Review Sheet
Scientific Method and Characteristics of Life

In the following situation, identify the hypothesis, independent variable, dependent variable, the control and constants.

After studying about recycling, members of John's biology class investigated the effect of various recycled products on plant growth. John's lab group compared the effect of different aged grass compost on bean plants. Because decomposition is necessary to release the nutrients, the group hypothesized that older grass compost would produce taller bean plants. Three flats of bean plants (25 plants/ flat) were grown for 5 days. The plants were fertilized as follows: (a) Flat A: 450 g of three-month-old compost, (b) Flat B: 450 g of six-month-old compost, and (c) Flat C: 0 g compost. The plants received the same amount of sunlight and water each day. At the end of the 30 days the group recorded the height of the plants (cm).

Hypothesis: If an older grass compost is used, then the bean plants will grow taller

IV: Age of grass compost (months)

DV: Height of Plants (cm)

control: Flat C- no compost

constants: amount of sunlight, water, amount of time to grow, type of plant, number of plants

In the following situations, identify the hypothesis, independent variable, dependent variable, the control and experimental group.

1. The addition of the chemical calcium chloride (CaCl) to water will increase its temperature.

Hypothesis: If calcium chloride is added to water then the temperature of the water will increase.

Independent Variable: Calcium Chloride

Dependent Variable: temperature of water

Control Group: Group with no Calcium Chloride

Experimental Group: Groups with varying amounts of CaCl

2. Watering a plant with salt water will kill the plant.

Hypothesis: If a plant is watered with salt water then the plant will die.

Independent Variable: salt water

Dependent Variable: health of the plant

Control Group: plant with regular water

Experimental Group: Groups with varying amounts of salt water

3. A person that takes a vitamin supplement has better memory retention.

Hypothesis: If a person takes vitamin supplements then the person will have a better memory.

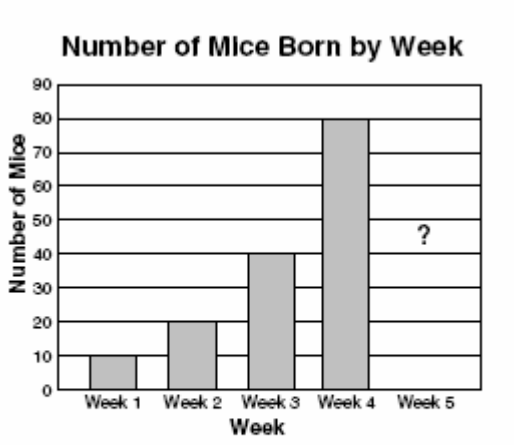
Independent Variable: vitamin supplements

Dependent Variable: memory of person

Control Group: people with no vitamins

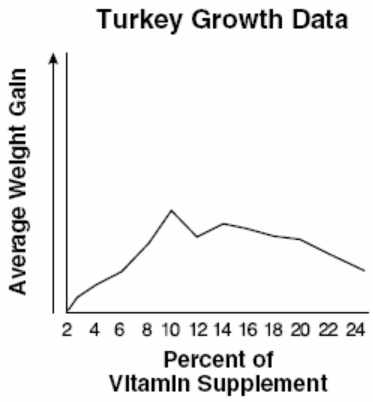
Experimental Group: people with different types of vitamins OR Groups with varying amounts of vitamins

Graphs: Look at the Graphs below and answer the questions that follow.



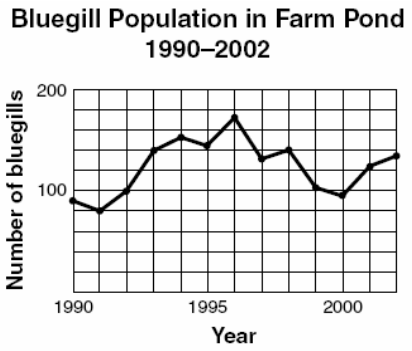
According to the graph, how many mice will be born in week 5 if the trend continues?

160 mice



A study on a poultry farm was conducted to determine the percentage of vitamin supplement necessary to add to the feed of turkeys in order to maximize their growth. According to this data, what percentage of vitamin supplement should be added to the turkeys' diet?

10%



In which year was there likely an abundance of bluegill food?
1996

In which year was there likely an increase in bluegill predators?
1991

Characteristics of Life

Define the main characteristics of Life below.

1. Cellular Organization: cells can be either eukaryotes or prokaryotes AND either multi-cellular or uni-cellular
2. Metabolism: the way an organism obtains energy and uses it- organisms can be autotrophs or heterotrophs
3. Homeostasis: an organism maintains an internal environment

4. Reproduction: organisms reproduce either sexually or asexually

5. Heredity: all organisms must have DNA and the DNA is passed on from generation to generation thruogh heredity
6. Responsiveness to the Environment: organism reacts to the environment

Identify the following situations as one of the 6 characteristics of life.

a) a cell divides : reporduction

b) a giraffe eats the leaves off of a tree : metabolism

c) when looking thru a microscope at a sample of elephant skin, you see thousands of cells :cellular organization

d) a human being gets goose bumps and shivers when it's cold outside " homeostasis & respond to environment

e) a plant captures the sun's rays to make glucose : metabolism

f) a sperm and an egg meet to create an embryo: reproduction

g) A rabbit's fur turns white in the winter and brown in the summer : respond to the environment

Review Sheet
Biochemistry & Water

Define: Define the following words

Monomer: building block of a larger molecule

Polymer: large molecule made of smaller units, known as monomers

Carbohydrate: contains C, H and O in a 1:2:1 ratio- made of monosaccharides

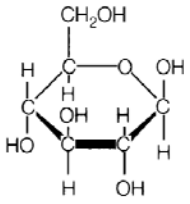
Protein: contains C, H, O and N- made of amino acids

Nucleic Acid: conatins C, H, O and P- made of nucleotides

Lipid: contains C, H and O- made of fatty acids

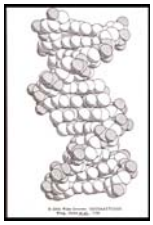
Identify: Place the following characteristics and diagrams into one of the four categories of organic compounds.

