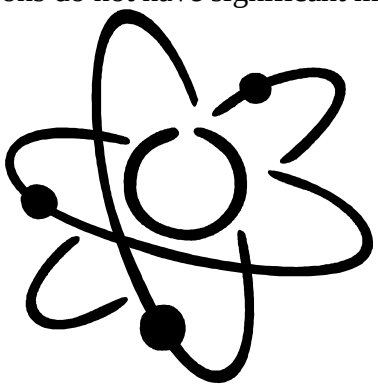
***Homework* = read pages 34 - 53**
Do all review questions 1,2,3 pg 38 & 1,2,3 pg 44 & 1,2 pg 49 & 2,3 pg 53 .
Key Terms = atom, nucleus, electron, element, isotope, compound, ionic bond, ion, covalent bond, molecule, hydrogen bond, cohesion, adhesion, mixture, solution, solute, solvent, suspension, pH scale, acid, base, buffer, monomer, polymer, carbohydrate, monosaccharide, lipid, nucleic acid, nucleotide, protein, amino acid, chemical reaction, reactant, product, activation energy, catalyst, enzyme, substrate

Day 11
What does chemistry look like in biology?
Atom – smallest particle that retains its individual chemical properties

- Density = mass/volume
- Reactivity to other substances
- Conductivity of heat and electricity

Atomic structure

- Nucleus – center of the atom containing protons and neutrons
- Orbitals – surround the nucleus – where the electrons can be found
    - Neutrons have an atomic mass unit of 1 and lack a charge
    - Protons have an atomic mass unit of 1 and a positive charge
    - Electrons do not have significant mass and a negative charge



Elements – pure substances found on the periodic table

Chemical Bonds – stabilize the atoms by satisfying charge and / or by “filling” the outermost orbital

- Ionic – an electron is lost or gained creating a charge because there is an imbalance of electrons and protons
    - Bully example of the kid who steals another's milk money
- Covalent - 2 or more atoms share electrons
    - Oxygen
    - Water

Atoms "want" a full outer orbital
Ions are charged particles
Atomic # = the # of protons
Atomic Mass = the # of protons + the # of neutrons
Isotope – the # of neutrons can vary
Radioisotope – the # of neutrons or protons vary and emit particles / radiation

Day 12 and 13
What is the difference between organic and inorganic molecules?

Organic compounds have carbon to carbon bonds and come from living organisms.

Inorganic molecules do not come from living things and do not have carbon to carbon bonds.

Large covalent compounds are known as macromolecules.

4 major types of organic molecules are carbohydrates, lipids, proteins, and nucleic acids.

Carbohydrates store energy and provide structure in plants
- Starch compound made of glucose molecules
- Glucose simple molecule that provides energy

Lipids are compounds that store energy and can act as barriers in membranes
- Oils are lipids that are liquid at room temperature
- Fats are lipids that are solid at room temperature

Proteins are organic compounds that provide structure in non-plant species, can be markers, receptor molecules, carrier molecules in membranes, and serve as enzymes
- Amino acids are the building blocks of proteins
- Enzymes are proteins that act as catalysts
    - Speed up chemical reactions by lowering the activation energy
    - Substrates are the substances that the enzymes act upon
        - The point of contact or reaction is the active site
        - An enzyme and substrate = an enzyme-substrate complex
    - **High temperatures, pH changes, heavy metals, and viruses can cause enzymes to change their shape making them less or ineffective – this is called *denaturing***

Denaturing is important because once an enzymes shape is changed it will no longer function as well or in some cases at all. Even if the conditions return to normal the enzyme cannot change its shape back to what it was. It is a permanent change – this is why people die from high fevers or high body temperatures such as children being left in cars on hot days.
In contrast if the temperature was to **decrease** the enzyme activity would just slow down and if the temperature returned to normal than the enzyme activity would also return to normal.
Shape is important because enzymes are shape / substance specific – like two puzzle pieces that fit together.

Nucleic acids are organic compounds that contain the genetic code

- Nucleic acids are built from nucleotides
- DNA – deoxyribose nucleic acid
- RNA – ribose nucleic acid

Dehydration synthesis – when molecules are constructed by removing a water molecule
Make a sketch of this below –

Hydrolysis is the splitting of a molecule by adding water – the inverse of dehydration synthesis.

pH – how acidic or basic a solution is

- Based on the H concentration in relation to the OH concentration
- The greater the H the lower the pH
- The lower the H the higher the pH
- 0 – 14
- 7 = neutral
- < 7 = acidic
- > 7 = basic
- Our pH is ~ 7.4 and if it moves by more than .1 we will likely die

Water – formula is H_2O

- Structure is $H - O - H$
- It has a slight charge on either end making it a polar molecule
- Properties of water
    - Polarity makes it a good solvent
    - Adhesion - water is able to chemically "stick" to other molecules
        - Capillarity – the ability to move upwards against gravity
    - Cohesion – water is able to "stick" to itself – rain drops

Energy – potential energy vs. kinetic energy

- Potential energy is –

- Kinetic energy is –

Chemical reaction vs. Phase change

- Chemical reaction – burning wood – the chemical formulas have been altered and the properties changed
- Phase change - water freezing - the chemical formula and properties are still the same, but the phase of the material has been changed

Types of chemical reactions

- Endothermic – heat is entering the system – cold pack
- Exothermic – heat is leaving the system – hot hands pack
- Decomposition – large molecules are broken into smaller molecules
- Synthesis – smaller molecules are combined to build larger ones
- Recombination – molecular pairs are switched – changing dance partners

Day 14

What are the relationships and outcomes when things get dissolved?

Solute – substance that gets dissolved
Solvent – substance that does the dissolving
Solution – solute + solvent, there is no chemical alteration salt water still tastes salty
Suspension – particles are held up, but will settle out in time
Colloid – suspension when the particles do not settle out – gelatin

Monomer – simple molecule – sugar
Polymer – more than one monomer – starch
Macromolecule – a very large molecule – starch

How do monomers bond?

- Dehydration synthesis

Polymers are broken apart by hydrolysis

Monosaccharide – simple sugar – glucose (plants), fructose (fruits), galactose (milk)

- **ose**

Disaccharide – 2 sugars
Polysaccharide – many sugars

Day 15

Review

Day 16
Quiz
Homework **= read pages 189 - 217**
Do review questions 3 pg 194 & 4,5 pg 205 & 1,2 pg 213 & 1 pg 217
Key Terms = cell, cell theory, cell membrane, nucleus, eukaryote, prokaryote, light microscope, diffusion, endocytosis, exocytosis, cytoplasm, organelle, vacuole, lysosome, cytoskeleton, centriole, ribosome, endoplasmic reticulum, Golgi apparatus (Golgi body), chloroplast, mitochondria, ATP, cell wall, lipid bilayer, selectively permeable, semi-permeable, facilitated diffusion, osmosis, isotonic, hypertonic, hypotonic, osmotic pressure, turgor pressure, homeostasis, tissue, organ, organ system, receptor
KNOW – Hooke, Leuenhooke, Schleiden, Schwann, Virchow
- ***Cell Theory***

Day 17
What is a cell?

Organisms can be unicellular or multi-cellular.
- Uni = one – example =
- Multi = more than one – example =

What lead to the discovery of the cell?
- Lens
- Light microscope
- SEM – scanning electron microscope
- TEM – transmission electron microscope

Timeline of the cell
Lens ~ 1600s
1665 – Robert Hooke – cork observation
- Named the cell after it cubical appearance like -

1675 – Leauwenhoek – first person to view living cells
1838 – Schleiden – concluded that all plants are made of cells
1839 – Schwann – concluded that all animals are made out of cells
1855 – Virchow – determined that all cells come from other cells while he was studying diseases

Why was there such a large gap in time between seeing living cells and concluding that all things were made up of cells?

The new discovery about the worm in everyone's brain made out of identical brain tissue – is this who we really are?

Day 18
What came from these peoples' efforts?

From the last three people the **cell theory** was developed.

The cell theory states that:

- All living things are made of one or more cells
- Cells are the basic unit of structure and function in organisms
- Cells come from existing cells

Cells can vary in size from 2 meters to 0.2 micrometers

- Most plant cells are 10 – 50 micrometers
- What cell is 2 meters long?

Why can't cells be large?

- Surface area : volume ratio!!!!!
    - A box example
    - 1cm X 1cm X 1cm = $1cm^3$ volume with $6cm^2$ surface area = a 6 :1 ratio
    - 3cm X 3cm X 3cm = $9cm^3$ volume with $27cm^2$ surface area = a 3 :1 ratio
- Food, waste, oxygen, must diffuse throughout a cell

Shape advantage – as a cell it is great to be out of shape

- Adds surface area

Shape = function

White blood cells are the real shape shifters of the body so that they can destroy pathogens or get rid of foreign materials

Day 19

The bacterium is too big for my membrane, what do I do? - I engulf it!!

Endocytosis – when a cell membrane slowly wraps around a molecule or another cell and pulls it inside – example – a white blood cell and bacteria

- Phagocytosis – ingestion of solids into the cell through endocytosis
- Pinocytosis – the ingestion of liquid into the cell through endocytosis

Exocytosis – when a cell membrane gets rid of waste or protein that has been packaged by the golgi body by unwrapping around it

Prokaryote vs. eukaryote

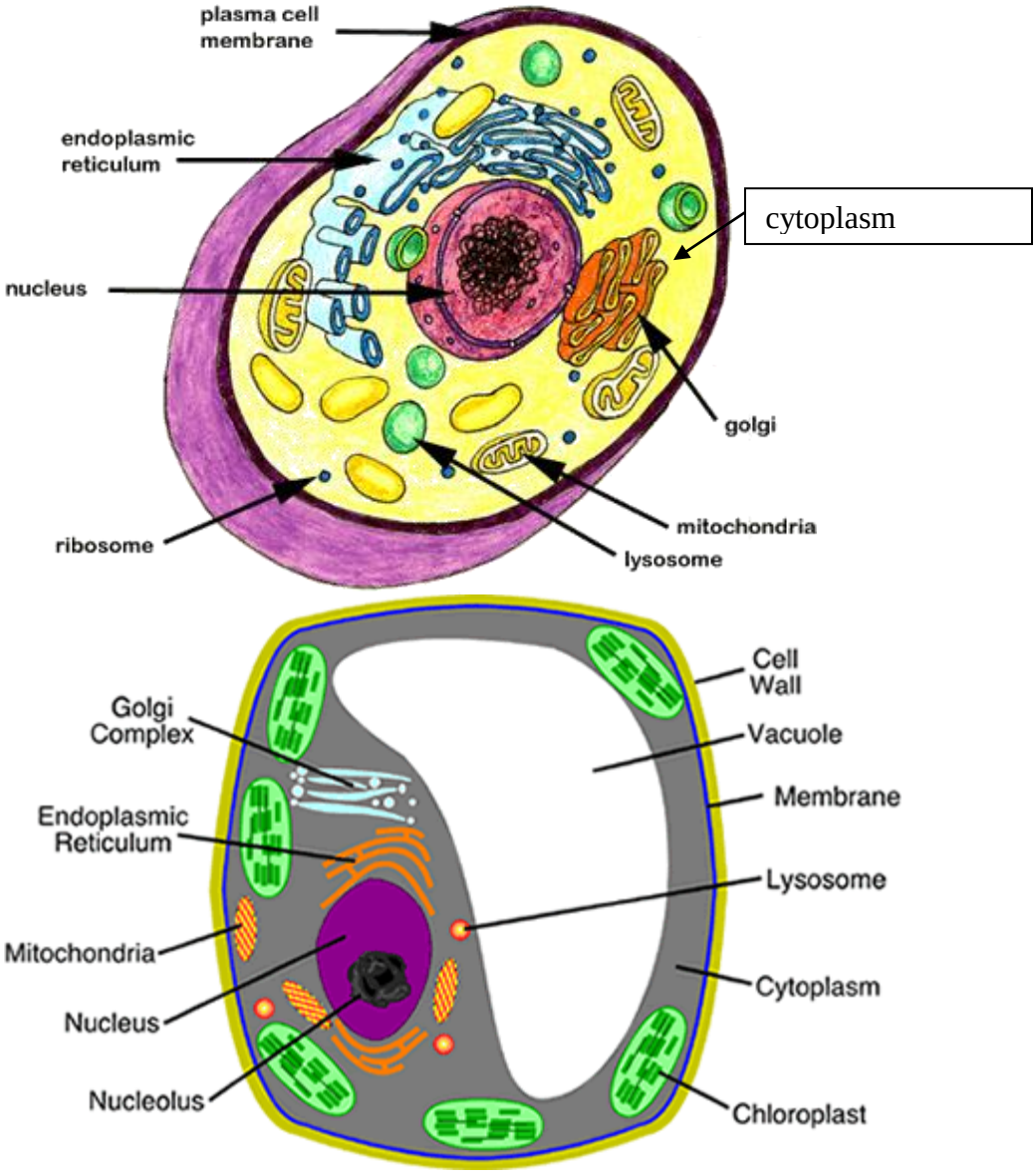
- Eukaryotes have membrane bound organelles and a nucleus
- Prokaryotes do not have either
    - Bacteria are prokaryotes
    - Plants, animals, fungi, protists

Five kingdoms of classification – monerans = bacteria, fungi = mushrooms, animalia = animals, plantae = plants, protista = single celled organisms

Day 20

What are the parts that make a cell a cell and are there differences between plant and animal cells?

Animal and Plant Cell



The definitions and roles of each of the organelles is in your homework.

What are the differences between plant and animal cells?

Plant	**VS.**	**Animal**
Cell wall		none
Chloroplasts		none
Large Vacuole		lysosomes
Middle lamella		none

Cell membrane

- 4 layers
    - Hydrophilic – hydrophobic – hydrophobic – hydrophilic
    - Carboxyl – glycerol – glycerol – carboxyl

Day 21

How does the cell membrane work?

Cool fact: Glycerol is a form of fat that can be used to detect the potential for heart disease

Fat = lipid
Oil and water do not mix so a protective barrier is created

Gated channels will open and close for certain molecules

Carrier molecules aid in the movement of materials through the cell membrane

Fluid Mosaic Model

- The cell membrane is made of many smaller pieces that are held together and are always in motion
    - Think of a whole bunch of people in the gym at a dance and you are looking down – this is kind of how the fluid mosaic works

Passive transport – form and function

- 2 major players
- Both are proteins
    - One protein extends through the membrane
    - The other is imbedded at the glycerol layer

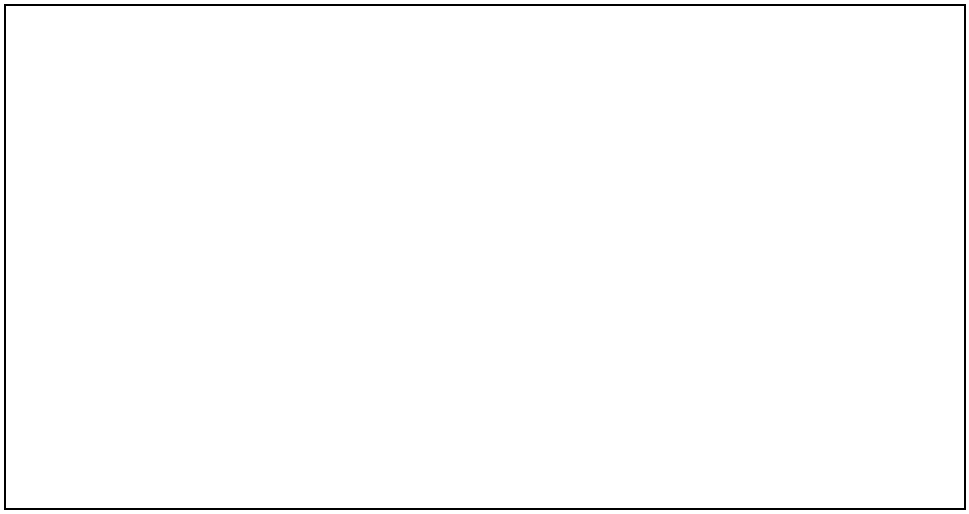
- Some act as carrier molecules that allow the passage of only one type of molecule
    - These can open and close to create a bigger gap or are shaped specifically for that type of molecule
    - This type of movement is called facilitated movement

- Other molecules form gated channels through the membrane with "gates" that can always be open or in some cases only open to certain molecules

Day 22
What is active transport?

Active transport can involve carrier molecules that "actively" move molecules against the concentration gradient

- The concentration gradient is an imaginary slope created by a difference in concentration either in space or across a membrane
- In the box sketch a concentration gradient for oxygen and carbon dioxide in the lungs and label them



- By being "active" the cell membrane requires the use of ATP
    - ATP is THE energy molecule used by organisms to perform all tasks

- The number one active transport system in the body is the sodium-potassium pump
    - Without it, our response time would be even slower than it already is
    - The sodium potassium pump moves 3 Na ions out of the cell and 2 K ions into the cell against the concentration gradients
        - This leads to an electrochemical gradient across the cell membrane that is important for nerve impulses and resulting movement

Day 23
Review all information from day 1 to present

Day 24
Quiz

Day 25

How do molecules move through space?

Diffusion and Osmosis
Gradient is a slope

- Can be used to show the difference in concentration across a membrane or space
- Can also show the difference of pressure, temperature, and electrochemical properties

Concentration

- Amount of solute in a given amount of solvent
    - Ex. 5g of salt in 100ml of water = 5% concentration

Diffusion

- Movement of molecules from an area of greater concentration to an area of lesser concentration
- Continues until the molecules are evenly distributed
    - Reach equilibrium
    - The molecules are still moving but at about equal rates from one side or area to another so that no measurable difference can be observed

Osmosis

- Movement of water into or out of a cell
- Water will move to an area of lower concentration
- No energy is required – the water just flows

Homework = **Answer the following questions:**

Why is cell communication important and how does it work?

Describe how each of the receptors work.

