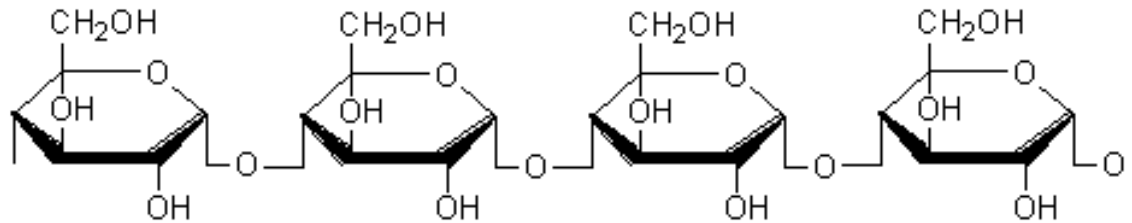




Interpretation of Data/Graphs Assignment: Chemistry of Life

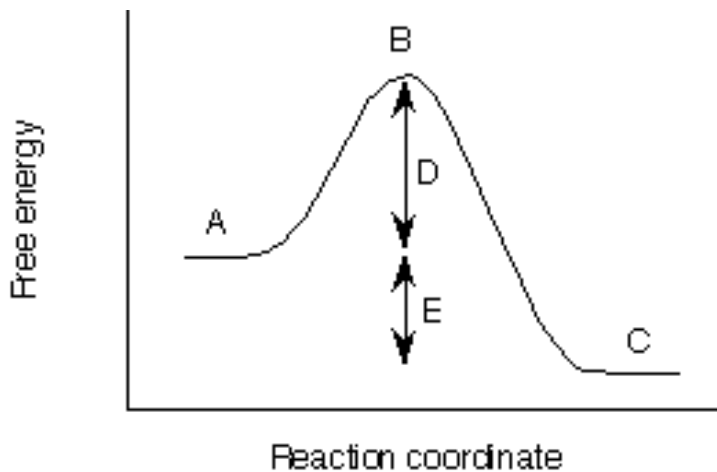
Study the diagrams, graphs, data sets, etc... that are shown below and then answer the questions that follow (with detail when necessary AND IN COMPLETE SENTENCES!!).

1. a. What types of molecule is shown at right? How do you know?



- b. Would this molecule be soluble in water? Why or why not?

2.



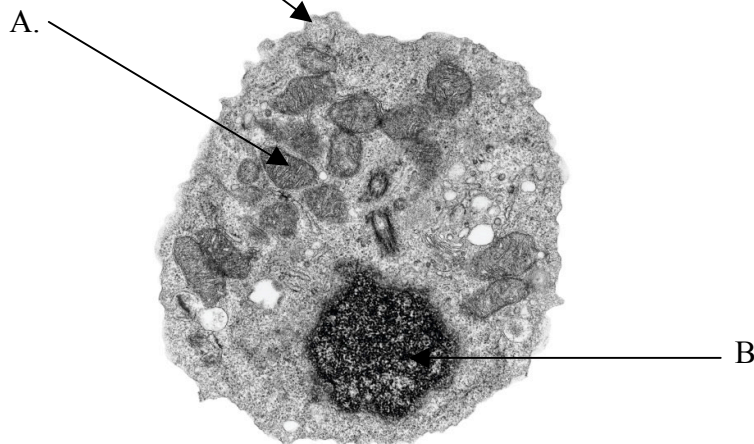
- a. Which letter represents the activation energy ( $E_A$ )?  
 b. Which letter represents the "free energy" from this reaction?  
 c. Is this reaction endergonic or exergonic? Explain in detail how you know.  
 d. This represents a reaction NOT catalyzed by an Enzyme. Draw in a line that shows what energy profile of the reaction would be if it was catalyzed by an enzyme.

Interpretation of Images, Data/Graphs Assignment: Cells

Study the diagrams, graphs, data sets, etc... that are shown below and then answer the questions that follow (with detail when necessary AND IN COMPLETE SENTENCES!!).