Carbohydrate
Monomer: monosaccharide
glucose, fructose & sucrose
sugars



Lipid
Monomer: fatty acid
steroids, waxes & phospholipids
make up the cell membrane
fats

Nucleic Acid
Monomer: nucleotide
DNA & RNA
Found in the nucleus of cells



Protein
Monomer: amino acid
enzymes, hemoglobin & actin
make up the cell membrane
Made at the ribosome of the cell
Lots are found in muscle cells

pH: Use the charts below to answer the following questions.

Test Paper Results

Chart A

pH	Red Litmus	Blue Litmus	pH Paper
Acid - pH2	red	red	red
Acid - pH4	red	red	orange
Acid - pH6	red	red	yellow
Base - pH8	blue	blue	green
Base - pH10	blue	blue	blue

Chart B

Substance	Red Litmus	Blue Litmus	pH Paper
Water	red	blue	yellow-green
Apples	red	red	red-orange
Beans	red	red	yellow
Milk	red	blue	yellow
Shrimp	red	blue	yellow-green

Chart A shows how changes in pH cause testing paper to change color. Chart B shows how testing papers reacted with several experimental substances. Which of these has a pH of about 3?

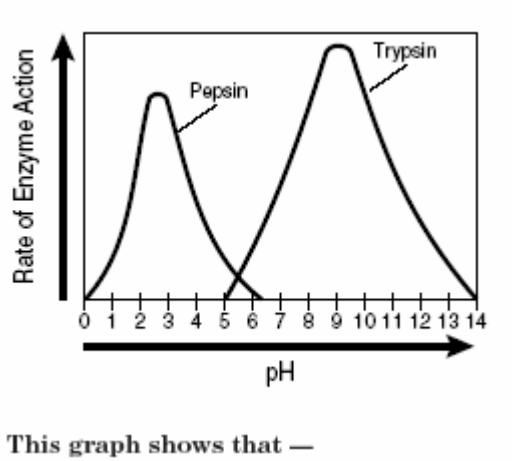
apples

Field Data

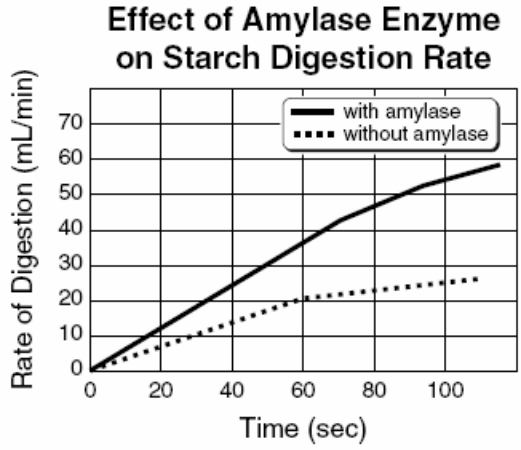
Pond	pH of Pond Water	Number of Duckweed Plants
A	6	150
B	12	300
C	8	500
D	4	80

Which pond is the most acidic?
D
Which pond is the most basic?
B
Which pond is closest to neutral?
A & C
In the experiment above, what is the dependent variable?
Number of duckweed plants
what is the independent variable?
pH of pond water
What conclusions can you draw about the effects of pH on duckweed growth? A higher ph (around 8-9) will produce more duckweeds

Enzyme Activity graphs: Use the graphs below to answer the following questions



This graph shows that —



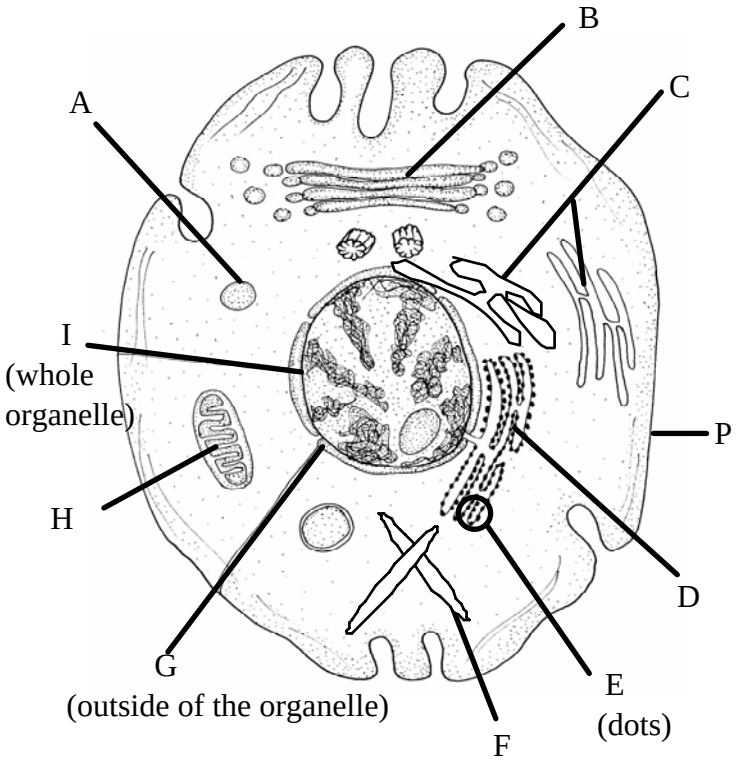
Which enzyme above works well in acidic conditions?
Pepsin
Which enzyme above works well in basic conditions?
Trypsin
What is optimal pH for pepsin?
~3
What is the optimal pH for trypsin?
~9