Describe diffusion and osmosis.

Describe the sodium potassium pump.

Day 26

How do we describe solutions and membranes?

Hypertonic

- Hyper means higher than or above
- Describes a solution that has a higher concentration of solute than that on the other side of a membrane

Hypotonic

- Hypo means lower than or below
- Describes a solution that has a lower concentration of solute than that on the other side of a membrane

Isotonic

- Iso mean equal or constant
- Describes a solution that is equal to a solution on the other side of a membrane

Permeable

- Describes a membrane (or other barrier) that allows substances to pass through it
- Molecule size and the steepness of the concentration gradient determine how readily molecules will permeate (diffuse into or out of) through a cell membrane

Semi-permeable

- Describes a membrane that will only allow certain substances to pass through based upon the size of the molecules

Selectively permeable

- Describes a membrane of many living cells that only allow certain substances to enter or leave the cell based on the size, shape, chemistry, or charge of the molecule
- The proteins of the cell membrane can regulate the passage of the molecules into and out of the cell
- Cells can also force the diffusion of molecules against the concentration gradient through active transport – but this requires the use of energy

Check out the insert

Day 27

What happens when water pressure builds or falls?

Water can cause cells to swell and shrink.

Turgor pressure refers to the amount of water pressure in a cell.

- High turgor pressure = lots of water = lots of water pressure!
- Low turgor pressure = little water = little water pressure!

Plasmolysis – when the cell shrivels or wilts because there is very little water pressure

Cytolysis – when the cell bursts because the water pressure is too much for the membrane to handle

Begin to review for an exam.

Day 28
Exam

***Homework* = read pages 225 – 241**
Do review questions 1,2 pg 228 & 1,2 pg 234 & 3 pg 241

Summarize the three stages of photosynthesis and where each one takes place.

What is the chemical formula of photosynthesis?

How do the stages of photosynthesis depend on the previous stage?

Key Terms – adenosine triphosphate, heterotroph, autotroph, photosynthesis, pigment, chlorophyll, thylakoid, stroma, NADP, light dependent reactions, light independent reactions (dark reactions), photosystem, electron transport chain, ATP synthase, Calvin cycle

Day 29
What are the 4 major organic molecules that we use?
Carbohydrates, Lipids, Proteins, and Nucleic Acids

Carbohydrates

- Provide us with a source of energy
- Sugars
- Starches
- Act as building blocks in plants
- Found in grains, potatoes, fruits, many processed foods and drinks
- Test for sugar using Benedicts solution
- Test for starch using iodine
- Elements that make up carbohydrates are Carbon, Hydrogen, and Oxygen
    - These usually occur in a 1:2:1 ratio

Lipids

- Include fats and oils
- Act as insulation, a source of energy , and are a major part of the plasma membrane of cells
- Found in nuts, animal, dairy and some plant food sources and many processed foods
- Can test for fat and oil using the paper bag test
- Can test for fats and oils using an organic solvent
- Elements that make up fats are Carbon, Hydrogen, and Oxygen
- Two types of fat
    - Saturated
    - Unsaturated

Proteins

- Act as a source of energy, the building blocks of all animals, and enzymes
- Found in meats, some vegetables, nuts, dairy and certain processed foods
- Test for proteins using nitric acid which turns yellow in the presence of protein
- Elements that make up proteins include Carbon, Hydrogen, Oxygen, and Nitrogen

Nucleic Acids

- Contain genetic information specific to the organism which it is from
- Found in all living things
- Elements that make up nucleic acids are Carbon , hydrogen, oxygen, nitrogen, and phosphorous

Day 30

Some odds and ends

‘***ase*** = some type of enzyme

- Amylase, protease, lipase

Amino acids are the building blocks of proteins
Proteins are made in the ribosomes

- Therefore they also build enzymes

Starch is a carbohydrate that is made from many sugars bonded together
Cellulose = a polysaccharide = a carbohydrate found in plants
Nucleotides = repeating units that make DNA and RNA

Receptor molecules can be for chemical or voltage "signals"

- Receptor molecules are made to either receive specific molecular structures or a certain charge that then causes them to cause the cell to respond either by performing an action or by expressing a gene
- Example is adrenaline and the response once adrenaline is released
- Example is insulin and the response on blood sugar levels when it is released

Day 31
Biochemistry molecule worksheet
Review

Day 32
Quiz

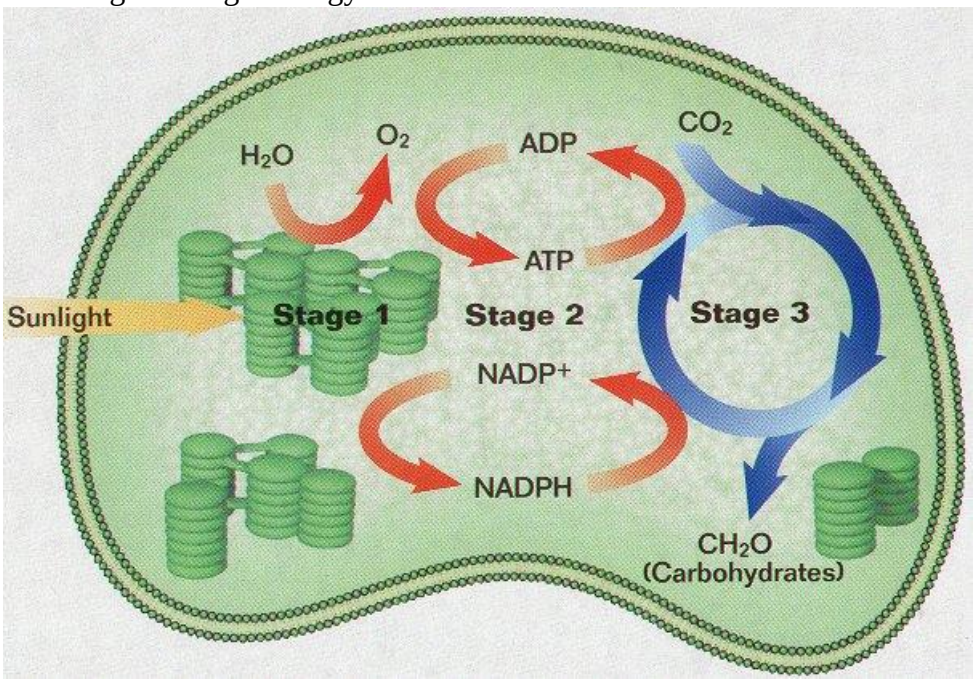
Day 33
What is photosynthesis?

Photosynthesis is an energy storing process that involves three distinct stages

- Absorption of light energy
- Conversion of light energy into chemical energy
- Storage of chemical energy in the bonds of sugars / glucose
    - The first 2 stages are light reactions – meaning that they require light to progress
    - The third stage is a dark reaction also known as the Calvin Cycle and does not require light to occur

Photosynthesis takes place in plants – in cells – in chloroplasts – in the thylakoid – in the chlorophyll molecules

- Chlorophyll molecules are pigment molecules that absorb and reflect certain wavelengths of light energy



Party analogy:

Day 34
What are the parts and functions of a leaf?
Leaf sheet
Finish for homework

Day 35
Quiz

Study skills -
How do you study and is it really studying?

What type of learner are you?

I am a –

What is the best environment for you to study in?

I need to study in –

What is the best method for you to use when studying?

I will try –

If that does not work then I will try –

If that does not work then I will try –

In classes that do not provide you with an outline for the year you should take notes on a notepad and recopy them over that same day into a permanent notebook. This helps you to remember and refresh yourself on what was covered in class and reorganize it so that the notes can make more sense.

Try these new methods.

Remember it is not how much time that you spend studying, but what you do in the time that you study that allows you to remember and understand the information.

***Homework* = read pages 249 - 265**
Answer review questions 1,3,4 pg 260, 1,2 pg 265.
Key terms = calorie, cellular respiration, aerobic, anaerobic, glycolysis, NAD, Krebs cycle, matrix, fermentation, bacteria, lactic acid, alcohol fermentation

Day 36
How does photosynthesis relate to respiration?

The chemical equation for photosynthesis is

- $6CO_2 + 6H_2O$ + light energy → $C_6H_{12}O_6 + 6O_2$

The chemical formula for aerobic respiration is

- $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + 38$ ATP

Respiration is an energy releasing process
There are 2 types of respiration
Both of these begin with glycolysis

- Glycolysis is a process by which a glucose molecule is broken down into 2 pyruvic acid molecules
    - It does not require oxygen
    - Enzymes catalyze the 4 stages of glycolysis

The first type is anaerobic respiration is called fermentation

- This is when a pyruvic acid molecule is broken down further without the use of oxygen
- This is an anaerobic process

The second type is aerobic respiration

- This is when a pyruvic acid molecule is broken down using oxygen
- Most organisms are able to accomplish this
- Far more energy is produced through aerobic respiration

ATP = adenosine triphosphate

- **This is an energy storing molecule**
- **The energy is stored in the bonds between the phosphates**

Glycolysis and anaerobic respiration occurs in the cytoplasm
Aerobic respiration occurs in the mitochondria

Follow the flow chart

Day 37

What are the stages of respiration?

Stage 1 - glycolysis

- Occurs in the cytoplasm
- Does not require oxygen – anaerobic
- A glucose molecule goes through ~ 10 chemical reactions to form 2 pyruvic acid molecules and a **net gain of 2 ATP molecules**
    - There is a gross of 4 ATP produced, but 2 ATP molecules are needed to supply the activation energy 4ATP – 2 ATP = 2ATP

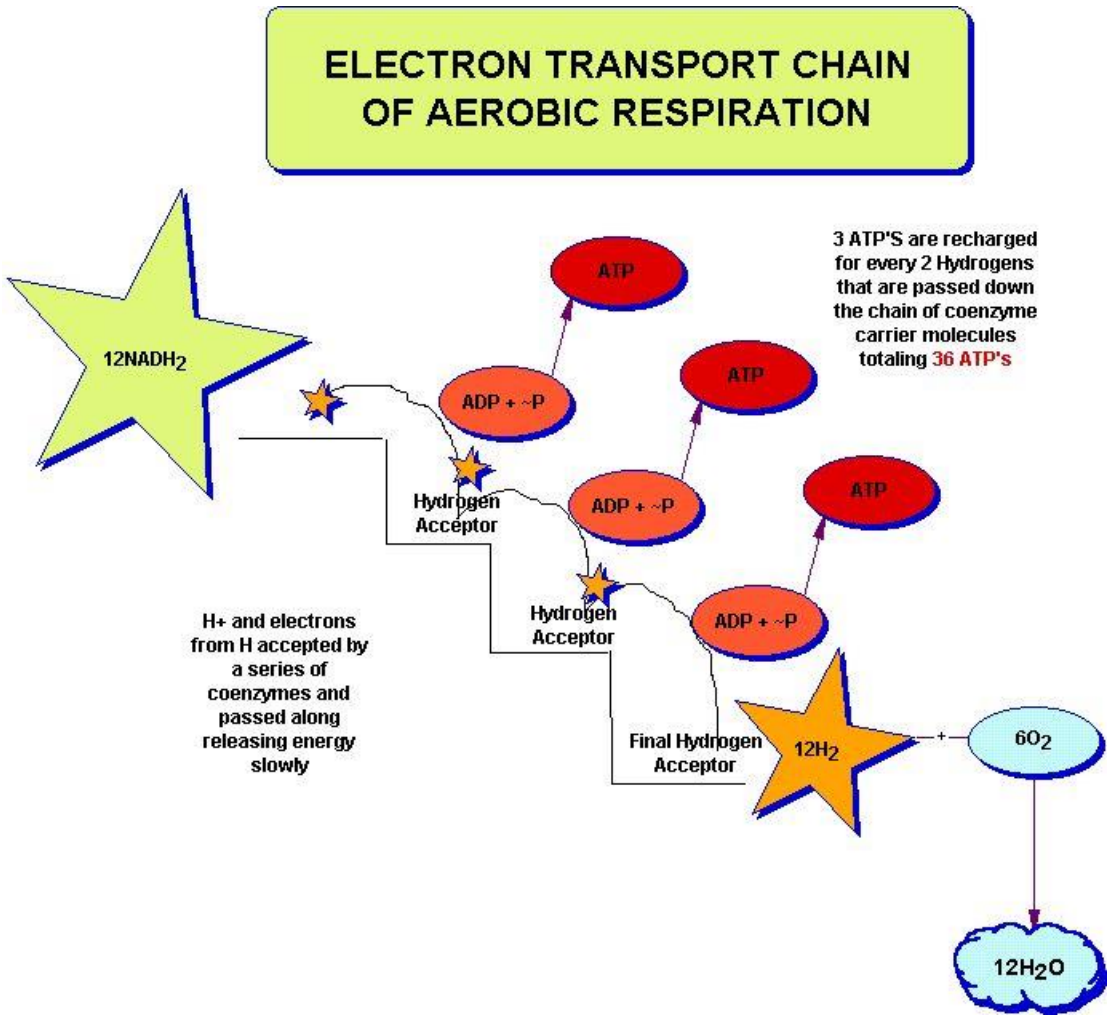
Stage 2 – Krebs Cycle

- Occurs in the mitochondria
    - The "workbench" that has all of the necessary "tools" / enzymes
    - It is set up like an assembly line for efficiency
- Require oxygen – aerobic
- In a "nut shell"

- Pyruvic acid is totally dismantled into a pile of carbon, hydrogen, and oxygen atoms
- The carbon and oxygen atoms combine to form CO_2 which is then exhaled
- The H atoms are delivered to stage 3

Stage 3 – Electron transport chain

- Hydrogen dissociates (breaks apart) into a proton H^+ which "hangs out" and an electron e- which gates passed like a hot potato along a series of molecules and as it is passed it releases some energy which is used to create ATP molecules
- The e- rejoins the H^+
- Then the H combines with oxygen to form water



Day 38

Why do I really need oxygen?

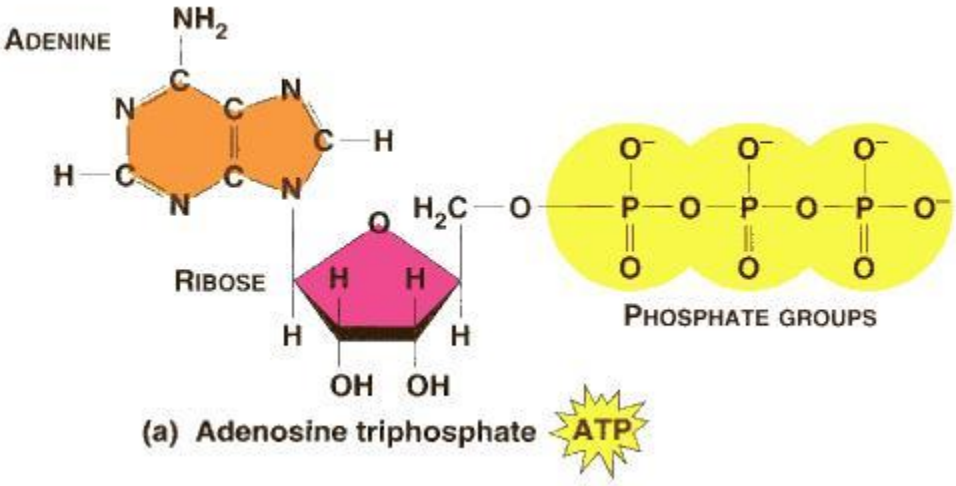
The reason that oxygen is so vital is that it keeps the bottom of the electron transport chain clear of H atoms. If hydrogen is not cleared away, stage three stops = **no more ATP!!!!!**

- ATP from glycolysis will last only about one minute before it is used up and cannot keep up with the body's needs

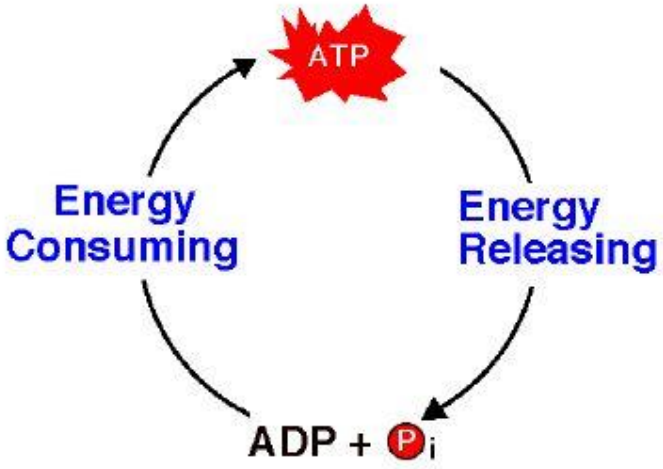
- This is the reason that you die without oxygen

ATP = adenosine triphosphate

Bonds – the forces that hold atoms together
- This is where chemical energy is stored



The ATP cycle
- ATP is not completely destroyed when it is used, instead it is broken down and then is rebuilt at a later time



A good analogy to the cycle is a savings account
- Make and save money
- Store the money in a bank
- Make withdrawals as you need the money

***Homework* = complete these help / review questions**
- **Where does the glucose come from that is in your body?**

- **Where does the oxygen come from that you use?**
- **What is the role of the oxygen atom?**
- **What are the differences between how a car burns gasoline and how your body burns glucose?**

Day 39
Review Photosynthesis and Respiration

Day 40
Photosynthesis and Respiration EXAM

Day 41
Review photosynthesis and respiration exam
Begin to review for the 10 week exam

Days 42 + 43
Review for the 10 week exam

Day 44
10 week exam

Day 45
Review the 10 week exam
***Homework*= Read pages 274 – 285 & 323 – 329, & 426,427**
Do review questions 1 pg 278, & 1 pg 284, 3 pg 329, &
and:
Explain the significance of sex chromosomes.
What causes genetic variation in offspring? (3 major events or processes)

Key Terms: cell division, asexual reproduction, sexual reproduction, chromosome, chromatin, cell cycle, interphase, mitosis, cytokinesis, prophase, centromere, chromatid, centriole, metaphase, anaphase, telophase, homologous, diploid, haploid, meiosis, crossing-over, zygote, allele, gene, cloning

Day 46
How do cells reproduce? Why can't cells get too big (review)?