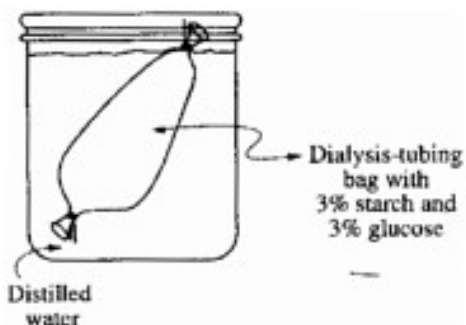
1. a. What are the structures labeled...  
 A. \_\_\_\_\_  
 B. \_\_\_\_\_  
 C. \_\_\_\_\_

C. (HINT: It surrounds the cell!)



- b. Is this cell an animal cell or a plant cell? How do you know?

2.



The picture at left shows an experiment in which a dialysis-tubing Bag was filled with a mixture of 3% starch and 3% glucose and Placed in a beaker of distilled water. The experimental set up was Left (covered) on the lab table for 24 hours.

- a. What are the expected results? Explain where you expect to find each of the molecules involved (water, starch, glucose, etc...) and what the concentration in each of the locations will be.

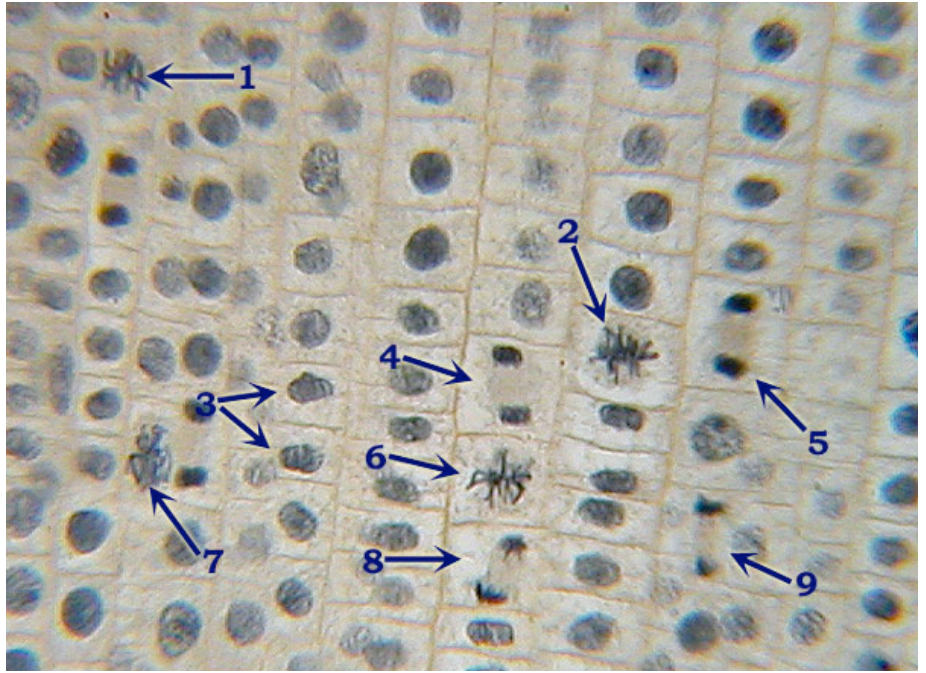
- b. If IKI (Lugol's Solution) was added to the distilled water in the beaker, explain what color changes you would expect and where they would happen.

3. a. What process is being shown in This picture?

b. What type of organism are these cells from? How do you know?

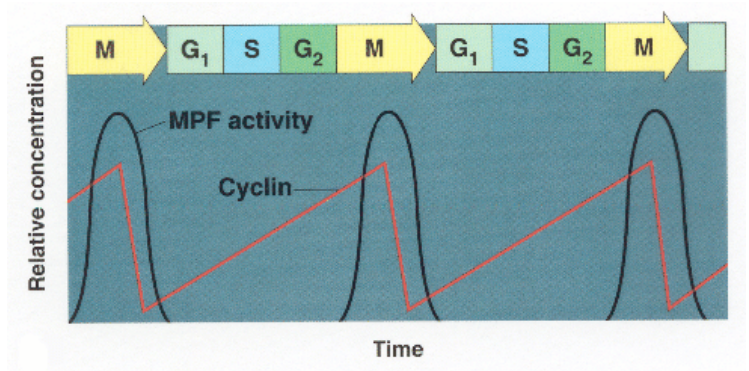
c. What part of the organism is this sample from? Why is this a good location to view this process?

d. What stage (phase) is represented by the cells numbered 1, 2, & 6? How do you know?