What is the substrate of amylase?
starch
What is the product of amylase?
monosaccharides
What does the graph indicate about adding amylase to a starch solution?
Increases the rate of digestion

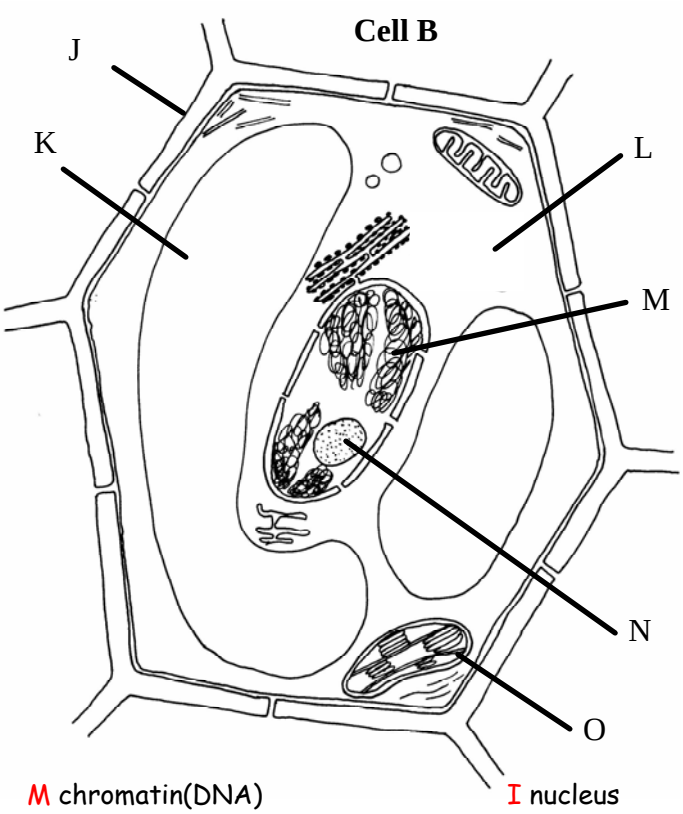
Review Sheet
Cell Parts and Types of Transport

Label the parts of the plant and animal cell below.

Type of Cell: animal cell



Type of Cell: plant cell



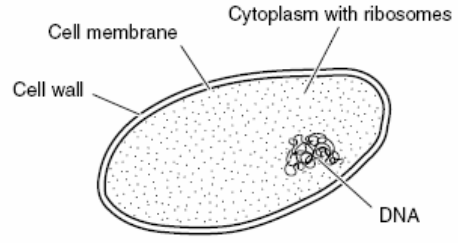
L cytoplasm	J cell wall	M chromatin(DNA)	I nucleus
P cell membrane	B golgi body	O chloroplast	Kvacuole
G nuclear membrane	H mitochondria	F cytoskeleton	A lysosome
N nucleolus	D rough ER	C smooth ER	E ribosome

The "tail" of a cell that allows it to move form place to place is called a flagella

The tiny hairs on the outside of a cell that allow it to move form place to place are called cilia

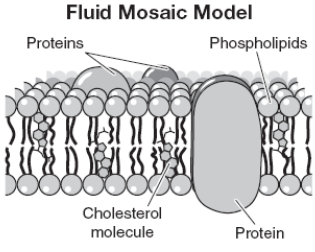
A cell that has a nucleus is known as an eukaryote

The cell to the right is known as a prokaryote
because it does NOT have a nucleus



An organism that is a prokaryote is a bacteria
cell.

The organelle shown to the right is the cell membrane
It is made of phospholipids and proteins.



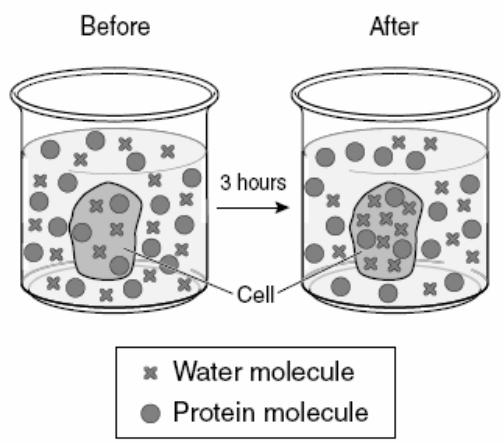
Cell Transport: In the boxes below, indicate what direction the water move in and what will happen to the cell.

Hypertonic Solution	Hypotonic Solution	Isotonic Solution
Direction water moves: Out of the cell	Direction water moves: Into the cell	Direction water moves: In and out of the cell at a constant rate
A cell in a hypertonic solution will... Shrivel, also known as crenating in animal cells and plasmolysis in plant cells	A cell in a hypotonic solution will... Burst, also known as lysing.	A cell in a isotonic solution will... Maintain its shape

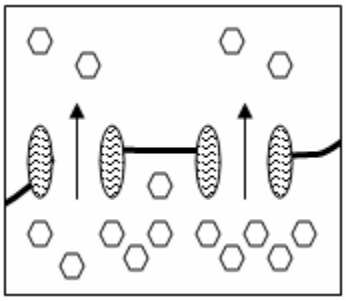
a. In the picture to the right, are the water molecules moving into or out of the cell? Into the cell

b. What type of solution is the cell in? hypotonic solution

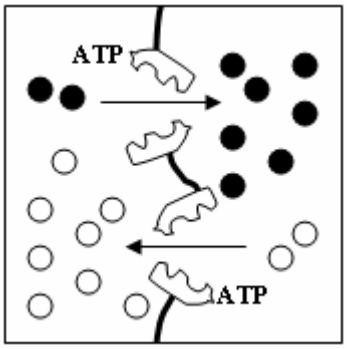
c. What will eventually happen to the cell? It will burst