There are two types of reproduction
- Sexual – 2 parents – DNA fro both parents
- Asexual – 1 parent – DNA is identical to the parent

Examples of asexual reproduction
- Ameba divides into 2 amebas
- Mold spores reproduce mold
- Runners of a strawberry plant producing another

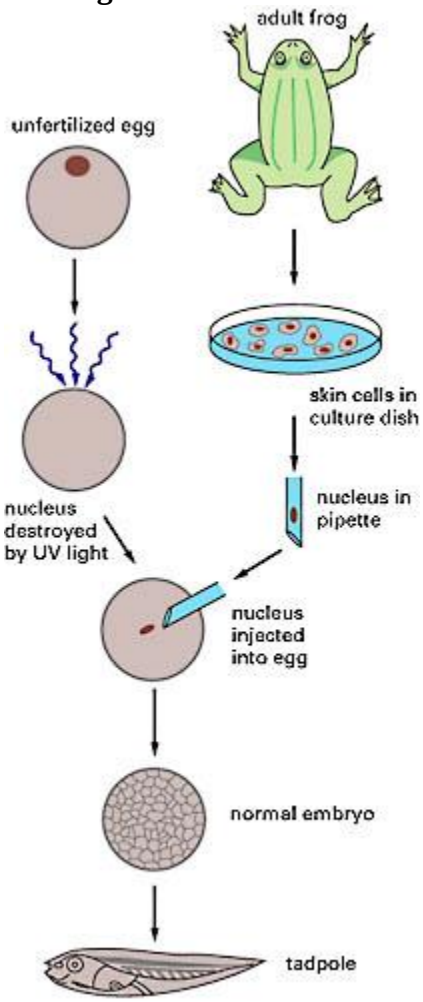
Sexual reproduction – ½ + ½ of the DNA from each parent
- Sex cells = gametes = haploid cells = sperm = egg

- When the egg and sperm fuse = fertilization
- Spermatogenesis = production of sperm
- Oogenesis = production of egg

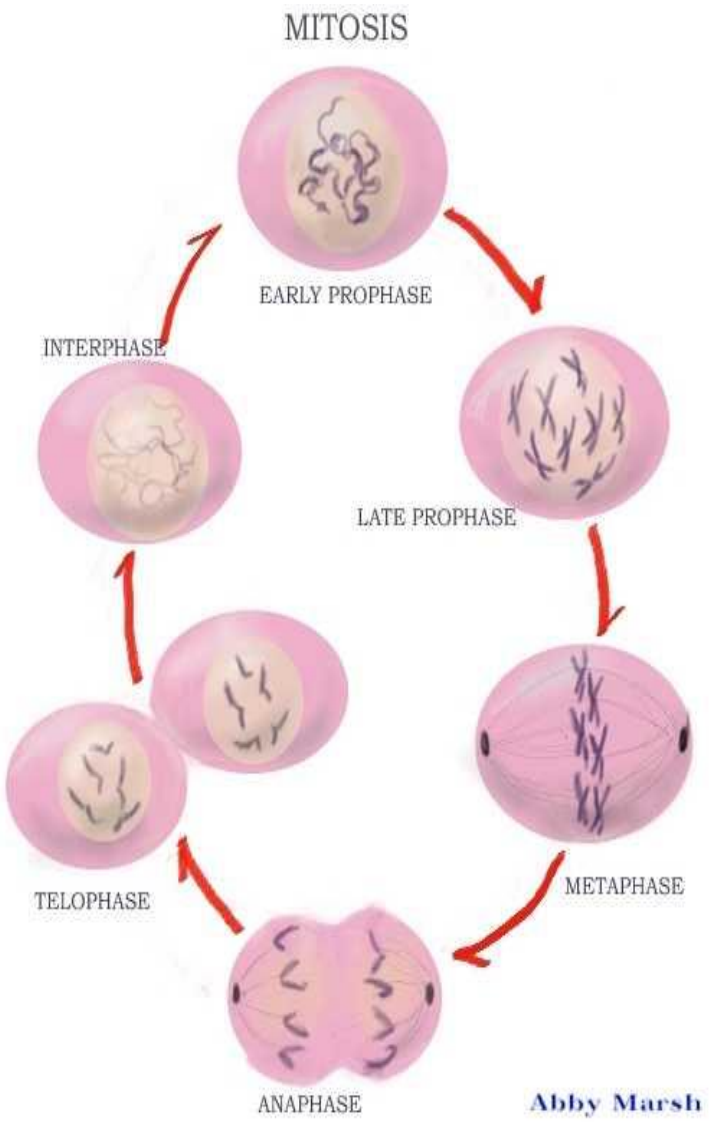
Cloning – technique that makes identical genetic copies

- Usually done in plants that poses a favorable trait
    - Grafting
    - Hormones are used to promote root growth
    - McIntosh apples
- Now it can also be done in animals
    - First the nucleus of an egg cell is either removed or destroyed
    - Second the nucleus of the animal to be cloned is removed and stored
    - Third, implant the nucleus from the animal (a full set of chromosomes) into the empty egg cell
    - Fourth, stimulate the cell and it will begin to divide into the organism from where the complete set of DNA came

Cloning



Day 47
What is mitosis?



Interphase is a period of growth and replication

Prophase – 2 centrioles form and move toward the poles

- The nucleus disappears
- Chromatin coils into chromosomes

Metaphase

- Chromosomes line up at the equator

Anaphase

- Fibers pull the chromatids toward the centrioles at the poles
- Chromosomes are pulled into chromatids

Telophase

- Chromatids are at the opposite poles
- Chromatids unwind into chromatin
    - A threadlike structure of DNA

Cytokinesis

- The two cells split apart into 2 daughter cells

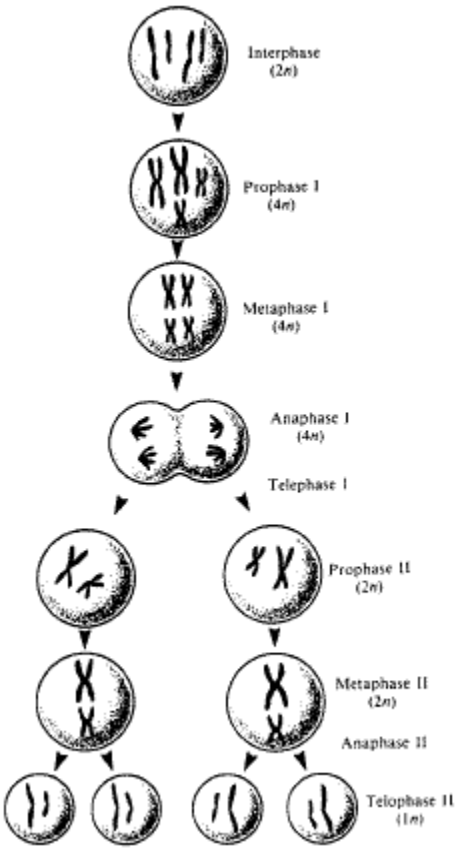
Day 48

What is Meiosis?

Meiosis is a form of cell division that has two stages that end with the production of 4 cells that contain ½ of the genetic material found in normal body cells. This type of cell division can lead to sexual reproduction.

The four cells produced are called sperm, egg, haploid, gametes, or sex cells.

MEIOSIS



Notice how one cell can create 4 sex cells

- In males all four are viable (able to survive)
- In females on is larger than the other three and the three smaller cells die

Meiosis provides a source of variation because it allows ½ of the genetic material to come from each parent.

Stages of meiosis

Prophase 1 – each chromosome duplicates and remains closely associated

- Called sister chromatids

Metaphase 1 – homologous chromosomes align at the equator

- Crossing over can occur at this stage

Anaphase 1 – homologous pairs separate with the sister chromatids remaining together

Telophase 1 – two daughter cells are formed with one chromosome from the homologous pair

The second phase of meiosis – gamete formation

Prophase 2 – DNA has not replicated – no interphase

Metaphase 2 – chromosomes align at the equator

Anaphase 2 – centromeres divide and sister chromatids migrate separately to each pole

Telophase 2 – cell division is complete

- 4 haploid daughter cells are formed

Meiosis differs from mitosis primarily because there are 2 cell divisions in meiosis that are not separated by interphase, resulting in cells with a haploid number of chromosomes

Day 49
Human cloning paper
DUE DAY 56

This is a position paper – your job is to make your argument as strong as possible while presenting and pulling apart the other side

Introduction – ½ to 1 page
- Make your position clear with some explanation

Body of the paper
- ½ to 1 page explain the process of cloning
- 4 – 5 pages cite research and ideas that support your position (name, year)
    - Also, begin to take apart the other position in the same manner as you build your own – statements and citations of past work and arguements
- 2 – 3 pages of taking down the other side
- ½ - 1 page conclusion – summarize your greatest arguments

Literature Cited
- Name, title, year, journal, pages
- Web – name title, web site, year
- AT LEAST 8 different sources

Size 12 font, arial, 1" margins, 1 ½ spaced

Day 50
Inheritance
What did you inherit from your parents?
How did you inherit these traits?

Plants – 2 types of pollination
- Cross-pollination is ---
- Self-pollination is ---

How can 2 green plants produce a yellow plant?

What is a gene?

What is an allele?

The dominant allele will always show itself as a physical, behavioral, or functional trait.

The recessive allele will only show itself in the absence of a dominant allele.

How are genes and alleles related? Explain your answer to a partner.

***Homework* = Read pages 286 – 290, & 338 – 353, & 372 - 376**
Do review questions 2 pg 290, 3 pg 343, 1,2 pg 348, 2 pg 376
Key terms = cancer, tumor, benign, malignant, lymphoma, carcinoma, leukemia, mutagen, carcinogen, germ cell mutation, somatic cell mutation, gamete, oncogene, transformation, bacteriophage, base pairing, plasmid, mutation, point mutation, frameshift mutation, polyploidy

Day 51
Mutations
What is a mutation?

- Any change in the normal DNA sequence

Only mutations that occur in the sex cells (egg and sperm) can be passed onto the next generation.

- Called germ cell mutations

Mutations that occur in the body and that are passed onto the daughter cells during mitosis are somatic cell mutations.

Two classifications of mutations are chromosome and gene.

Chromosome mutations occur during cell division when the DNA is being shuffled and result in structural change to the DNA or deletion of an entire chromosome.

4 major types of mutations occur during cell division

- Translocation – when a piece of DNA breaks away from one chromosome and attaches to a different chromosome
- Deletion – when a piece of, or an entire chromosome is lost or is not replicated
- Inversion – when a piece of DNA breaks away and then reattaches in the opposite direction
- Non-disjunction or non-separation – when a chromosome fails to split apart during cell division, resulting in an extra chromosome in one cell and one less in the other daughter cell

Day 52
Gene mutations
How are gene and chromosome mutations different and similar to one another?

Gene mutations

- Smaller scale than a chromosome mutation
    - It may involve a single nitrogen base or a larger piece of DNA

Point mutation

- When a single nitrogen base is added, substituted, or removed
    - Any of these three changes of a gene results in a different protein structure.
    - WHY?
- Addition or deletion causes the code to be shifted up or down – similar to hitting the space bar or backspace on the computer
    - Called a **frame-shift mutation**

Day 53 + 54

What causes mutations?
Mutagens – any environmental factor that can damage DNA

- Increased amounts of energy or chemicals that interfere with the process of DNA replication can cause mutations
    - Radiation
        - Sunlight – ultra-violet radiation
        - Atomic bombs – gamma radiation
        - Asbestos, radon gas – alpha and beta radiation
            - ALL ENERGY
- Other agents
    - Cigarette smoke
    - Certain viruses
    - Chemicals in food

Carcinogen – anything that causes or is linked to the cause of cancer

- Cancer is related to
    - Inherited genes – some people are more likely to get cancer because of their genetic make-up
    - Frequency of exposure and the intensity of the exposure to cancer causing agents (up the odds)
    - Infection by viruses that inhibit the normal process of DNA replication or cell division

All of these affect the process of cell division, either genetically or functionally

- Oncogene – gene that when affected can cause a cell to become cancerous

Cancer is a cell or group of cells that are out of control in terms of cell division

- Cancer cells do not have natural stops for cell division

Results in tumors – abnormal masses

- Benign – do not spread
- Malignant – break away from the original mass and spread

Three classifications of cancer

- Leukemia – affect white blood cells
- Lymphoma – solid tumors in blood cell producing tissues

- Carcinoma – skin and nervous tissue

Day 55

Gene expression

How does a gene express itself?

A gene is expressed when the gene produces a protein

Sometimes a gene will not function the same when under different environmental conditions

- Plant being white in the absence of sunlight
- Sunlight is needed to stimulate the gene responsible for producing chlorophyll

Gene expression is the result of activated genes.

You would be a real mess is every gene was expressed in every cell.

Genotype – the pair of alleles

Phenotype – the physical, behavioral, or functional trait that results from the genotype

Homozygous

- Recessive – 2 like alleles that are recessive in nature

- Dominant – 2 like alleles that are dominant in nature

Heterozygous – one dominant and one recessive allele

Punnett squares are used to simulate a cross between parental characteristics and predict the probability of the traits being passed onto the offspring.

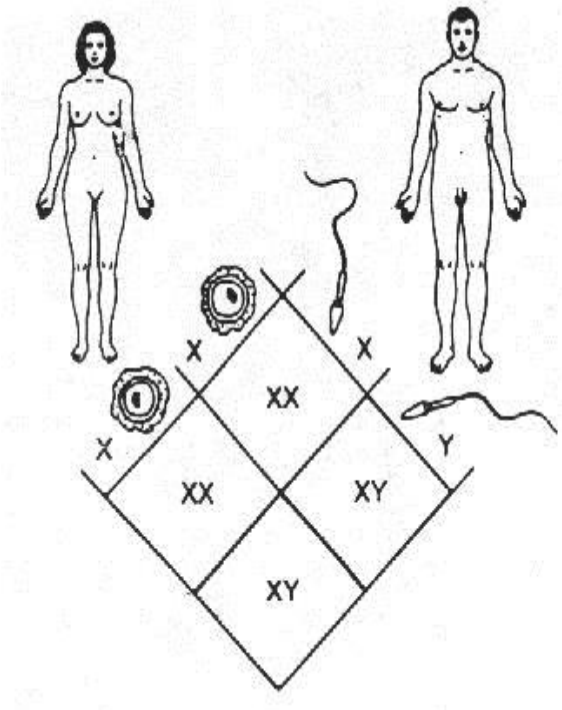


Fig. 1 Punnett square

	B	b
B	BB	Bb
b	Bb	bb

Shared dominance is when both alleles show up as the phenotype

- A pink rose has both a red and white allele = pink

Codominance is when both show up separately as traits – a roan horse has red and white hairs

Some traits are linked to the sex chromosomes

- Balding

Day 56

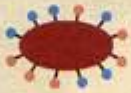
Cloning papers are due
What was your position?
What were some other people's opinions?

With a partner explain why blood type is so complicated?

- Look at page 125 and 656
- Explain

Day 57

Table 12-1 Human Blood Group Characteristics

Genotype	Blood Type and Frequency in U.S.	Red Blood Cells	Plasma Antibodies	Can Receive From:	Can Donate To:
AA Ab	A 40%	 A glycoprotein	anti-B	A O	A AB
BB Bo	B 10%	 B glycoprotein	anti-A	B O	B AB
AB (Universal recipient)	AB 4%	 Both A and B glycoproteins	none	A B AB O	AB
oo (universal donor)	O 46%	 Neither A nor B glycoprotein	Both anti-A and anti-B	O	A B AB O

Positive and negative blood types work in the same fashion.

Positive has a protein named after the rhesus monkey and cannot donate to people with a negative blood type.

History of blood use and beliefs –

Universal donor =

Universal recipient =

Day 58
Review with a partner
- Drill and grill each other
- One uses their notes and questions the other and then switch

Day 59
Review continued
Questions?

Day 60
Exam mitosis, meiosis, cloning, heredity, cancer, mutations
***Homework* = read pages 350 - 353**
Do review questions 1,2 pg 353
Key terms = nucleotide, double helix, mutagen, nitrogen base, DNA, replication, DNA polymerase, telomere

Day 61
DNA – deoxyribose nucleic acid
How does DNA relate to me?

Genetic information = traits found in DNA

Heredity – genetic information is passed from one generation to the next

DNA is organized in the form of genes found in chromosomes
- Found in the nucleus of eukaryotes
- Tightly coiled DNA strands
- Found in a ring called a plasmid in prokaryotes

Human traits are inherited with different #s of genes – 1 - many

Gene VS. Allele revisited
- Gene =
- Allele =

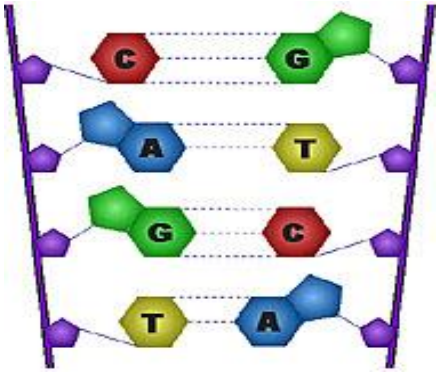
DNA = chemical code
- Twisted ladder called a double helix
- Made of subunits called nucleotides
    - Each nucleotide contains –
        - Deoxyribose – a 5 carbon sugar
        - Phosphate group
        - Nitrogen base

Code comes from the nitrogen bases

- When the order of the bases is different the code if different
    - Adenine – A
    - Thymine – T
    - Cytosine – C
    - Guanine – G

Day 62

What is this?