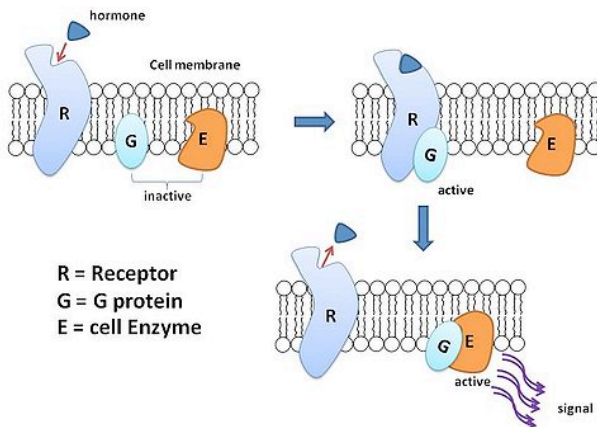


f. In what stage (phase) are most of the cells in this picture? How do you know? What does this indicate about what is happening during this stage (phase)?

4. What is the relationship between cyclin, MPF, and mitosis/cytokinesis as shown in the diagram at right?



5.



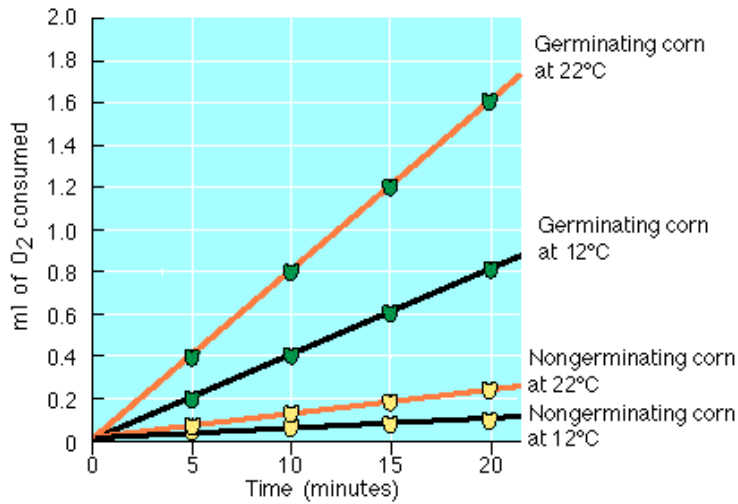
a. Is the hormone in this picture fat soluble? How do you know?

b. Explain what is happening in this picture? Give an example of a disease or physiological response that uses this pathway.

Interpretation of Images, Data/Graphs Assignment: Cellular Energetics

Study the diagrams, graphs, data sets, etc... that are shown below and then answer the questions that follow (with detail when necessary AND IN COMPLETE SENTENCES!!).

1.

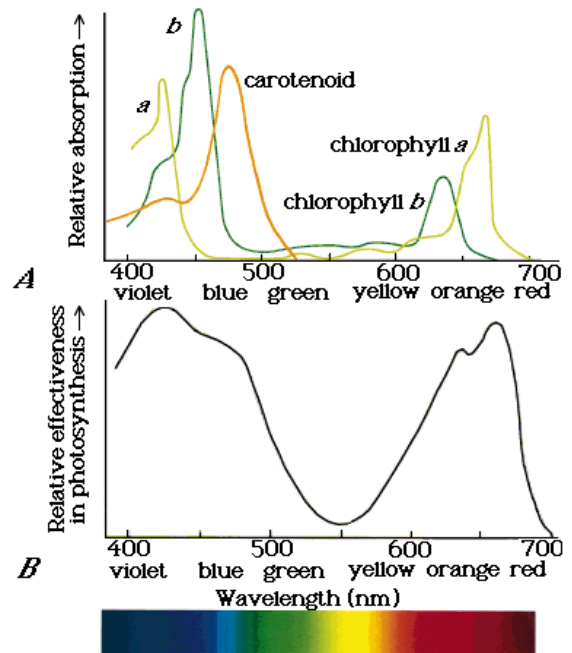


- What is the relationship between germination and cellular respiration? Explain WHY!
- What is the relationship between temperature and cellular respiration? Explain WHY!
- Draw in a line that would represent Germinating corn at 15°C.