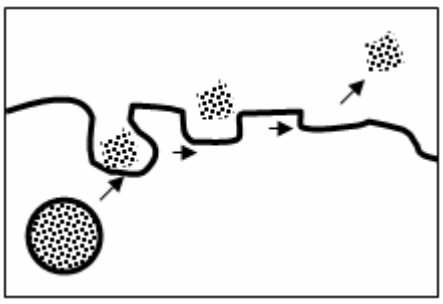
Identify the types of transport below: exocytosis, endocytosis, facilitated diffusion and active transport.



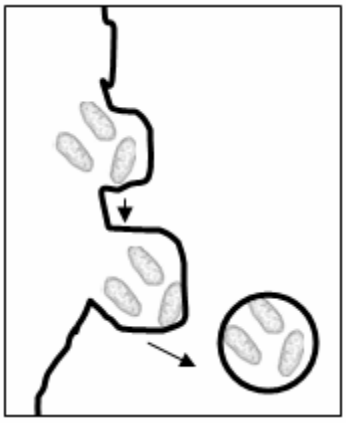
Facilitated diffusion



Active transport



Exocytosis

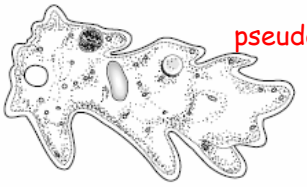


Endocytosis- specifically phagocytosis

How do the following cells move below?

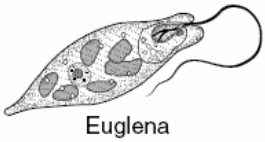
cilia

Paramecium



pseudopod

Amoeba



flagella

Euglena

Review Sheet
Photosynthesis & Respiration and food chains & webs

What is the equation for photosynthesis?
$6CO_2 + 6H_2O + \text{sunlight} \rightarrow C_6H_{12}O_6 + 6O_6$

What are the reactants?
carbon dioxide, water and sunlight

What are the products?
glucose & oxygen

What is the energy in photosynthesis? sunlight

Where in the cell does photosynthesis occur? chloroplast

What is the equation for respiration?
$C_6H_{12}O_6 + 6O_6 \rightarrow 6CO_2 + 6H_2O + 36\ ATP$

What are the reactants?
glucose & oxygen

What are the products?
carbon dioxide, water and ATP

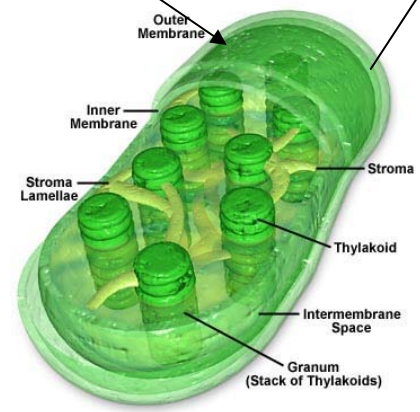
What is the energy in respiration? ATP

Where in the cell does respiration take place? mitochondria

Fill in the cycle below.

1.____sunight_____
(energy to photosynthesis)

2. chlorplast
(what is this organelle?)



3. carbon dioxide and water
(products of respiration)

4 oxygen and glucose
(products of photosynthesis)

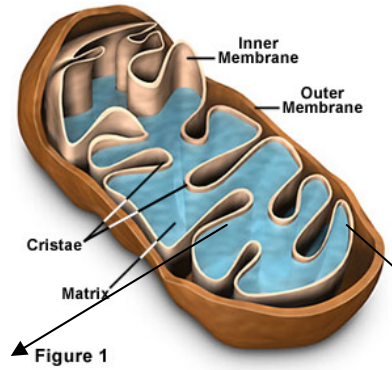
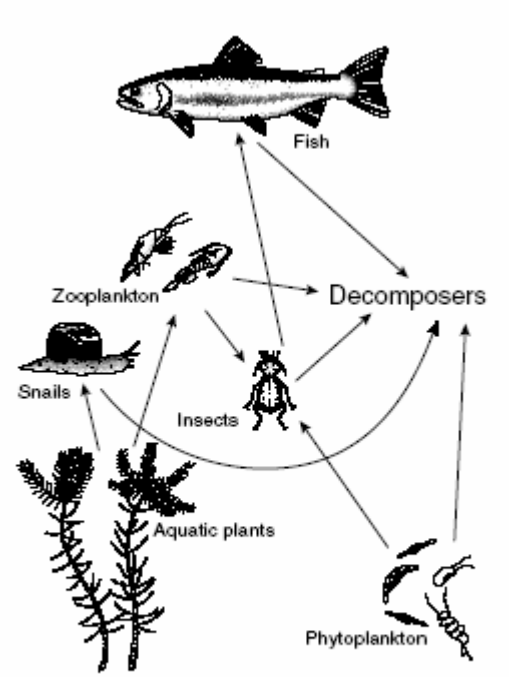


Figure 1

5.____ATP_____
(energy made from respiration)

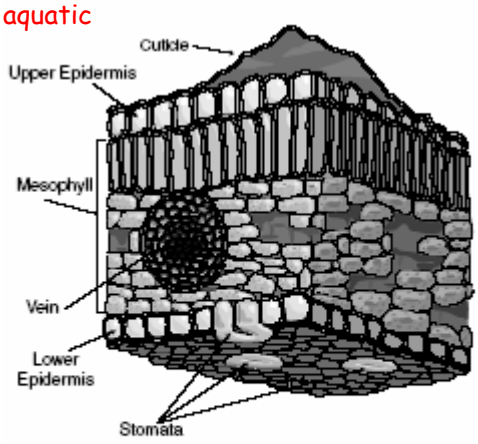
6 mitochondria
(what is this organelle?)