Adenine and Guanine are purines – they have a double ring of carbon and nitrogen atoms

Thymine and cytosine are pyrimidines – they have a single ring of carbon and nitrogen atoms

Thymine and adenine always pair together

Cytosine and guanine always pair together

The reason why they pair together is that they are complimentary to one another because they form bonds together / fit together chemically

They are held together by hydrogen bonds

- They share a proton
- A + T = 2 H bonds
- C + G = 3 H bonds

A single gene is usually hundreds of bases

The whole human code is ~ 3 billion bases long

Genome project is ---

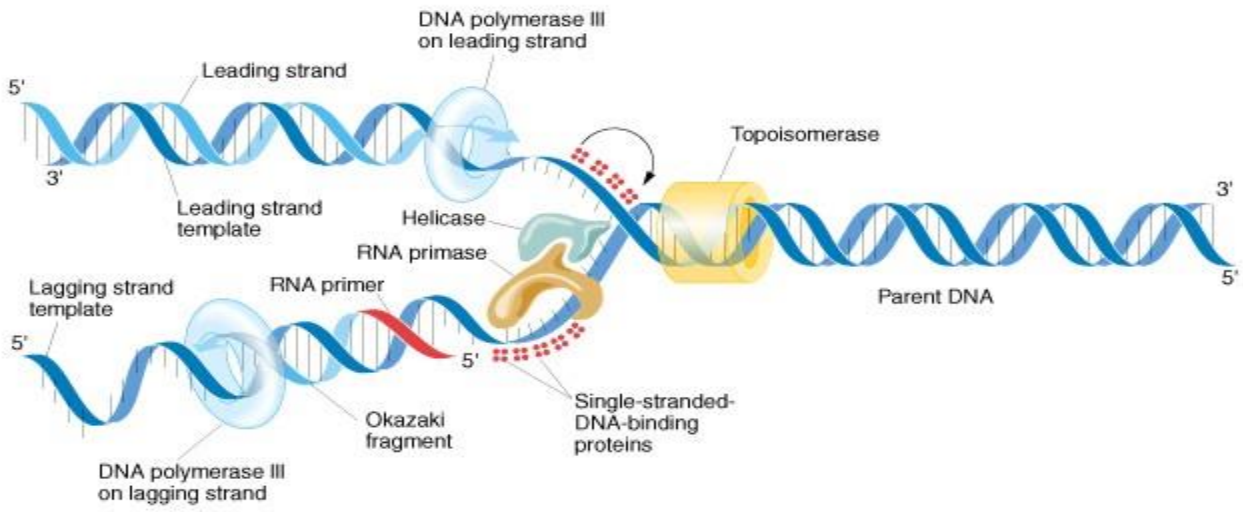
Day 63

Replication = duplication

1. DNA helicase (an enzyme) attaches to a DNA molecule
2. DNA helicase moves along the molecule, unzipping the 2 strands of DNA
    - It breaks the H bonds between the nitrogen bases
3. Unpaired bases react with complimentary bases of nucleotides in the nucleus
4. New H bonds are formed
    - DNA polymerase (an enzyme) catalyzes the process
5. **Two identical molecules are formed**
    - **Each contains one old and one new strand**

Multiple sites are used to cut the time down

- Example – 1 DNA molecule from a fruit fly takes 16 days to be replicated with only 1 enzyme
- The same DNA molecule under normal circumstances with around 6,000 sites takes ~ 3 minutes



Day 64
Do errors occur and what happens to them?

Errors do occur, but they are very rare!
Proofreading enzymes and/or proteins go through the DNA molecule and repair errors made during replication.
In the end, errors occur at the rate of around 1 error / billion nucleotides.

DNA Damage and Repair
Damage to DNA is caused by heat, radiation (sun), and chemicals (cigarettes)

- What does this have to do with cancer?

Body heat itself is able to break the bonds between deoxyribose (sugar) and purines (adenine and guanine).

Repair enzymes replace the damaged nucleotides with undamaged ones – errors rarely go unnoticed.

Carcinogens can elevate the chances of damage to occur and increase the chance that a damaged strand can go without being repaired.

Day 65

How does DNA relate to genes/ inheritance/ and proteins?

DNA contains the entire blueprint of the body and some extra information that is not used.

- Why do we have this extra DNA?

Usable DNA is information that can be expressed in the form of genes.

Only certain genes within the DNA strand are expressed by each cell.

- Expressed genes = proteins

Genes are 100s of base pairs in length and the entire human DNA strand contains over 3 billion base pairs.

We inherit our genes from our parents.

- Therefore we inherits our traits from our parents
- This is how genetic information is passed down from one generation to the next

Day 66

How do you stack up as a class compared to DNA proofreading enzymes?

- Take out a piece of paper
- Write the alphabet as fast as you can backwards and shifting down a letter after each completion x 4 alphabets
- Now while being timed, you are to make as many corrections as you can while reading the alphabets backwards in 10 seconds – cross out the wrong letter and replace it with the correct letter.
- Now switch your alphabets with a neighbor and they will repeat the corrections in a timed 10 second period
- We will figure out how many errors / 100 and then how many there are / 3,000,000,000 letters

What did you think?

How did you compare to your enzymes?

Day 67

Review

Day 68

DNA structure and replication quiz

***Homework* = read pages 361 – 371, 377 - 383**

Do review questions 1 & 2 pg 365, 1,3 pg 371, 3 pg 383

Key terms = RNA, messenger RNA, ribosomal RNA, transfer RNA, transcription, RNA polymerase, promoter, intron, exon, polypeptide, genetic code, codon, translation, anticodon, gene expression, operon, operator, RNA interference, differentiation, homeotic gene, homeobox gene, Hox gene

Day 69

What is RNA?

Like DNA, RNA is a polymer formed by a sequence of nucleotides.

Unlike DNA,

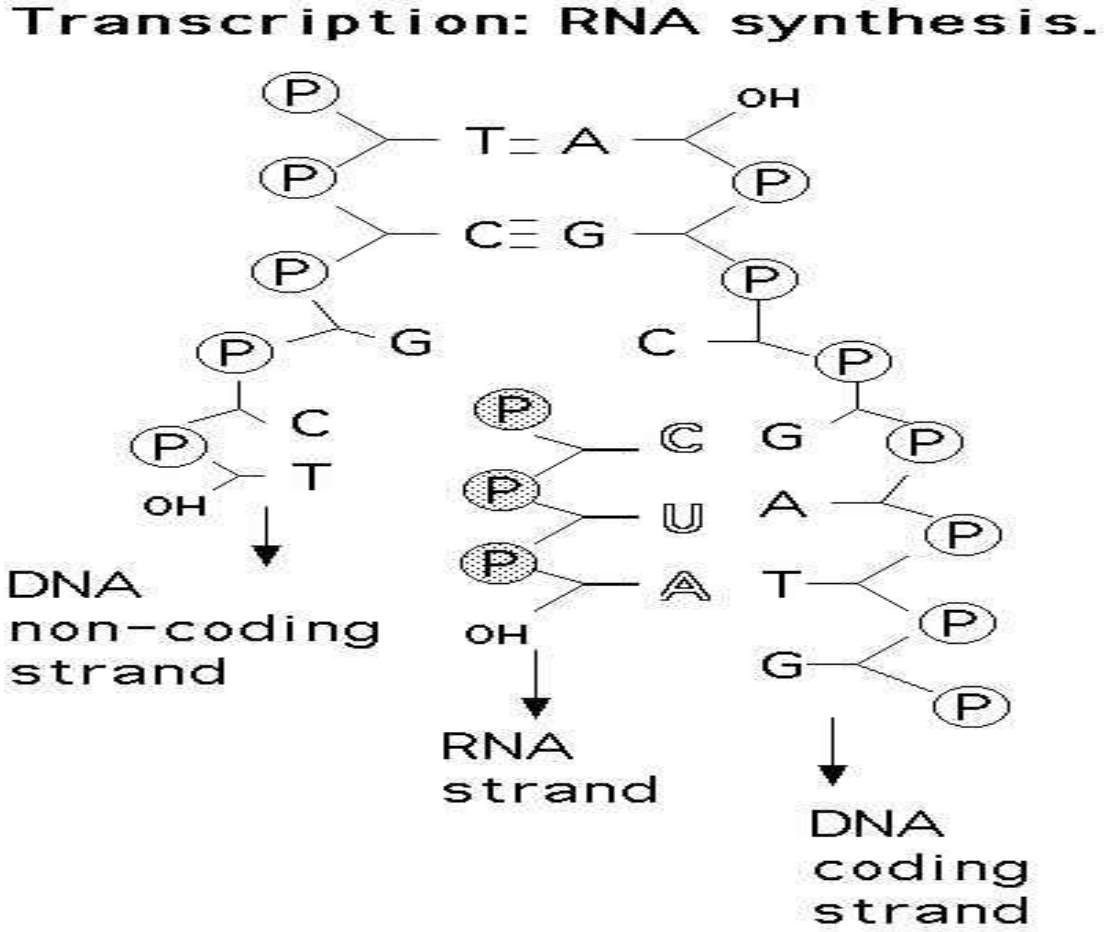
- RNA is a single strand – not a double helix
- The sugar molecule in RNA is ribose instead of deoxyribose
- The base uracil takes the place of thymine

There are three different types of RNA
- Messenger RNA (mRNA)
- Transfer RNA (tRNA)
- Ribosomal RNA (rRNA)

Synthesis of RNA
Transcription – when the cell is between divisions and the DNA is stretched out as individual strands, RNA nucleotides attach themselves and form a RNA chain

Each gene produces a mRNA molecule

Other regions produce transfer RNA



The genetic code – the sequence of bases along each molecule of messenger RNA specifies the sequence of amino acids that will make a specific protein chain.

Each amino acid is represented by a sequence of 3 bases called a codon

Day 70

What are codons and how do they affect us?

Codons – a specific group of 3 sequential bases of mRNA

Each codon codes for a specific amino acid using tRNA

There are 64 possible codons
- Each of the 20 amino acids can have several codons
- The universal start sequence is AUG
- The universal stop sequence is UGA

Anticodon – is a segment of tRNA that is complimentary to mRNA
- Helps to determine the order of amino acids

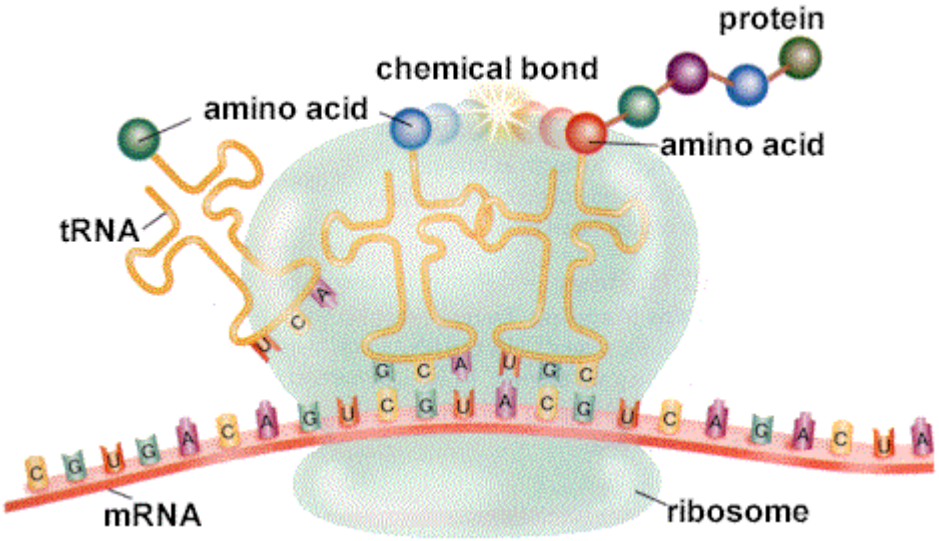
Specific protein structure is a function of the order of bases in mRNA

A specific region of DNA determines the base sequence of mRNA

The DNA therefore directs the production of a polypeptide / protein – a gene

Information from several genes may be required to produce a particular protein.

Day 71
What is this?



Protein synthesis

Messenger RNA moves from the nucleus to the ribosome

The coded message of the mRNA is “read” at the ribosome and is converted to a chain of amino acids in the following way:

- Transfer RNA – each molecule of tRNA has a segment that becomes attached to a particular amino acid in the cytoplasm. The other end of tRNA has an anticodon of 3 bases that matches a codon on mRNA for that particular amino acid
- Translation of mRNA – at the ribosome, the tRNA molecule with its amino acid temporarily bonds to its complimentary codon on the mRNA molecule. The mRNA molecule then moves past the ribosome to the next codon and another tRNA molecule bonds to it. An enzyme then joins the amino acids. A chain of amino acids is formed. Each tRNA molecule is released to repeat its functions as the mRNA molecule moves past the ribosome. Each enzyme is responsible for the production of one enzyme or protein.

Day 72 and 73
Review

Day 74
EXAM – DNA, RNA, cloning, protein synthesis
***Homework* = read pages 391 – 410 & 418 - 439**
Do review questions 2 pg 397, 1,2 pg 401, 1,2 pg 409, 1,2 pg 427, 1,2,3 pg 434, 1,2 pg 439.
Key terms = genome, karyotype, sex chromosomes, autosome, sex-linked gene, pedigree, nondisjunction, restriction enzymes, gel electrophoresis, bioinformatics, genomics, selective breeding, hybridization, inbreeding, biotechnology, polymerase chain reaction, recombinant DNA, plasmid, genetic marker, transgenic, clone, gene therapy, DNA fingerprinting, forensics

Day 75
How does genetic technology relate to you?

Human genome project:
- Map the location and code of every human gene and allele
- Used for medical purposes
    - What you may get in the future / problems to watch for
    - allergies
- How to treat certain diseases
- What else could it be used for?
    - Schools?
    - Professions?
    - Who to hire?
    - Who has kids?
    - Presidents?
- Legal aspects – trying to copyright genes?

Day 76
Medical research has resulted in
- Safer drugs
- Vaccines – weakened or dead strains of a pathogen are injected into a patient so that the body forms antibodies so that it can fight off the full strength version in the future
- Insulin – produced by bacteria that had the human insulin gene spliced into the plasmid and is used to help balance the blood sugar in diabetics
- Organ transplants

Other benefits of genetic technology

- Reduced amounts of fertilizer by
- Reduced amounts of pesticide by
- Reduced amount of cropland needed
- Improved livestock
- Improved crops
- More appealing crops, such as larger strawberries, sweeter strawberries, strazzberries

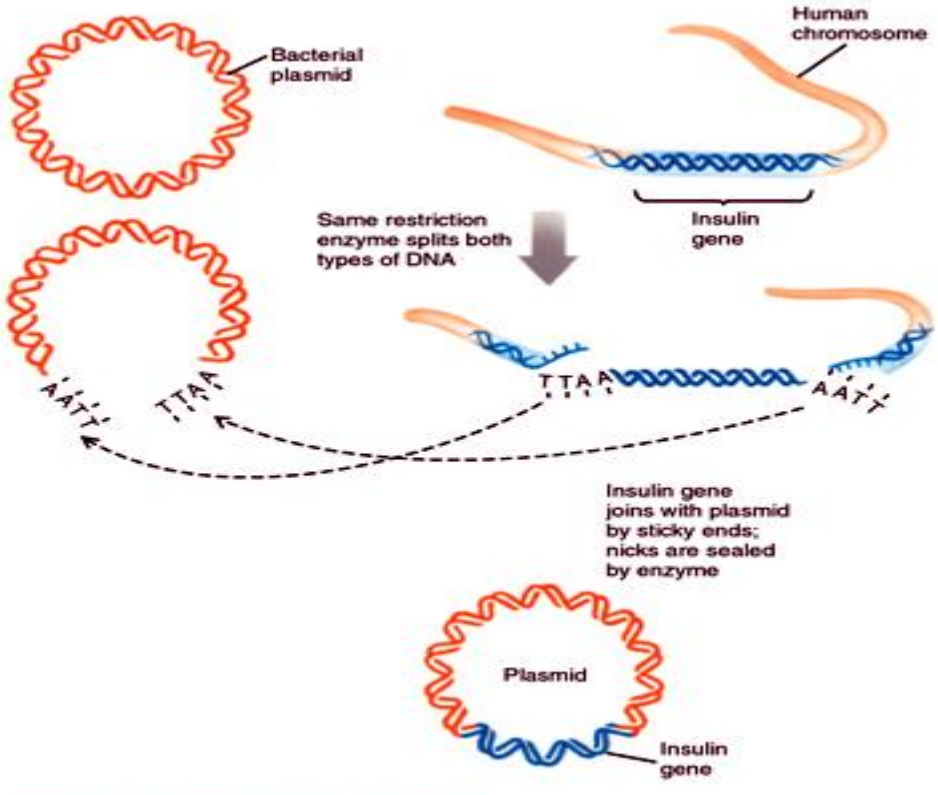
Day 77

Bacteria is a key player

- A prokaryote
- Simple DNA in a ring called a plasmid
- Reproduces through mitosis creating an identical copy

How are bacteria used?

- Restriction enzymes are introduced to the plasmids of bacteria and cut the DNA at very particular sites
- The same enzyme is introduced to the DNA we want and cuts it at a particular point around the desired gene or genes
- The 2 are mixed together and some of the strands switch places with the desired entering the plasmid
- Now that bacteria will reproduce itself and produce the desired protein, chemical, or hormone that is needed



Day 78
Review

Day 79
Quiz – genetic technology

Day 80 – Day 82
Review for the 20 week

Day 83
20 week exam

Day 84 – 88 ish
Regents exam period

Day 89
Review the 20 week exam

What are the theories of evolution?

Look at the concept map.

What is the theory of evolution?
Individually and with a partner trace the evolution of each of the following:

- Computers
- Cars
- Toothbrush

How did each develop to begin with?