2. a. What color and wavelength of light is reflected (NOT absorbed)? How do you know?

b. What wavelength(s) increase the rate of photosynthesis to increase? What pigment does this correspond to? How do you know?

c. What color would carotenoid pigments appear to YOUR eye? How do you know?



Interpretation of Images, Data/Graphs Assignment: Heredity

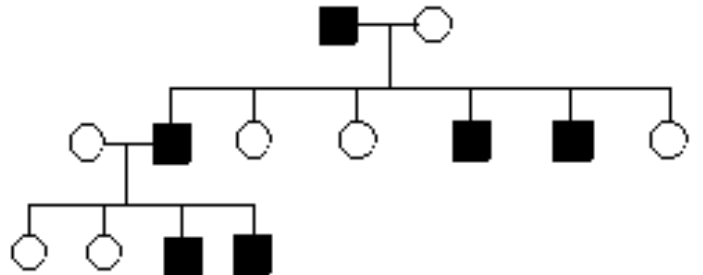
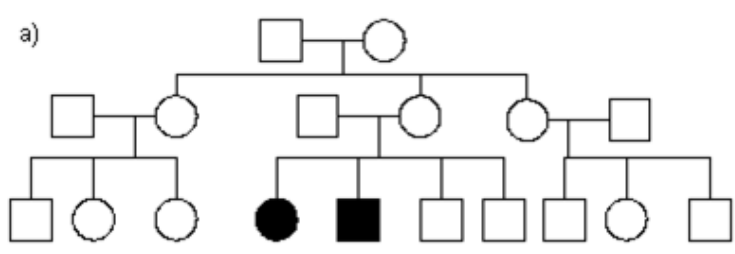
Study the diagrams, graphs, data sets, etc... that are shown below and then answer the questions that follow (with detail when necessary AND IN COMPLETE SENTENCES!!).

1.



- a. Is this karyotype showing a male or a female? Explain how you know?
- b. Is this person “normal” or do they have a disorder? If so, which one? Explain how you know.
- c. What type of mutation would lead to this type of karyotype?
  - a. How could this mutation affect 100% of the gametes? How could it affect 50% of the gametes?

- 2. a. What type of inheritance is shown in each pedigree below? Explain how you know!
  - a. What do the two pedigrees have in common?



3. A space probe discovers a planet inhabited by creatures that reproduce with the same hereditary patterns seen in humans. Three of the phenotypic characteristics of these creatures are: height, antennae, and nose morphology. Earth scientists were able to do some controlled breeding experiments with these organisms. 100 males and 100 females were used in the experiments and the results of a number of crosses are shown below. Review this information and use it answer the questions that follow.

Cross I: True-breeding tall creatures were crossed with true breeding short creatures. ALL of the F1 were tall. The F1 creatures were crossed and the following data was obtained.

F2 Phenotype	Male	Female
Tall	2575	2625
Short	1425	1375

Cross II: True breeding creatures WITH antennae are crossed with true-breeding creatures WITHOUT antennae. ALL of the F1 had antennae. The F1 creatures were crossed and the following data was obtained.

F2 Phenotype	Male	Female
WITH antennae	3125	3100
WITHOUT antennae	875	900

Cross III: Creatures that are true breeding for upturned snout are crossed with creatures with down turned snouts. ALL of the F1 offspring had upturned snouts. The F1 creatures were crossed and the following data was obtained.

F2 Phenotype	Male	Female
Upturned Snout	1750	3475
Down Turned Snout	1750	0

Cross IV: True breeding tall, with antennae creatures were crossed with true breeding short, without antennae creatures. ALL of the F1 offspring were tall, with antennae. These F1 offspring were crossed with true breeding short, without antennae creatures. The F2 data is in the table below.