Food Webs



Energy is transferred from insects to fish in this system by —

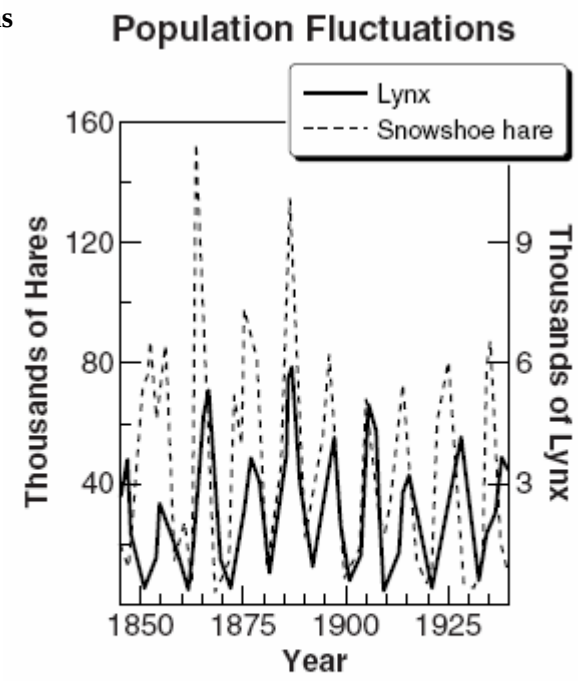
Give an example of a carnivore from the food web above.
Insects, fish
Give an example of a producer from the food web above.
Aquatic plants, phytoplankton
Give an example of a herbivore from the food web above.
Snail, zooplankton
What is an example of a decomposer?
Bacteria, fungi
Is the food web above aquatic or terrestrial?
aquatic



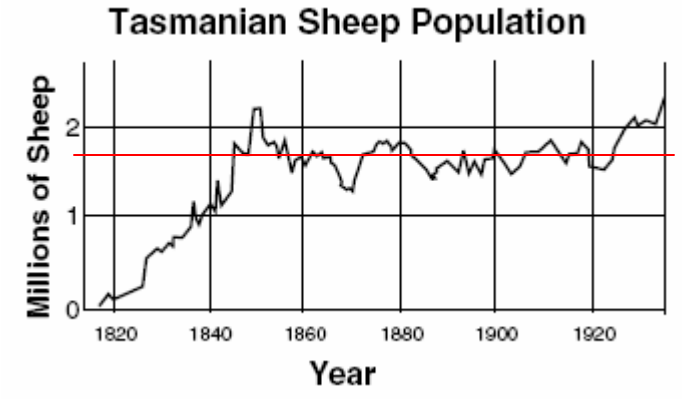
Which area of the leaf is most responsible for protecting the leaf from the drying effects of the air? cuticle

What part of the leaf is responsible for bringing water to the cells? vein

Ecology Graphs



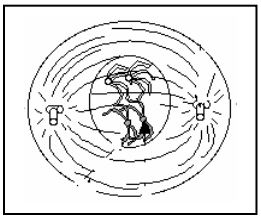
In the graph above, which is the predator?
lynx
In the graph above which is the prey?
hare
How do the lynx & hare affects each other?
Lynx is the predator of the hare
If a predator of the lynx were introduced to this population, how would this affect the hare numbers?
the hare number would increase



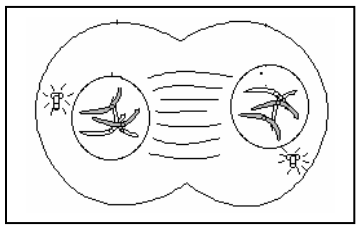
What is the carrying capacity for the sheep population above?
~ 1.75 million sheep

Review Sheet
Cell cycle, mitosis, meiosis, DNA, protein synthesis

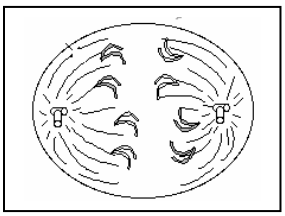
Identify the following stages of mitosis and indicate the correct order.



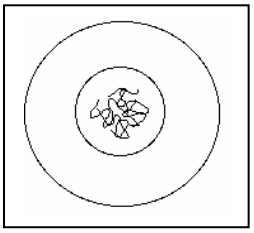
A. prophase



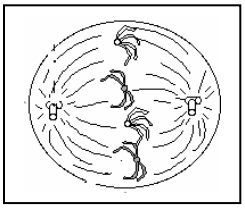
B. telophase



C. anaphase



D interphase



E. metaphase

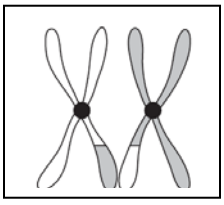
1. What order should the phase above be in? D→ A→ E→ C→ B

2. What type of cells does mitosis occur in? somatic cell (body) What does mitosis produce? Identical body cells

3. The Cell cycle is made of two stages: interphase and cell division. Interphase consists of 3 phases: G1, S and G2. During the S phase DNA is copied.