What has lead to the separation of jobs and could people replace each other in their jobs?

- Doctors, lawyers, cashiers, journalist, truck driver

How do you think that these relate to the theory of evolution?

***Homework* = read pages 553 -558, 450 – 473 & 538 - 552**
Do review questions 3 pg 558, 2 pg 458, 1,2 pg 464, 3 pg 473, 1,pg 545, .
Key terms = endosymbiotic theory, evolution, fossil, artificial selection, adaptation, fitness, natural selection, biogeography, homologous structure, analogous structure, vestigial structure, extinct, half-life, geologic time scale, gradualism, punctuated equilibrium, adaptive radiation, convergent evolution, coevolution

Day 90
Where did life start?

Origin of life

Formation of the Earth – the big bang theory or other that led to:

- Gases condensing
- Planets forming
- Water vapor was in the atmosphere
- Temperatures cool
- Water vapor condenses and rain falls
- Oceans formed

Life on Earth
Telling the story of life through fossils
How do fossils form?

- Organism dies
- It is buried
- Organic material is dissolved and lost
- Space fills in with mineral deposits

How did life develop?
4 major developments

- Simple organic compounds important to life must have formed (amino acids)
- Formation of complex organic compounds (proteins)
- Concentration of the compounds
- Development of links between chemical reactions of growth, metabolism, and reproduction

Can no longer occur because we have oxygen

Day 91
What was the first life form?

Prokaryotes are thought to have appeared first.
The first ones are thought:

- To have gotten their food from their surroundings
- Used the food through glycolysis or a similar process
- Were heterotrophs
- Through competition for food autotrophs developed
- Chemosynthesis, rather than photosynthesis occurred first
- Then photosynthesis
- Then photosynthetic organisms that produced oxygen as a waste product
- Oxygen destroyed many enzymes – but gave rise to aerobic respiration
- Aerobic respiration resulted from reactions used to trap free oxygen

The theory of eukaryotes – like prokaryotes – no one knows but there are some educated guesses

Endosymbiosis – mitochondria and chloroplasts are thought to have entered eukaryotes for protection and happened to perform a function within them

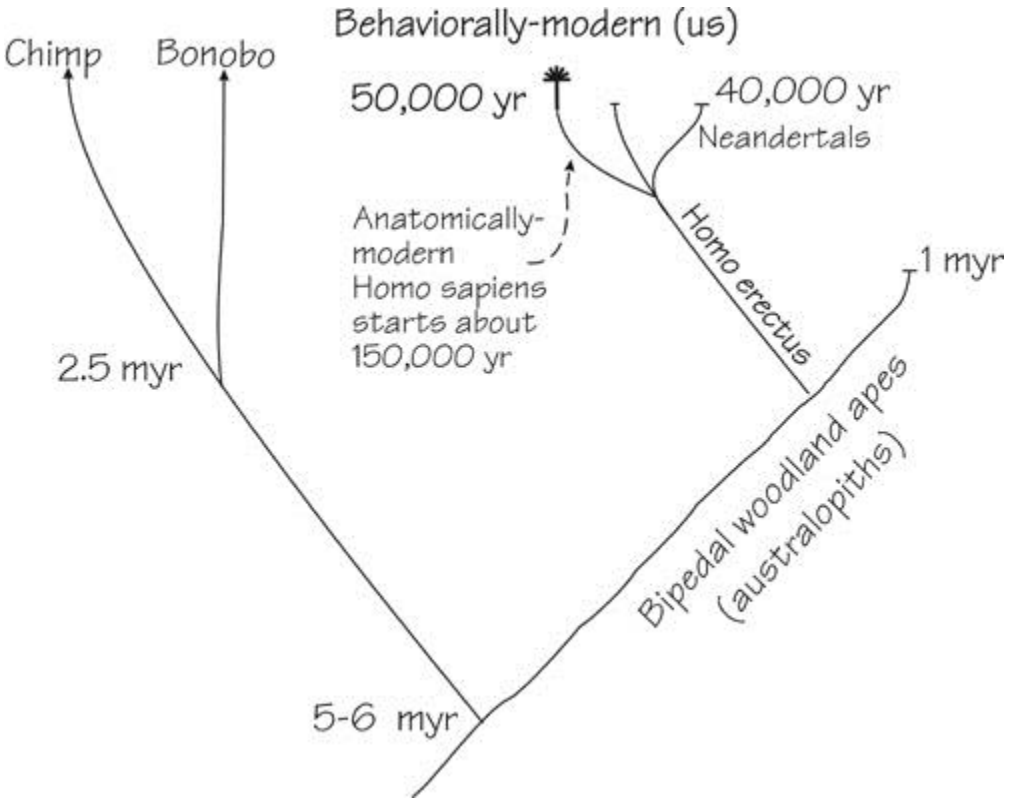
Day 92
Fossil Record

What do evolutionary changes look like?

Fossil record – a collection of fossils that provide clues to the history of the Earth's organisms

- It spans much of geologic time – the billions of years of Earth's history
- It reveals many changes that has occurred in the environment and to species

Evolutionary changes
Phylogenic tree shows common ancestry and what species are still present today



At the bottom of the tree is a common ancestor to all of the rest
As you progress up the tree, different species develop and different species from them develop
At the tips of the tree is a bud that represents the most recent species
The branches that are still growing represent species that are still present
Those that have stopped growing have gone extinct

The Theory of Evolution

- Theory –
- Evolution –

What supports the theory of evolution?

- Fossil record –
- Common ancestry –
- Homologous structures
- Vestigial structures –

Day 93
How are fossils dated?

How can scientists determine that a fossil is a certain age or older than another?

- Position in the sediment – the lower one is older
- Carbon dating using isotopes C14 is unstable C12 is stable
    - By comparing the ratio of C12 to C14 a rough age can be determined

Spontaneous generation
- The idea that living things come from nonliving material
- It resulted from people observing otherwise unexplainable phenomena

Redi – fly and meat experiment – flies were thought to come from dead meat

Spallanzani – bacteria and broth experiment – microorganisms were thought to come from the air

Pasteur – cleared up Spallanzani's experiment and in doing so caused the theory of spontaneous generation to disappear

The theory of Biogenesis replaced it

Biogenesis – the theory that all living organisms must come from other living organisms

Day 94
Review for quiz

Day 95
Quiz

Day 96
Begin Evolution
How does evolution relate to life?

Failure to adapt = death
Extinction – when an entire species fails to survive a change in their environment
- The species no longer exists anywhere on the planet

Extirpation – when a species fails to survive a change in their environment within a geographical location

Importance of change
- If all of the members of a species were exactly alike and an environmental change took place it could be disastrous
- By having genetic variation there is a greater chance that at least some of the members of the species would survive an environmental change
- Endangered species may not have enough genetic variation required to survive even a slight change in their environment

Patterns of change

- Change is related to the change in the environment
    - Minimal environmental change results in stable populations
    - Rapid environmental changes result in rapid changes in the species
- Species with high rates of reproduction and short reproductive cycles evolve quicker
- Failure to adapt = death

Rate of Evolution

- Stable environment = stable species – horseshoe crab
- A changing environment = a changing species – horse
    - Bacteria and antibiotics
    - Insects and pesticides

Day 97

What does genetic variation cause?

Most changes can be categorized as structural, functional, or behavioral

Structural change

- Homologous and vestigial structures
- Thick white fur on the pads of polar bear paws

Functional change

- Electric eels – electric current in the muscles to move changes and can be used in defense and to hunt prey

Behavioral change

- Digging 2 nests by sea turtles rather than 1
- Fighting walruses over females
- Blinking rate of fireflies for species recognition
    - Blinking rate of predacious fireflies to match those around them so that they can catch and eat them

Genetic variation

- Combination of traits that each inherit from its parents
- Organisms within a species are never exactly alike
    - Squirrels may have longer tails, claws, ears, fur, nose, legs, than another animal
    - These traits may provide an adaptive value and help the individual to survive and if so will be passed on more frequently than those lacking it

Day 98

What is adaptive value?

Any trait that helps an organism to survive and reproduce under a given set of environmental conditions

- Rabbits' fur or moth color may allow them to blend in with the surroundings allowing them to escape capture from a predator. Those that do not possess these beneficial traits have a greater chance of being removed from the population.

In a "nutshell"

- A beneficial trait will help individuals to survive and over time will become more and more frequent in the population
- Eventually, nearly all of the individuals in the population will have the beneficial trait
- Therefore, a changing environment is often the driving force for evolutionary change

Patterns of evolution

- Divergent evolution – 2 related species becoming more and more dissimilar
- Convergent evolution – unrelated species becoming more and more alike in appearance as they adapt to similar environments
- Co-evolution – change of 2 or more species in close interaction – hummingbirds and the flowers that they pollinate

Day 99

Where does variation come from?

Physical variation is caused by genetic variation.

Mutation – a change in the base sequence of a DNA molecule

- It could be a random chance event
- In organisms that reproduce sexually, only a mutation in the sperm or egg cells can be passed onto the next generation – and the basis for evolutionary change
- Nearly all mutations are harmful and negatively impact the survival of the individual
- Beneficial mutations may increase the fitness of the individual and may lead to the evolution of a new species

Genetic shuffling – sexual reproduction shuffles the DNA of both parents and then recombines it randomly in a new offspring – creating variety

- The best new combinations out compete or outlast the lesser individuals
- Over time only the best are able to reproduce and recombine their DNA to make the next generation
- This is a major source of variation for all sexually reproducing species.

Day 100

What leads to one individual out competing another and their not being more individuals of each species over time?

Overproduction – the ability of a species to produce more offspring than can possibly survive

- Example is salmon – each female can lay thousands of eggs – not all will survive – by the next salmon run there will be approximately the same number of salmon spawning again
- As the young grow to adulthood they are selected against by the environmental conditions around them, competition with one another, and by chance
    - One rabbit may be born in a lush green field and another in front of a cultivator (this is chance)
    - Temperature, disease, parasites, predators are environmental
    - Limited water, food, shelter, mates promote competition – determines the level of fitness

Individuals do not evolve – the individual may or may not survive to pass on what it was given at fertilization

Conditions vital for evolution

- The potential for a species to increase its numbers – overproduction
- Limited supply of resources needed for life – competition
- Genetic variation of offspring due to mutation and genetic shuffling
- The selection by the environment of those offspring better able to survive and reproduce – natural selection

Day 101

Who is Darwin and what did he do?

Darwin was an individual who spent a good part of his life observing organisms and trying to determine why they were the way that they were. He paid special attention to the bills of finches.

Darwin came up with the theory of Natural Selection

- A process that occurs in nature where individuals are "selected" to pass on their genes to the next generation
- Unsuccessful individuals will die in nature without passing on their genes
- Successful individuals will tend to live longer, breed more, and pass on their genes to the next generation
    - Fitness is the ability to pass on genetic material to the next generation
    - The higher the fitness level the more likely the traits of the individual will show up in the next generation and survive in the population
- Favorable characteristics will become more and more common with each generation
- Unfavorable characteristics will become less and less common with each generation

Where does this occur in our society?

Are humans being naturally selected or are we becoming a weaker species?

Day 102 – 103

What evidence is there for common ancestry?

Homologous structures – common anatomical structure or embryologically similar structures

- Bat wings, whale flippers, bird wing, human arm and hand, alligator foot

Vestigial organs – functionless parts of an organism

- Tail bone in humans, leg bone in snakes, eyes of blind fish, pelvis bones in whales
- Usually vestigial structures are homologous to a functional structure in what is thought to be a related species
    - Tail bone in humans to those of primates
    - Eyes of blind fish to those of seeing fish

Embryological development – embryos of different species develop almost identically

- This is especially true in the early stages of development
- The similar development suggests genetic similarities

Common proteins = common DNA

- Blood proteins are shared by multiple species
- Muscle proteins are also shared by more than one species

Evidence of evolution

- Homologous structures
- Vestigial structures
- Embryonic development
- Common proteins / DNA
- Fossil record

Analogous structures – structures that are similar in function, but do not share physiological traits

- Bird wings have bone – moth wings do not have bone

Lamark VS. Darwin

- Lamark came before Darwin, but was missing some pieces and more importantly he was missing required evidence
- Larmark said that traits developed by living organisms were passed down to the offspring
- Darwin put the pieces together and said that it was inherited traits – not acquired traits that were passed on

Homework = Evidence of Evolution Worksheet

Day 104
Review for the exam

Day 105
Evolution Exam

Day 106
Correct the exam and answer any questions

***Homework* = read pages 482 – 497 & 510 - 514**
Do review questions 1,2 pg 486, 1,3 pg 492,
Key terms = gene pool, allele frequency, single gene trait, polygenetic trait, directional selection, stabilizing selection, disruptive selection, genetic drift, bottleneck effect, founder effect, genetic equilibrium, Hardy-Weinberg principle, sexual selection, species, speciation, reproductive isolation, behavioral isolation, geographic isolation, temporal isolation, binomial nomenclature, genus, systematics, taxon, family, order class, phylum, kingdom

Day 107
What is a species?

Speciation – process that causes a new species to develop

Species – a group of individuals that look similar **and** are capable of producing fertile offspring

Morphology – similarities and differences in internal and external structures
- Allows scientists to communicate characteristics, behavior, and relationships of organisms

Morphological Species Concept
- Species is classified by appearance

Biological species concept – can they breed and produce fertile offspring

Presently both are used to define a species.

How do species evolve?
Two ideas of how species get from point A to point B in terms of evolution.

Punctuated equilibrium
- All populations of a species may exist for a long period of time and then undergo a rapid genetic change that leads to speciation
- Arguments that support this include the lack of connections in the fossil records – instead fast changes there are fast changes or missing links that should be there if the change was gradual

Gradualism
- Populations change a little bit at a time over a long period of time

Day 108 + 109
What makes a population?

Population – all of the members of the same species that ***live in the same area at the same time***
- Example – all of the largemouth bass that live in the same pond at a particular point in time

- Why is it important to have boundaries and a set time when defining the population?

What gives an individual its appearance?
- DNA – genes
- Genotype

What is the appearance or trait resulting from the genotype called?
- = phenotype

All of the genes in a population make up the gene pool

Alleles are the types of a specific gene

Hardy-Weinberg Principle - a population will remain at genetic equilibrium only if the following conditions are met
- No mutations occur
- No migration out or immigration into the population occurs
- Population must be large
- Individuals mate randomly
- Natural selection does not occur

If these conditions are not met, evolution will occur

Genetic drift is when the allele frequencies or the trait resulting from genes shift in a population as a result of random events or chance – deer with spots are all crushed under a mudslide

Isolated populations lead to new species
2 types of isolation – geographical and reproductive

Geographical occurs when there is a physical barrier separating populations
- River, mountain range

Reproductive isolation occurs when members of the same species cease to reproduce together
- Wood frog and leopard frog are capable of producing fertile offspring, but breed at different times that do not overlap

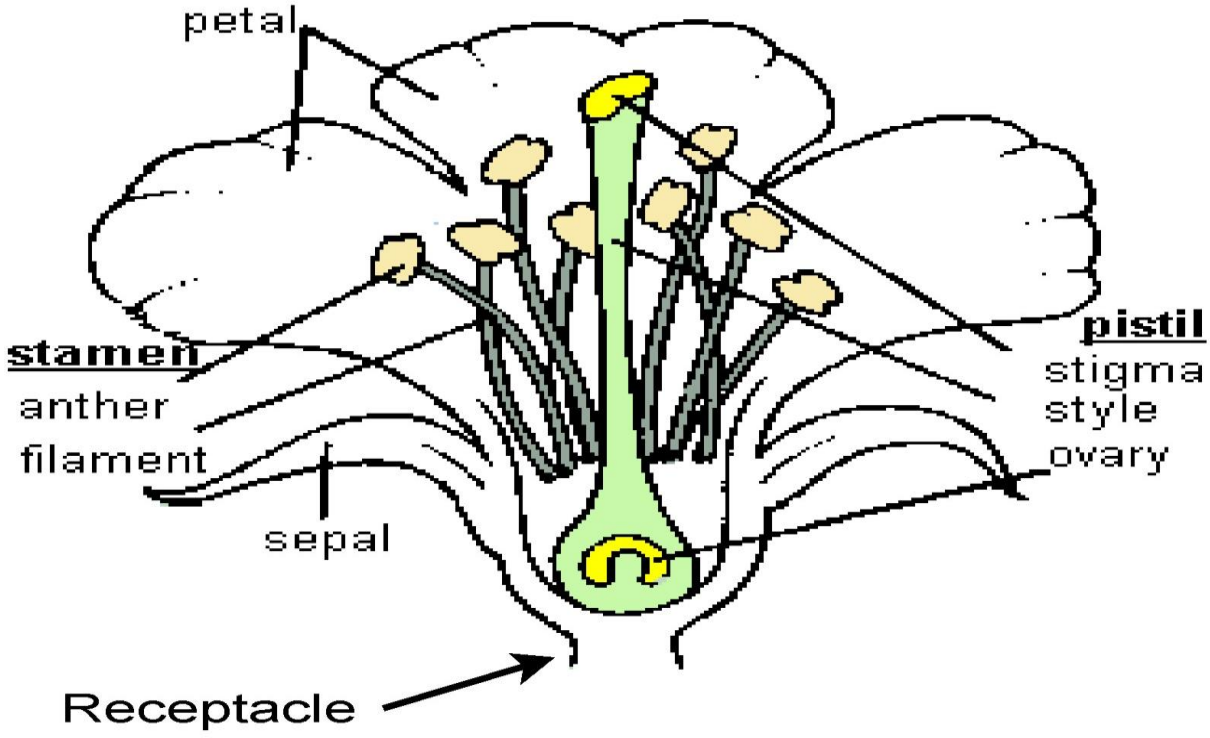
Classification – King Phillip Came Over For Good Soup
What does classification show us and why is it important?