4. What type of cells does meiosis occur in?(gametes) sex cells What does meiosis produce? Gametes (sperm & egg)

5. Look at the picture to the right. What is the term for this process?



Crossing over

b. In what phase of meiosis does the following occur?

Prophase I

c. What does this process cause in the gametes?

Different gametes- no 2 gametes are the same since they have different DNA

6. If a gamete of an organism has 6 chromosomes, how many will its body cell have? 12

7. If a liver cell of an organism has 32 chromosomes, how many will its gametes have? 16

Mitosis vs. Meiosis

Complete the chart below by checking off which cell division has which characteristics.

Description	Mitosis	Meiosis	neither
Cell division in body cells	X		
Cell division in gametes		X	
Eukaryotic cells	X	X	
Produces haploid cells		X	
Produces diploid cells	X		
Produces 2 cells	X		
Produces 4 cells		X	
Used by bacteria to divide			X

Replication/Transcription/Translation

1. DNA is copied through a process called replication. This occurs during the S phase of interphase before the cell is ready to divide.

2. DNA contains information to make the organic molecule proteins, such as enzymes.

3. The process of making RNA from DNA is called transcription and occurs in the nucleus of the cell.

4. There are 3 types of RNA: mRNA, rRNA and tRNA. The mRNA takes the genetic code from the nucleus to the ribosomes, which is made of rRNA. The tRNA brings amino acids to the ribosomes to build the protein. The 3 nucleotides on the mRNA make up a codon that matches the anticodon on the tRNA.

5. The process of making a protein from mRNA is called translation and occurs in the ribosome of the cell.

Use the strand of DNA below to answer the following questions.

DNA strand	T	A	C	A	C	G	C	G	C	T	A	T

6. What is the complimentary DNA to the strand of DNA above? ATGTGCGCGATA

7. What is the mRNA to the strand above? AUGUGCGCGAUA

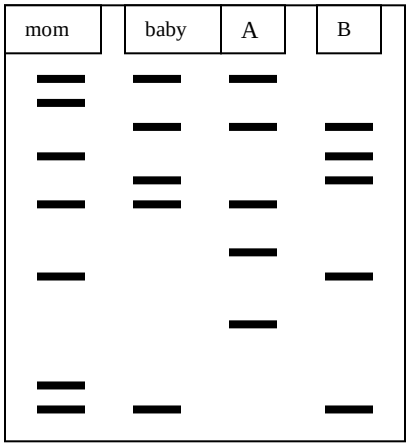
8. Using the codon chart, what would be the sequence of amino acids from this mRNA?
Methionine- Cytesine- Alanine- Isoleucine

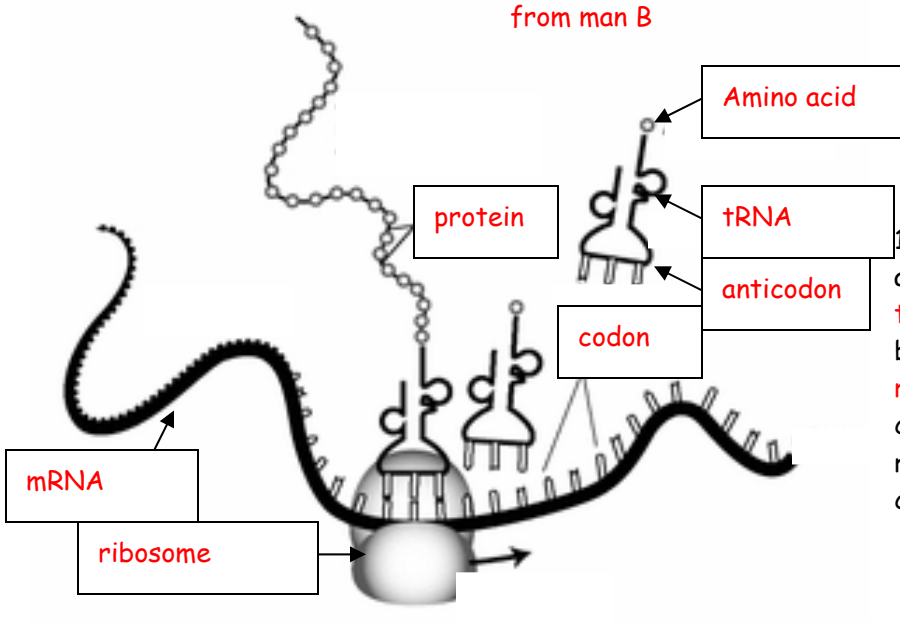
9. What amino acid must every protein begin with? Methionine end with? stop

10. Look at the picture to the right.
a. The picture is an example of a (n) electrophoresis gel- DNA fingerprint.

b. In the diagram, who is the father of the baby? Man B

c. Justify your answer from part b. the baby receives some of its DNA from man B





11. Look at the diagram to the left.
a. What process is shown to the left?
translation
b. Where in the cell does the process occur?
ribosome
c. In the diagram to the left, label: the ribosome, mRNA, tRNA, amino acid, protein, codon, anti-codon.

Review Sheet
Genetics/Evolution

1. The "father" of genetics is Gregor Mendel, who was a monk and worked with pea plants.

2.

Hairline	Widow's peak (W__)	No widow's peak (ww)
Freckles	Freckles (F__)	No freckles (ff)
Blood cell type	Round blood cells (B__)	Sickle cell shape (bb)

a. Give an example of a phenotype for hairline. Widow's peak or no widows peak What is its genotype? WW or ww
b. What is the dominant trait for freckles? Having freckles recessive? No freckles
c. What is the genotype for a **carrier** of sickle cell blood? Bb
d. Give an example of a heterozygote genotype for freckles Ff homozygote genotype for sickle blood BB/bb
e. What is the genotype for a hybrid freckles, no widow's peak person? Ffww

3. Genes are carried on chromosome and human beings have 46 of them. A change in a gene is called a mutation. There are a number of types of mutations: a mutation that replaces one base for another is called a substitution, a mutation that omits some of the bases is called a deletion and a mutation that adds extra bases is called an addition.

4. Each parent gives their offspring one copy of a gene, so their offspring has 2 genes for each trait.
What gametes are possible from the following genotype? AaBB AB, aB
DDEE DE ffGg fG, fg

5. Probabilities of a genetic cross are shown in a punnett square, a grid used to predict possible offspring between 2 individuals.

a. If tall is dominant to short, what is the genotype for short (you pick the letter)? tt
b. If a pure tall plant is crossed with a short plant, what will be the **phenotype** of the offspring? tall
c. If a hybrid tall plant is crossed with a short plant, what will be the **phenotype** of the offspring? 50% tall & 50% short

6. A red flower when crossed with a white flower produces all pink flowers.
What kind of inheritance is this? Incomplete dominance

What are the phenotypes of the offspring from a pink and white flower? Use a punnett square.
50% pink and 50% white

	R	W
W	RW	WW
W	RW	WW

7. A person with type A blood has children with a person that has type B blood. They have a type O baby. How is this possible? Use a punnett square.
The person with A type blood has the genotype I^Ai and the person with B type blood has the gentype I^Bi

	I^A	i
I^B	I^AI^B	I^Bi
i	I^Ai	ii

8. In plants, yellow pods (Y) is dominant over green pods (y) and axial flowers (A) are dominant over terminal flowers (a). A hybrid plant for both pod color and flower position is crossed with a green, terminal plant. What are the phenotypes and chances of each phenotype in the offspring? Use a punnett square
25% yellow & axial 25% green & axial
25% yellow & terminal 25% green & terminal

	YA	yA	Ya	ya
ya	YyAa	yyAa	Yyaa	yyaa

Evolution

1. The "father" of evolution is Charles Darwin who sailed aboard the HMS Beagle and studied the animals located on the Galapagos Islands a series of islands off the coast of South America.

2. Darwin's idea of evolution is called natural selectionwhich is known as survival of the fittest. The 5 points to natural selection are:

1. There are variations in population

2. Some of these variations are favorable

3. More young are produced then will survive to adult hood and reproduce

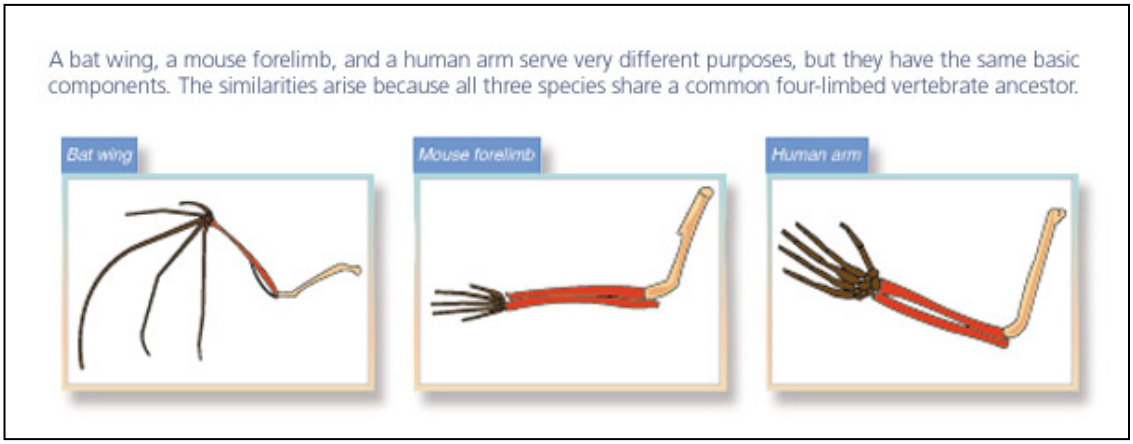
4. Those that survive to adult hood and reproduce have the favorable trait

5. Over time, the population will change into the favorable trait

3. A structure that shows a common ancestor is known as a homologous structure. A structure that does not show a common ancestor is known as an analgous structure.

The bat wing, mouse forelimb and human arm are examples of homologous structures.

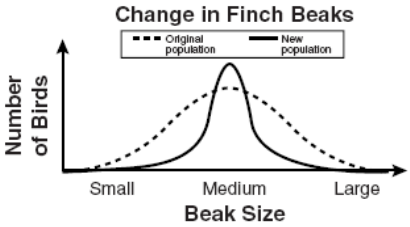
A bat wing and a fly wing would be examples of analogous structures- they serve the same purpose but they do not show a common ancestor.



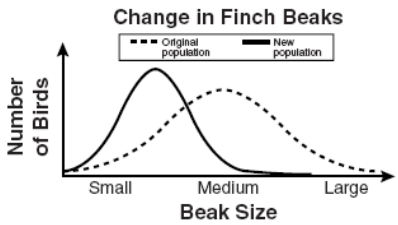
4. A particular type of homologous structure is known as a vestigal structure, such as the hip bones of snakes.

5. Identify the 3 types of graphs below and the situation that accurately describes them.

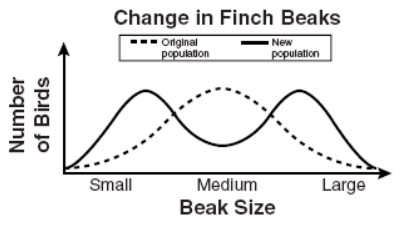
A. stabilizing



B. directional



C. disruptive



B Small sized beaks are favored
C Small & large beaks are favored
A Medium sized beaks are favored

What is the term for a graph that shows normal distribution (the dotted line in each of the graphs above)? bell curve

Review Sheet
Classification, Taxonomy & Kingdoms

1. Place the following characteristics in the proper Kingdoms. Those that are used more than once have the number of time sit will be used in parentheses ().