Day 110
Review

Day 111
Speciation Quiz
***Homework* = Read pages – 634 – 638, 646 – 654, 680 – 684, 696 - 707**

Do review questions 1,2 pg 638, 1 pg 649, 1,2 pg 684, 1,2 pg 707 and:
Be able to label a diagram of a flower and explain the function of each.
Describe some of the requirements for some seeds to germinate.
What is required for all seeds to germinate?
Key terms: sporophyte, gametophyte, seed, gymnosperm, angiosperm, pollen grain, pollination, seed coat, ovule, pollen tube, ovary, fruit, cotyledon, monocot, dicot, woody plant, herbaceous plant, stoma, guard cell, cuticle, xylem, phloem, palisade layer, spongy layer, sepal, petal, stamen, pistil, stigma, anther, filament, style, double fertilization, grafting, germination, dormancy

Day 112
How do plants and animals reproduce?



What is the role of each part?

What is the route of fertilization?
Pollen is produced in the _____. Pollen is transported by _____, _____, _____, to the _____, which is part of the pistil. The pollen stays here and does not get knocked or blown off because the surface is _____. Now a pollen tube grows from the tube cell down the _____ and the haploid generative cell undergoes mitosis to form 2 haploid _____ cells. When the pollen lands on top of the pistil it is called _____. Only when the sperm and egg make a zygote does _____ take place.

How are sperm produced?

How are eggs produced?

Self-pollination is –

Cross-pollination is –

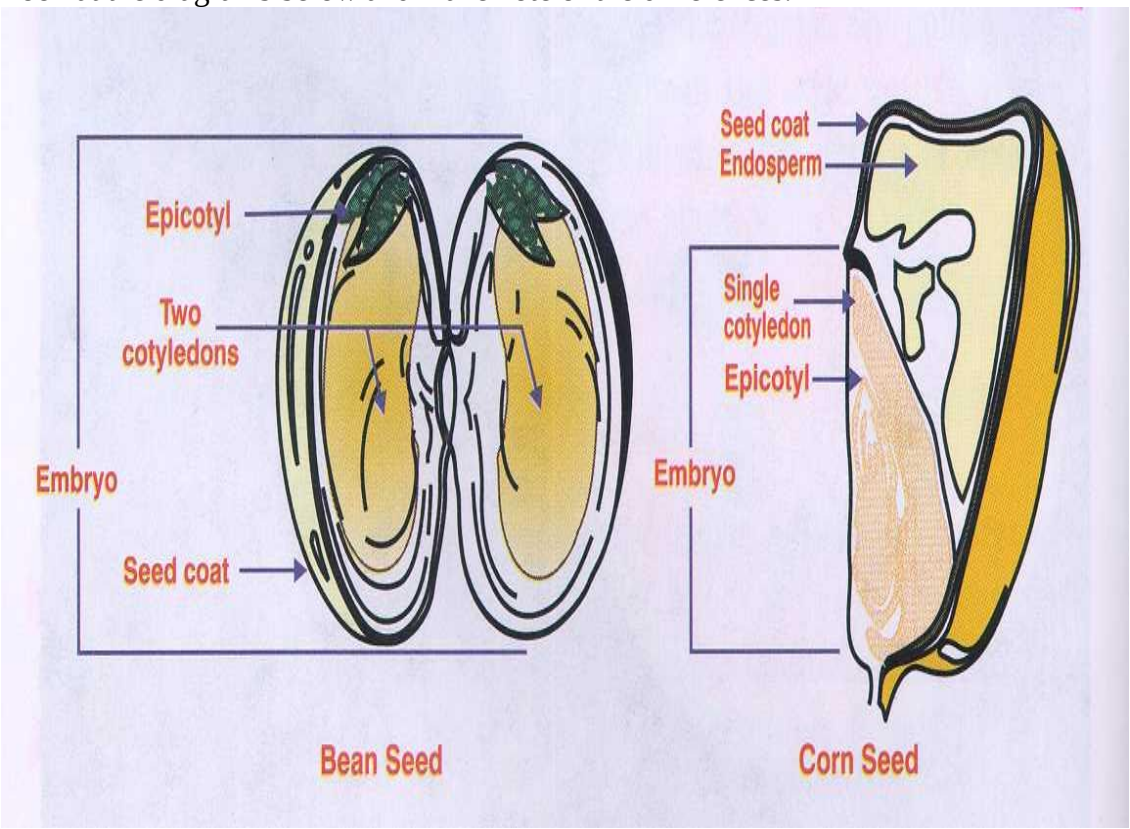
Which type of pollination is better?

How can you tell what the likely method of pollination is – wind or animal / insect – by looking at the flower part arrangement?

Day 113
Fertilization and Germination
How does fertilization lead to germination?

Sperm fertilizes the egg → zygote is formed → ovule forms a seed around an embryonic plant → germination occurs

What are the differences between a monocot and a dicot seed?
Look at the diagrams below and make note of the differences.



Seeds are dispersed by wind, animals, birds, fur, and water.
How do plants appear under power lines?
Some seeds require certain conditions for germination to occur. Until these conditions are met the seed may remain in a state of dormancy. Some require certain amounts of moisture, warmth, fire, or an intestinal trip.

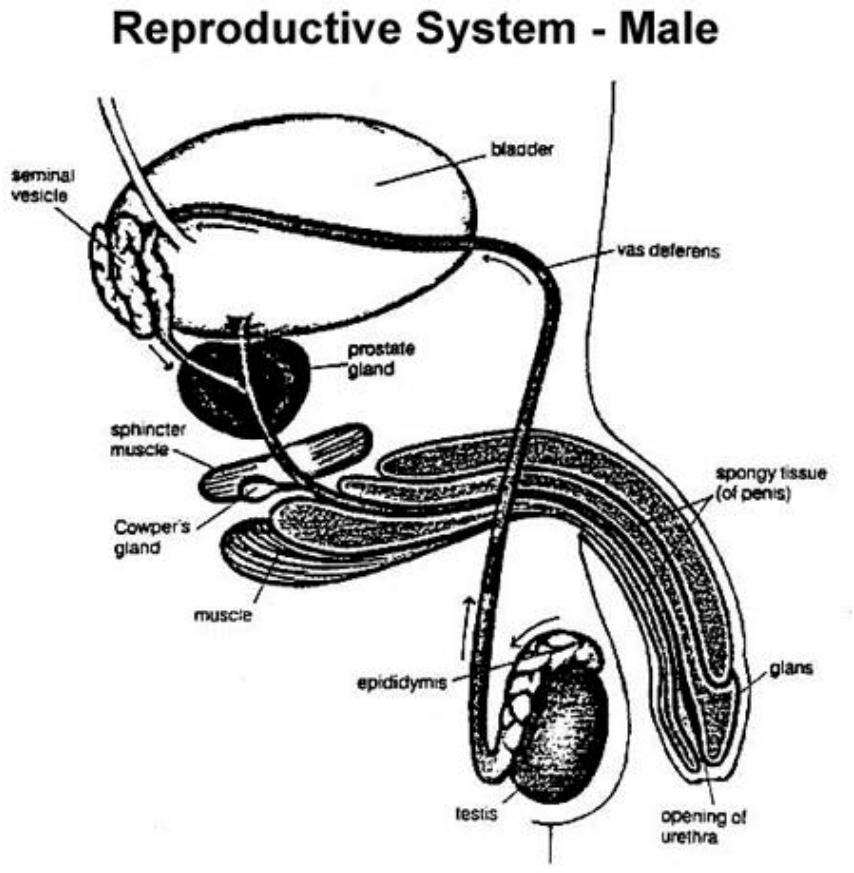
All germinating seeds require at least some level of moisture, temperature, and warmth. Germinating seeds do not require soil or sunlight or carbon dioxide. Only after germination has occurred do plants need these things.
WHY?

***Homework* = Read pages 988 - 1001 & 292 - 297**
Review Questions 2 pg 1001, 2,3 pg 297
Key terms = puberty, testis, scrotum, seminiferous tubule, epididymis, vas deferens, semen, ovary, menstrual cycle, ovulation, corpus luteum, menstruation, sexually transmitted disease, zygote, blastocyst, implantation, gastrulation, neurulation, placenta, fetus, embryo, differentiation, stem cell, abortion, miscarriage

Day 114
Male reproductive anatomy
What are the male reproductive parts and what is the role of each?

Males produce, store, and release sperm (the male gamete)

- Begins at puberty and continues for all or most of a male's life

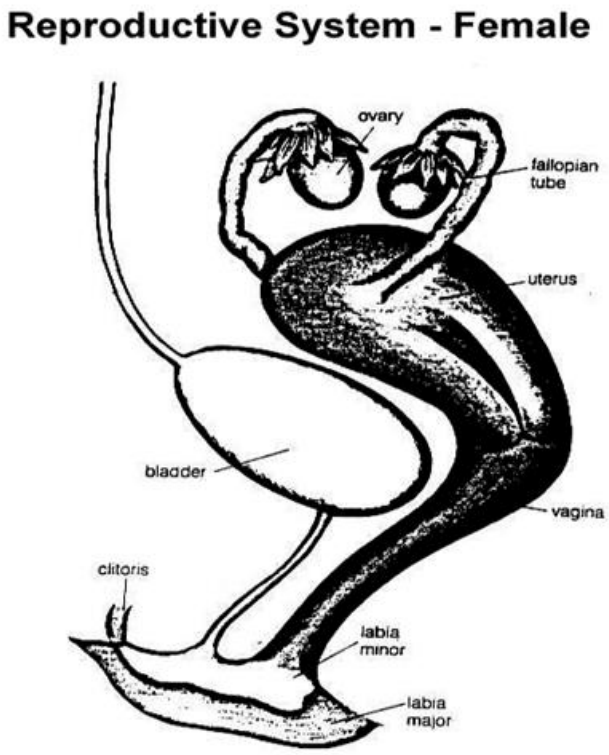


What are the roles of each of the male reproductive organs? Use the movie to help you answer this question.
Why do males have a scrotum?
Why should males trying to have a child wear boxer shorts rather than tighty-whities?
How does this relate to enzymes / proteins and denaturing?

Day 115
Female reproduction
What are the roles of the female reproductive structures?

Females are responsible for producing gametes (eggs), support internal fertilization and development, exchange materials through the placenta, and provide milk to the offspring.

- This begins at puberty and continues until menopause



Fertilization occurs in the oviduct / fallopian tube and then the fertilized egg moves down to the uterus

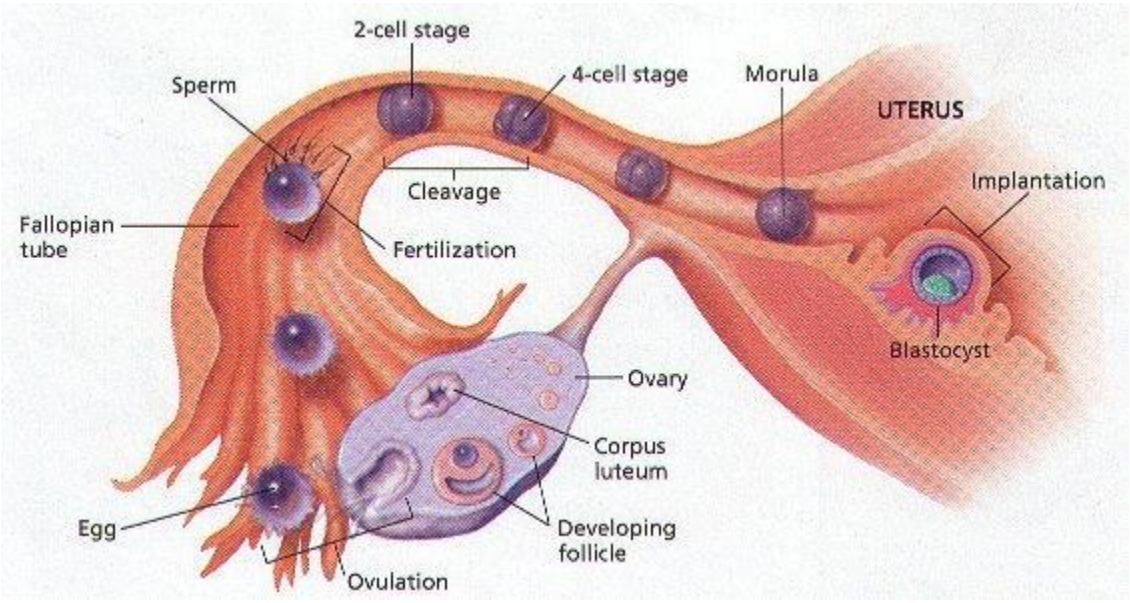
What are the roles of each of the female structures? Use the movie to help answer this question.

Day 116 and 117
Movie of male and female parts and function

Review the parts and function.

Day 118
Quiz on male and female anatomy and function

Day 119
What is the pathway and result of fertilization?



Hormones play an important role from beginning to end.

Females – progesterone, estrogen, FSH (follicle stimulating hormone), LH (lutenizing hormone)

Progesterone – produced in the ovaries – associated with sexual development and the reproductive process

- Produces a thicker lining along the uterus to nourish and protect the egg
- Maintain the lining throughout the pregnancy
- If the egg is not fertilized the levels drop and the lining breaks down – menstruation

Estrogen – produced in the ovaries – associated with sexual development and the reproductive process

- Produces a thicker lining along the uterus to nourish and protect the egg
- If the egg is not fertilized the levels drop and the lining breaks down – menstruation

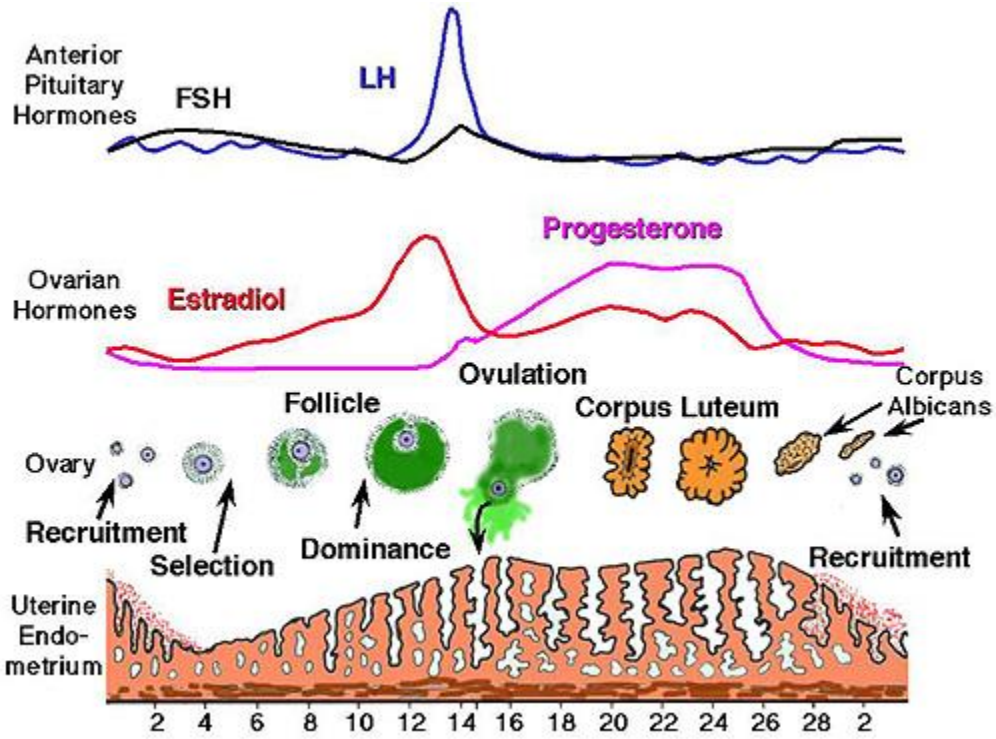
FSH – produced in the pituitary

- Stimulates the production of estrogen

LH – produced in the pituitary gland

- Production is stimulated by estrogen
- Causes the maturation of the egg

Day 120
What is the menstrual cycle and why must it occur?



*** The menstrual cycle is not exactly the same for every woman.***

Note how the hormones act / influence one another throughout the cycle.

In males testosterone is the primary hormone (one of several androgens).

Testosterone is produced in the testes and is responsible for the secondary sex characteristics and reproduction.

- Hair, chest broadening, voice deepens, more muscular – these are the secondary sex characteristics

Fertilization and development
Fertilization is the recombining of genetic material when sperm and egg unite.

The new complete cell is known as a zygote, which contains all of the genetic material needed by the offspring for growth, development, and eventual reproduction

Recombination is the combining of genes from the two parents

In greater detail
The egg in the ovary has ovarian cells form around it called the follicle – this is caused by FSH and occurs between days 6 – 12

The egg is released between days 13 – 16 (usually day 14) and matures by LH
During the corpus luteum stage the follicle on the egg changes and the corpus luteum stimulates the production of progesterone.

If the egg is fertilized it attaches to the wall of the uterus and continues producing progesterone.

If the egg is not fertilized the uterine wall breaks down when progesterone and estrogen are no longer produced = menstruation days 1 – 6

Day 121
How do we end up with so many different types of cells and when do they first form?

Differentiation – early on, the cells undergo mitotic division and as they do this they become slightly different from one another physically (the DNA stays the same). Some genes are turned on in one cell but not another and vise versa. These lead to specialized cells → tissues → organs → organ systems → multi-cellular organisms

An embryo is an organism at an early stage of development – all of the genetic material in each cell is the same, ***BUT*** in different cells only certain genes are activated (environmental conditions from within the cell, adjacent cells, or outside the organism influence activation).

- Become different cells

Those genes that are activated and produce proteins are expressed

Steps of development
Fertilization → zygote → blastocyst (a sphere of cells with a large fluid filled cavity)→ embryo (first 8 weeks in a human) → fetus (after vital organs have begun to develop)

Complications in human pregnancies usually arise in the first 2 months due to genetic problems with the embryo or mother, harmful environmental conditions or environmental influences (diet, drugs, alcohol, and disease)

Gestation = time from fertilization until birth

Day 122
What are trimesters and what happens in each?

Pregnancy is broken into 3 periods. Each one of these 3 periods is called a trimester and represents a different period of growth and development.

First trimester is a period of development of organs and tissues, at 5 weeks the baby looks a lot like the young of other organisms, but after that it quickly begins to look like a human.

Second trimester is a period of growth and development of the skeleton – it begins to move and have periods of sleep.

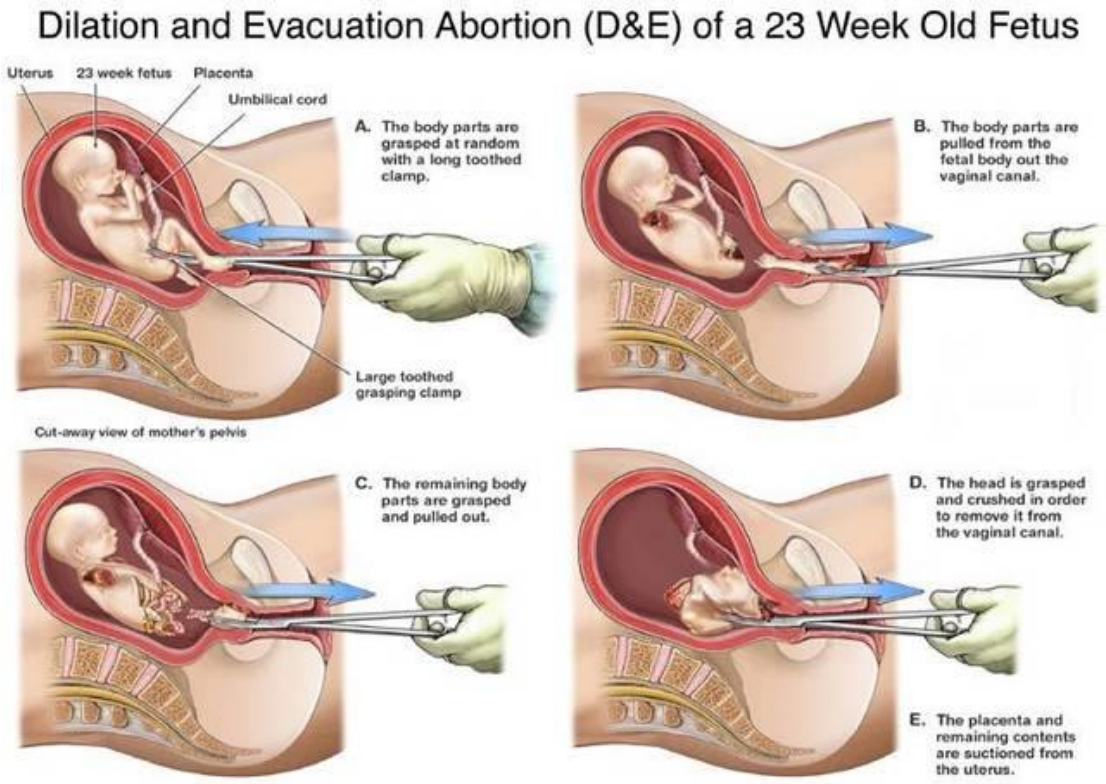
Third trimester is a period of growth and refinement for entry into the outside world – some believe that learning can take place during the third trimester.

- Political hot-topic – this is the time that late term or partial birth abortions occur

Birth occurs 270 – 280 days after the fertilization of the egg. It is induced by hormones being released by the fetus and the mother. Doctors can induce birth by using these hormones.

The hormones cause the muscles to contract, breaking the amniotic sac and causing the fluid to flow out of the vagina (water breaking). The cervix relaxes and expands / dilates and the baby is pushed through the vagina and out of the body.

The diagram below shows the female reproductive parts and one method used to abort a fetus.



Day 123 & 124

Finish the movie and –

What is reproductive technology and how is it used?

- Cloning insect resistant plants by the millions
- Artificial insemination allows thousands of offspring to be produced from one male animal
- Sperm can be frozen and shipped thousands of miles away
    - In agriculture this is far less expensive than shipping the animal itself
- Endangered species are benefiting
    - Embryos from endangered species are transplanted into related species that then carry and give birth to the endangered species
- Insect pest management using hormones is replacing insecticides in many places
- Hormones are being used to help catch invasive species such as the sea lamprey that infests the Great Lakes and Lake Champlain
- Hormone therapy is helping infertile women become fertile or increase the sperm production in males

- Artificial insemination placing several eggs in a laboratory dish, fertilizing them, and placing them back inside the female
- Ultrasound and miniature cameras allow doctors to view problems within the female reproductive organs and the fetus
- Extract fetal cells to look at chromosomes and determine if there may be chemical deficiencies that may threaten the fetus

Day 125 & 126
Review for exam

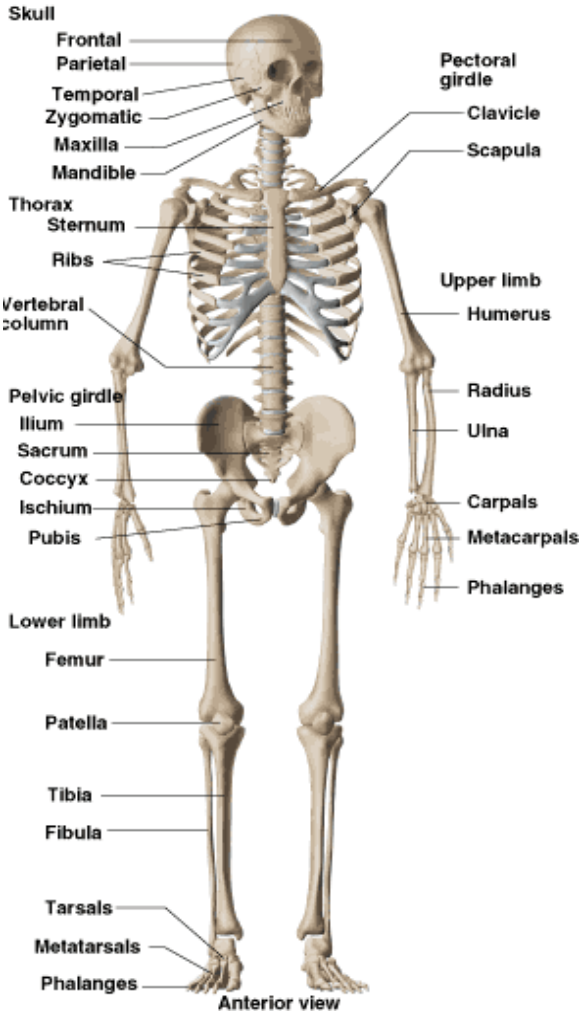
Day 127
Reproductive development and technology exam

Day 128 – 130
Review for the 30 week exam

Day 131
30 week exam

Day 132
Human cavities, bones, and muscles

Cranial cavity holds the brain and is bounded by the skull



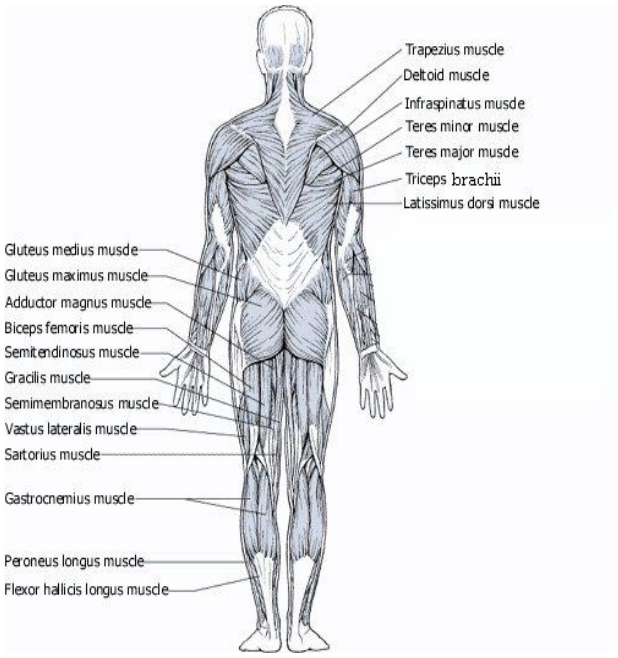
Thoracic cavity holds the lungs and heart and is bounded by the ribs, sternum, diaphragm, and spine

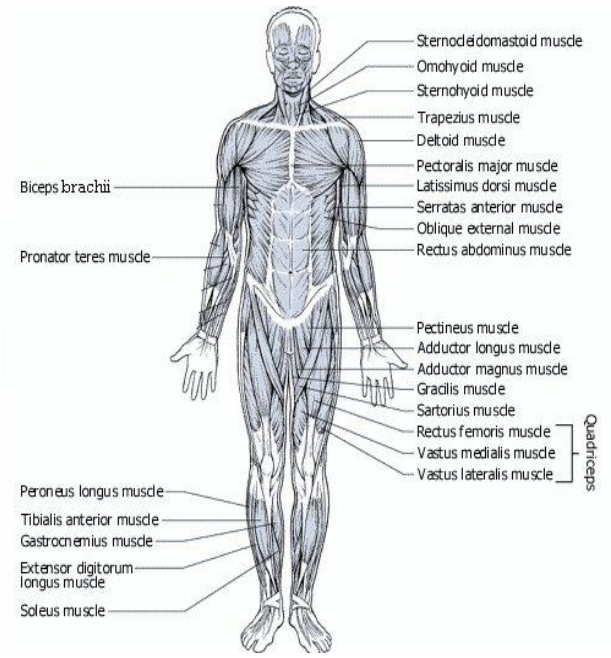
Abdominal cavity holds the stomach, pancreas, liver, small intestine, large intestine, kidneys, spleen, bladder, and reproductive organs

- It is bounded by the diaphragm, ribs, abdominal muscle, and pelvis

Learn the bones, joints, and muscles

Homework = read pages 922 - 927
Do review questions 2 pg 927
Key terms = bone marrow, cartilage, ossification, joint, ligament,





Day 133
Review the bones as a class and then with a partner.

Homework = read pages 928 - 933
Do review questions 1,2,3 pg 933
Key Terms = muscle fiber, myofibril, myosin, actin, sarcomere, neuromuscular junction, tendon

Day 134
Cavity and bone quiz
What are muscles and how do they move?
How muscles move activity.
Myosin, actin, cross-bridges
Muscle cell → muscle fiber → myofibril → actin, myosin, cross-bridges (sarcomere)

Below write how muscles move from the activity.

Muscles can only pull – they cannot push
What is the difference between voluntary and involuntary muscle?
Give an example of each.
Voluntary you _____ control such as _____.

Involuntary you _____ control such as _____.

Force increases with the number of fibers that are stimulated.
Learn the muscles and how each moves your body.

Day 135
Review the muscles with the stim machine.

Day 136
Muscle quiz
Homework = read 954 – 961, 935 - 939
Do review questions 1,2 pg 961, 1 pg 939
Key terms = plasma, red blood cells, hemoglobin, white blood cells, platelet, lymph, epidermis, keratin, melanin, dermis, sebaceous gland, hair follicle

Day 137 + 138

Blood, skin, connective tissue

What is blood made up of and why do we need it?

Blood is 60% plasma by volume

- Plasma is a combination of water, metabolites, wastes, salts, ions, and proteins
- Water acts as a solvent
- The other components of blood provide nourishment, act as catalysts, chemical messengers, maintains volume, and fight infection

Cellular components of blood make up 40% by volume

- Red blood cells are used for oxygen and carbon dioxide transport
- White blood cells produce antibodies and ingest foreign material
- Platelets aid in the clotting of blood

Tendons – strong bands of connective tissue that hold muscle to bone
Ligaments – strong bands of connective tissue that hold bone to bone

Integumentary system – skin and related structures

- Hair, nails, glands, horns, antlers, …
- Serve as a barrier against infection and injury
- Regulates body temperature
- Removes waste products from the body
- Protects against UV radiation

Skin contains several types of sensory receptors – pressure, heat, cold, pain
There are two main layers of skin – the epidermis and dermis
Beneath these two layers is subcutaneous fat and loose connective tissue that help insulate the body

The epidermis is the outermost layer and has 2 layers within itself

- Dead skin cells
- Living cells

Living cells divide to replace the dead cells

- Produce keratin to help waterproof the skin and to make hair and nails

- Produce melanin to protect against UV radiation

Dermis – below the epidermis

- Contains blood vessels, nerve endings, glands, sensory organs, smooth muscles, and hair follicles

Blood vessels help to regulate body temperature. HOW?

Glands – sweat and sebaceous / oil

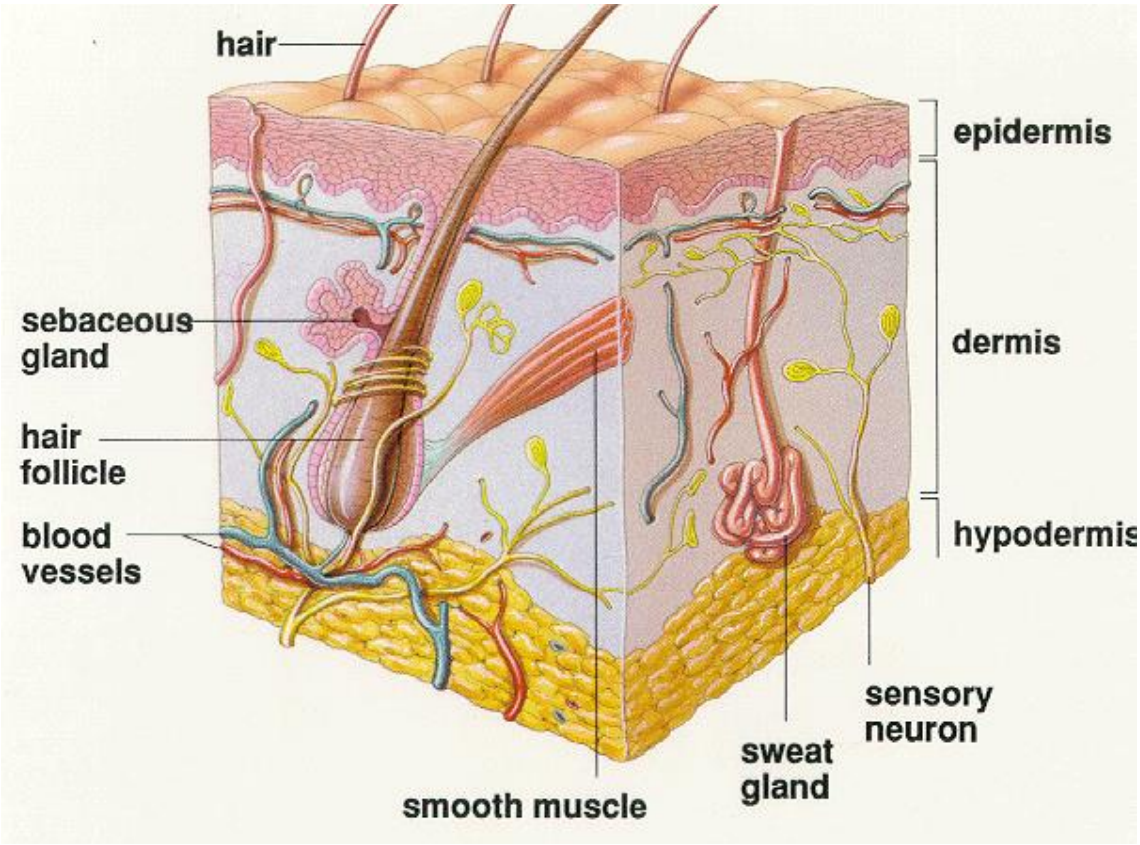
- Sweat removes metabolic waste and cools the body
- Sebaceous helps keep the skin waterproof and flexible

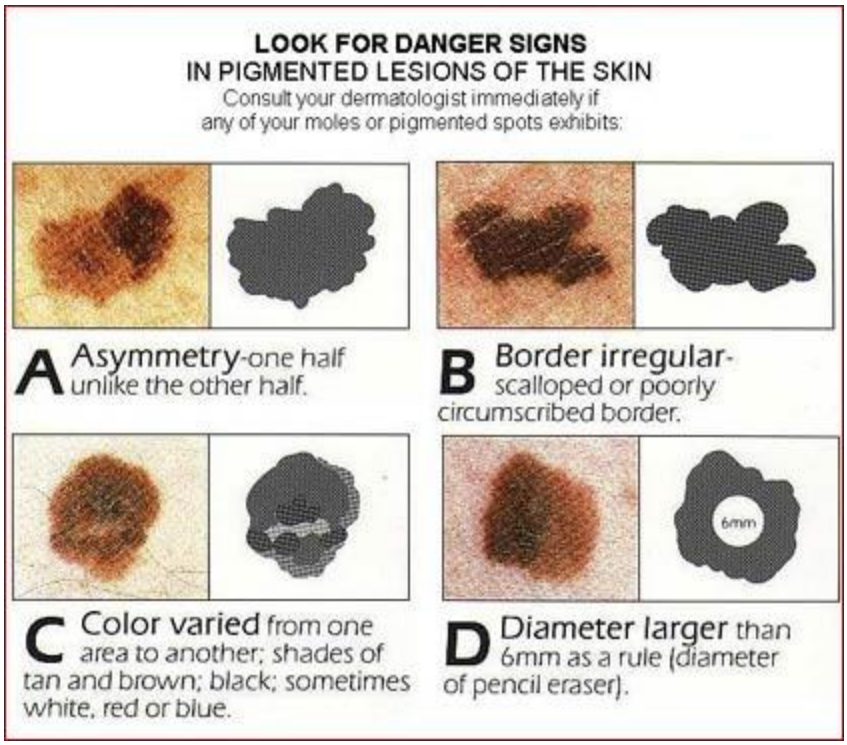
Hair and nails are both made out of keratin

Other structures made out of keratin include – horns, scales, feathers, porcupine quills

Hair protects and insulates

- Protects from abrasions, impact, dirt entering the eyes, ears, nose, and against UV
- Insulates against the cold and heat
- Hair follicles are in close contact with sebaceous glands so that the hair does not become brittle and break





***Homework* = read pages 882 - 887**
Review questions 1,2,3 pg 887
Key terms = kidney, nephron, filtration, reabsorption, excretion, ureter, urinary bladder, urethra, Bowman's capsule

Day 139
What is excretion and how do you do it?