Yeast	eukaryotes(4)	prokaryotes	only heterotrophs(2)	moss
Mushroom	protozoan	dicot	algae	tree
Amphibian	jellyfish	only autotrophs	mold	reptile
conifer	only unicellular	multicellular (3)	multi- & unicellular	fern
Flower	bird	fish	mammals	monocot
decomposer (2)	cellulose cell walls	insects	hetero- & autotrophs (2)	E.coli

K. Animalia	K. Plantae	K. Fungi	K. Protista	K. Archaebacteria & Eubacteria
eukaryotes only heterotrophs amphibian jellyfish reptile multicellular bird fish mammals insects	eukaryotes moss dicot tree only autotrophs conifer multicellular fern flower monocot cellulose cell walls	yeast eukaryotes only heterotrophs mushroom mold multicellular decomposer	eukaryotes protozoan algae multi- & uni-cellular hetero-& autotrophs	prokaryotes only unicellulara decomposer hetero-& autotrophs E.coli

2. The diagram below is a phylogenic tree/ cladogram which shows evolutionary relationships between organisms.

a. Which 2 organisms are the most related? ___B & C

b. How long ago did A & D split? ___~ 3 mya

c. Which organism is most related to G? ___F

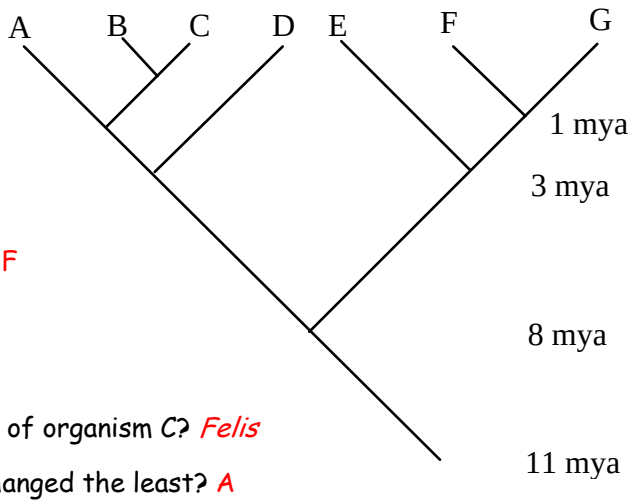
d. Which 2 organisms are the LEAST related? A & G

e. Which 2 organisms are MORE related: D & E or E & G? E & G

f. Which 2 organisms are LESS related: A & D or D & F? ___D & F

g. Which 2 organisms split ~8 mya? ___A & G

h. Which organisms would be in the same phylum as G? E & F



i. If organism B is *Felis domesticus,* what is the most likely genus of organism C? *Felis*

j. Which organism has changed the most in 11 million years? B Changed the least? A

3. What is the taxon hierarchy- starting with kingdom and ending with species?

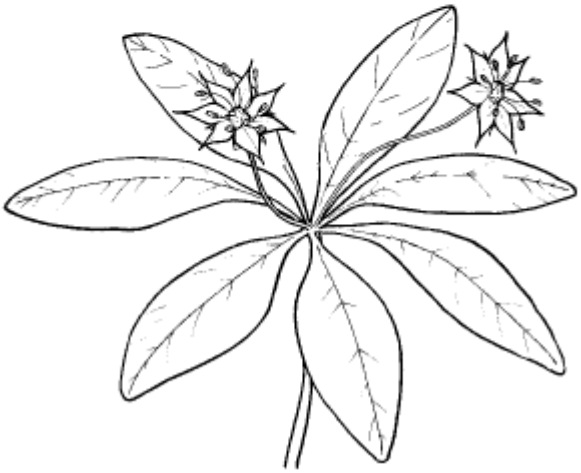
Kingdom
Phylum
Class
Order
Family
Genus
Species

4. What is the scientific name for the flower below?

Trientalis borealis

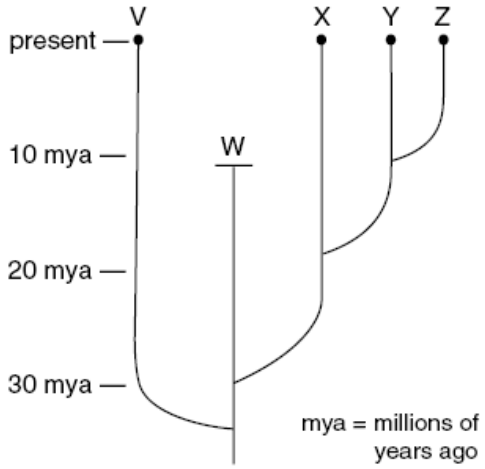
Key to White Wildflowers

1a. Five petals	Go to 2
1b. Seven petals	Starflower (*Trientalis borealis*)
2a. Petals single pieces	Go to 3
2b. Petals deeply divided	Chickweed (*Stellaria media*)
3a. Wide round petals	Common strawberry (*Fragaria virginiana*)
3b. Narrow elongated petals	Bowman's root (*Gillenia trifoliata*)



5. Which species went extinct? How long ago?

W- 10 mya



4. Which of the beetles below are most closely related? Justify your answer.

Oak Weevil and Hazelnut Weevil- they are both in the same genus (*Curculio*)