Excretory systems regulate the chemical composition of body fluids by removing metabolic wastes and retaining the proper amounts of water, salts, and nutrients.

Excretion is the removal of cellular waste products from an organism

Functions of the excretory system
- Collect water and filter body fluids
- Remove and concentrate waste products from the body fluids and return other substances to the body fluids as necessary for homeostasis
- Eliminate excretory products from the body

Organs involved
- Lungs – excrete carbon dioxide and water vapor
- Liver – converts ammonia to urea because ammonia is toxic to tissues
- Skin – excretes urine like wastes (water, salt, and urea)
- Kidney – excretes most of the water

The nephron makes urine by –
- filtering the blood of its small molecules and ions and then reclaiming useful materials
- the waste molecules are then collected and released as urine

Waste is carried from the kidneys through the ureters to the bladder and then out of the body through the urethra

Kidney stones are hardened crystal clumps that can develop when there is an imbalance in the amount of liquid to solids in the urine

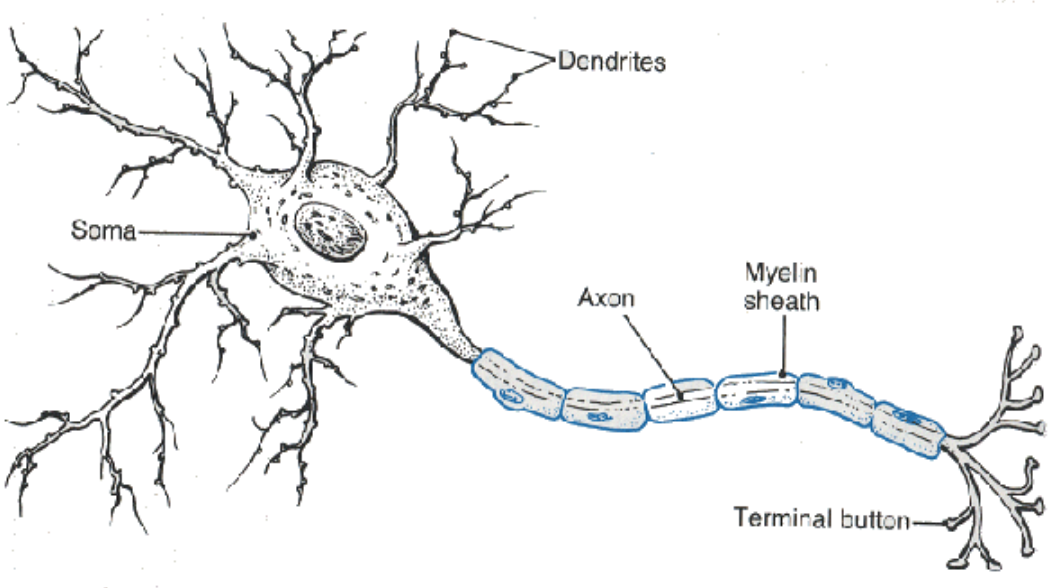
***Homework* = read pages 896 - 904**
Do review questions 3 pg 900, 2 pg 904
Key terms = neuron, nerve, dendrite, axon, myelin sheath, synapse, neurotransmitter, central nervous system, peripheral nervous system, cerebrum, cerebellum, hypothalamus, sensory neuron, reflex, autonomic nervous system, brain stem, dopamine

Day 140
Nervous and hormonal regulation
How do nerves and hormones compare?

Nervous system

- high speed communication
- maintains homeostasis
- secretes chemicals that carry impulses across synapses
- rapid and short lived

The neuron = nerve cell is the basic cellular unit of the nervous system and is specifically designed for transmission of impulses



Synapse – gap between adjacent neurons

Neurotransmitter – chemical substances which starts the transmission of the neurons impulse by –

- an impulse travels down an axon to the tips of a terminal branch
- the terminal branch secretes neurotransmitter into the synapse gap

- the neurotransmitter travels to the next neuron and causes depolarization of that neuron – thus a new nervous impulse is started in next neuron

Sensory neuron carries the signal towards the spinal cord
Interneuron switches the impulse from sensory to motor
Motor neuron carries the signal away from the spinal cord

Nerve impulses involve electrical charges – sodium potassium pump creates an electrochemical gradient

***Homework* = read pages 948 - 953**
Do review questions 3 pg 953
Key Terms = myocardium, atrium, ventricle, valve, pulmonary circulation, systemic circulation, pacemaker, artery, capillary, vein, blood pressure, cardiovascular disease, hypertension

Day 141

How does the brain relate to thinking and actions?

The brain and all of the nervous tissue make up the nervous system

Parts of the brain

- cerebrum – memory, thinking, and reasoning
- cerebellum – coordinate motor activities and aids in maintaining balance
- medulla – involuntary activity – breathing, heartbeat, blood pressure
- hypothalamus – hunger, thirst, body temperature, water balance, sexual desire, hostility, pain

Stroke – a condition resulting from a cerebral hemorrhage or a blood clot in a cerebral vessel, blocking blood flow to part of the brain

- may also result from a ruptured blood vessel
- strokes may result in brain damage leading to partial or total paralysis

Circulatory system – blood, heart, and vessels

- arteries move blood away from the heart
- veins move blood toward the heart
- capillaries are the site of exchange between cells and the blood within very narrow vessels

Mammalian heart

- 2 pumps, side by side
- Right side pumps blood from the body to the lungs
- Left side pumps oxygen rich blood from the lungs to the body

4 chambers

- 2 upper – atria – which pump blood into the heart

- 2 lower – ventricles – which pump blood out of the heart
- A heart beat is like a wave moving across the heart from the upper right to the lower left – why we hear a lub-dub

Blood moves from the body, to the right atrium, to the right ventricle, to the lungs, to the left atrium, to the left ventricle, to the body

***Homework* = read pages 868 - 881**
Do review questions 1,2 pg 873, 2, 3 pg 881.
Key terms = calorie, carbohydrate, fat, protein, vitamin, mineral, mechanical digestion, chemical digestion, amylase, esophagus, peristalsis, stomach, pepsin, small intestine, villus, micro villus, large intestine

Day 142
What happens to your food once it goes into your mouth?

Digestion
Digestion is the breaking down of particles into useable size or form

Mechanical and chemical digestion

Mechanical – physically breaks down very large particles - chewing
- Increases surface area to volume ratio and therefore increases the rate of chemical activity

Chemical - breaks complex molecules into simpler molecules
- Use enzymes

Mouth – mechanical and chemical digestion

Esophagus – transports food from the mouth to the stomach

Stomach – mechanical and chemical digestion
- The stomach is protected from acids by mucus
- Too much acid leads to ulcers
- Loose upper sphincter = heart burn / acid reflux disease
- Loose lower sphincter = diarrhea

Pancreas – produces protease and lipase
- Produces insulin – balances blood sugar
- Produces bicarbonate to neutralize stomach acid

Duodenum – where the stomach mixture mixes with bile and more enzymes and the pH rises

Liver / Gall bladder – stores bile from the liver that breaks down fat into smaller molecules

Small intestine

- ~ 6 meters long
- Where most of the chemical digestion takes place
- Where food diffuses into the blood and water is absorbed
- Has villi and micro-villi to increase the surface area to increase the rate of diffusion

Large intestine

- Water returns to the body
- Vitamins B and K are made here by bacteria
- Storage and egestion of indigestible waste

***Homework* = read 963 - 969**
Review question 2 pg 969
Key terms = pharynx, trachea, larynx, bronchus, alveolus, diaphragm, inhalation, exhalation, asthma, emphysema, lung cancer

Day 143
Other than food what do you need?

Minerals - inorganic compounds necessary for the normal action of many enzymes – iron, copper, iodine, and zinc
Vitamins – organic substance needed to activate enzymes and regulate the release of energy in the body

- 2 types
  - Fat soluble : accumulate in fat – vitamin A
  - Water soluble : not stored in the body tissue and the excess is excreted in urine – vitamin C

Water – most vital nutrient

- Can only survive a few days without water
- Urine should be a pale yellow or clear

Air / respiratory system

- Enters through the nose or mouth
- Down trachea to bronchial tubes continues to branch out to small air sacs called aveoli
- Carbon dioxide and oxygen exchange occurs through these sacs
- Enough surface area in the lungs to cover over ½ of the white tiles on the floor

***Homework* = read pages 978 – 987 & 1010 - 1027**
Do review questions 1,2 pg 981, 2 pg 987, 1,2 pg 1013, 2,3 pg 1019, 1,3 pg 1022, 1 pg 1027.
Key terms = hormone, target cell, exocrine gland, endocrine gland, pituitary gland, releasing hormone, corticosteroid, epinephrine, norepinephrine, thyroxine, calcitonin, parathyroid hormone, infectious disease, germ theory of disease, Koch's postulates, zoonosis, vector, inflammatory response, histamine, interferon, fever, immune response, antigen, antibody, humoral immunity, aell-mediated immunity, vaccination, active immunity, passive immunity, allergy, asthma

Day 144
What is your endocrine system?

More than a dozen glands and groups of cells that secrete hormones to coordinate life processes and maintain homeostasis

- Examples – pituitary, thyroid, thymus, adrenal, pancreas, ovaries, testicles

Hormones are recognized by receptor molecules and cause the cell to perform a task or behave in a particular way

- Example – adrenaline causes an increase in heart rate, stimulates respiration, directs blood to skeletal muscles and the brain and away fro the digestive system, and promotes enzymes to break down glycogen into glucose

Feedback mechanisms –

- Immune system – includes all of the body's structures involved in producing antibodies

Antibodies + Antigens = WAR
Antigen = foreign material / chemical that promotes the formation of matching antibodies

- Example – bacteria and viruses

Antibody = a protein that combines with and neutralizes an antigen

- Made in the tissue of the lymphatic system – lymph nodes, bone marrow, spleen
- Some act as memory cells to fight in the future

Once antibodies surround an antigen, white blood cells engulf and destroy it through phagocytosis

Active immunity – individuals build their own antibodies by having the disease in a strong or mild form

Passive immunity – antibodies are produced by other organisms and are given to the individual

Vaccine – dead or weakened form of the pathogen is injected into the individual, the body creates antibodies and memory cells to fight a full version of the pathogen if it ever enters the system

Day 145 + 146
Review for EXAM

Day 147
Exam

Day 148
Correct and review the exam
***Homework* = 64 - 145**
Do all review questions 1,2,3 pg 68, 1 pg 72, 1,2 pg 78, 4 pg 86, 1,2,3,4 pg 104, 1,2 pg 109, 1,3pg 121, 1,2,3,4 pg 135, 1,2 pg 141
Key terms = biosphere, species, population, community, ecology, ecosystem, biome, biotic factor, abiotic factor, autotroph, primary producer, photosynthesis, chemosynthesis, heterotroph, consumer, carnivore, herbivore, scavenger, omnivore, decomposer, detritivore, food chain, phytoplankton, food web, zooplankton, trophic level, ecological pyramid, biomass, nutrient, limiting nutrient, weather, climate, microclimate, greenhouse effect, tolerance, habitat, niche, resource, predation, herbivory, keystone species, symbiosis, mutualism, parasitism, cemmensalism, ecological succession, primary succession, pioneer species, secondary succession, wetland, population density, carrying capacity, limiting factor, demography
Day 149
Work on the homework assignment.

Day 150
What are ecosystems?

Energy flow through ecosystems always starts with sunlight → plants → primary consumer → secondary consumer → tertiary consumer → decomposers
OR
Sunlight → autotrophs → heterotrophs → decomposers
OR
Sunlight → producers → herbivores / omnivores → carnivores / omnivores → decomposers

All start with sunlight and all end with decomposers

Ecology is the study of interactions of organisms with one another and with the physical environment

Biotic = living
Abiotic = nonliving

- Examples – annual low temperature, dissolved oxygen in streams, precipitation

An ecosystem involves the interactions between abiotic (physical) and biotic (living) factors. The members of the community in the ecosystem and environment must interact to maintain a balance.

There are many different types and sizes of ecosystems

- Example – decaying log, pond, corn field, even a fish tank

The environment where an organism lives is its habitat.
The role of the organism within the environment is its niche.

All of the Earth's ecosystems make up the biosphere (portion of the Earth where life exists)

Environmental limits on population size within each ecosystem are dictated by limited resources. Organisms are constantly competing for water, food, territory, mates, and sunlight (plants).
Intraspecies competition occurs amongst members of the same species for limited resources.

Interspecies competition occurs between different species for limited resources.

Day 151
What is carrying capacity?

Carrying capacity is the maximum number of organisms the resources of an area can support.

- There are 2 types of carrying capacity – natural and social

Natural carrying capacity for an organism is limited by the available biotic and abiotic resources.
Social carrying capacity for an organism is determined by the number of organisms people want or will tolerate.

Dynamic equilibrium is a constantly changing stable state where populations fluxuate on either side of an average.

Biomass – the amount of living material in a given time

- It can refer to one or several species

Bioaccumulation – toxins accumulate in greater **concentrations** as you progress up the food chain

Relationships exist between organisms

- Producer – consumer – decomposer
- Predator – prey
- Parasite – host
- Scavenger – dead things

Examples of parasites – pinworm, tapeworm, bot fly, leech, tick, mosquito, lamprey, chigger, tomato worm wasp, fleas

Symbiotic relationships

- Clown fish and anemone
- Birds and buffalo
- Hummingbirds and flowers
- Fig and wasp

Day 152

Why is biodiversity so important?
Biodiversity = the number of different organisms that can be found in a particular habitat

The greater the diversity of an area, generally indicates greater the environmental health.

- Provides stability because if one organism is removed from the area there should be another to fill its role in the environment as a predator, prey, or other role.

Much of today's medical research is looking at plants and animals for cures or at least clues for cures to many diseases.

Agriculture can strip an area of biodiversity, but it can return in most cases.

Urban sprawl is minimizing biodiversity with longer more permanent conditions.

Ecosystems are dynamic – meaning that they are always changing.

- Nature will never balance out in a stable state contrary to what many people have come to believe from Disney movies.

This constant change is called succession.
Succession is the natural replacement of one plant community by another until a climax community is attained.

- As the plant community changes so changes the organisms that use them.
- Primary succession
- Secondary succession

Day 153
We will go outside to look at succession and think about the animals that can use that plant community throughout the year.

Day 154
What happens with a changing environment?

Changes that occur in the environment can be gradual or rapid.

- Climate
- Human impact and natural disasters

Keystone species are species that other species depend on or suffer by their actions.

- Elephants
- Beaver
- Humans

Introduced species are organisms not native to an area that appear by accident, on purpose, or by circumstance (on their own). Unlike native species the new species evolved away from the community that they are now part of – as a result, many do not have predators, disease, or other form of natural check to keep them under control.

- Also, they may exploit prey species or plants that have not evolved to protect themselves from this new organism.
- Most introduced species die shortly after being introduced, but those who do not generally become a huge environmental problem.
    - Example – zebra muscles, purple loosetriphe, round goby, ruffe, water flea, Norway maple, Japanese barberry

Day 155
Review for environmental exam

Day 156
Exam
***Homework* = read pages 154 - 179**
Do review questions 1,2 pg 157, 1,2 pg 165, 1a,1b,2 pg 172, 1,2 pg 179.
Key terms = monoculture, renewable resource, nonrenewable resource, sustainable development, desertification, deforestation, pollutant, biological magnification (bioaccumulation), smog, acid rain, biodiversity, ecosystem diversity, species diversity, genetic diversity, habitat fragmentation, ecological hot spot, ecological footprint, ozone layer, aquaculture, global warming

Day 157
Human Impact
How do you impact the environment?

Air pollution – burning fossil fuels

- Fossil fuels are non-renewable resources that are carbon rich and when burned create tons of carbon dioxide per year.

Water pollution – "the solution to pollution is through dilution" JFK – was he right?

- Chemicals from plants – Onondaga Lake
- Dumping waste – beaches of MA and RI and NH
- Temperature – removal of vegetation along shorelines
- pH – acid rain caused by smoke stack emissions creating acid in the clouds and eventual precipitation

Global warming – Carbon dioxide and methane trap heat by reflecting it back to the Earth

- study done on an island in the Pacific shows the steady increase in carbon dioxide
- there are some natural cycles of warming trends as well
    - all of these lead to another ice age

Ozone layer is being destroyed

- CFC molecules destroy ozone molecules
- Ozone which is O3 is broken down into O2
- Ozone protects us and everything else from UV radiation
- If the ozone layer were compressed it would only be as thick as a bed sheet
- As UV increases → skin cancer increases, cataracts increase, and single celled organisms die
    - Most of our oxygen comes from single celled organisms that live in the oceans and presently these are disappearing at an alarming rate.

Habitat Destruction – products from South America and Asia in particular

- Non-renewable forests
- Poor timber harvest practices
- Highly sought woods – mahogany, teak
- Cheap wood products – particle board furniture

Day 158
How do you disturb the environment? What is your ecological footprint?

Noise –
Presence –
Roads / cars –
Buildings-
Mud slides –
Runoff –
Poaching –
Pets –

Day 159
Review for exam

Day 160
Environmental exam

Day 161
Review for 40 week exam

Day 162 – 169
Regent's review

Day 170
40 week exam

Day 171 – 172
Review 40 week exam