F2 Phenotype	Male	Female
Tall, WITH antennae	2360	2220
Tall, WITHOUT antennae	220	300
Short, WITH antennae	260	220
Short, WITHOUT antennae	2240	2180

- What conclusions can be drawn from cross I and cross II? Explain how the data supports your conclusions.
- What conclusions can be drawn from cross III? Explain how the data supports your conclusions.
- What conclusions can be drawn from cross IV? Explain how the data supports your conclusions.
  - Draw a picture of what this chromosome might look like with the genes “mapped.” (SHOW your calculations!!!)

Interpretation of Images, Data/Graphs Assignment: Molecular Genetics & Biotech

Study the diagrams, graphs, data sets, etc... that are shown below and then answer the questions that follow (with detail when necessary AND IN COMPLETE SENTENCES!!).

1. Compare the two DNA sequences shown below. Transcribe them into mRNA and translate them into an amino acid sequence.

a. GTG CAC CTC ACT CCA GAG GAG (Normal Hemoglobin)

mRNA →  
amino acids →

b. GTG CAC CTC ACT CCA GTG GAG (Sickle Cell Hemoglobin)

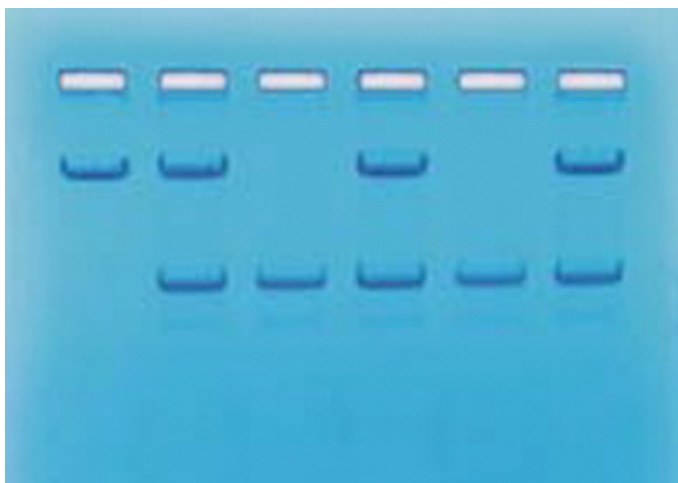
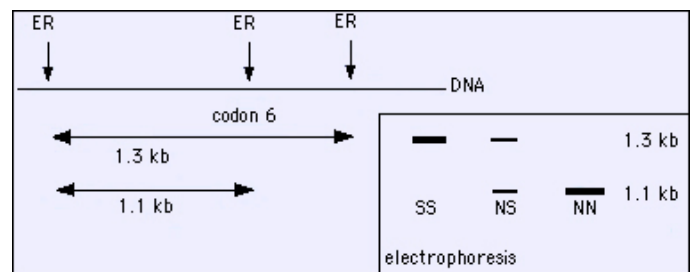
mRNA →  
amino acids →

- Circle any differences there are in the DNA, RNA and amino acid sequences that might exist between these two sequences.
- Identify the type of mutation that is represented AND EXPLAIN, IN DETAIL, what effect this would have on the protein/pigment (be sure to mention the types of functional groups on the amino acids and how this would affect shape of the molecule).

2. You can diagnose Sickle Cell Anemia prenatally by running a DNA gel. For prenatal diagnosis you need to know that there is a restriction enzyme (ER) which normally recognizes and cleaves the gene at the 6th codon, among other sites, producing a DNA fragment of 1.1 Kb. The mutation responsible for the disease eliminates this site at codon 6. Because the next site is farther on the gene, the fragment will be of 1.3 Kb. Then, by electrophoresis of the DNA, it is possible to discriminate the normal homozygotes (NN), the heterozygotes (NS) and the affected homozygotes (SS). See the figure below:

Using the figure at right and the information above “diagnose” the patients in the gel shown below.

A B C D E F



- A =  
B =  
C =  
D =  
E =  
F =

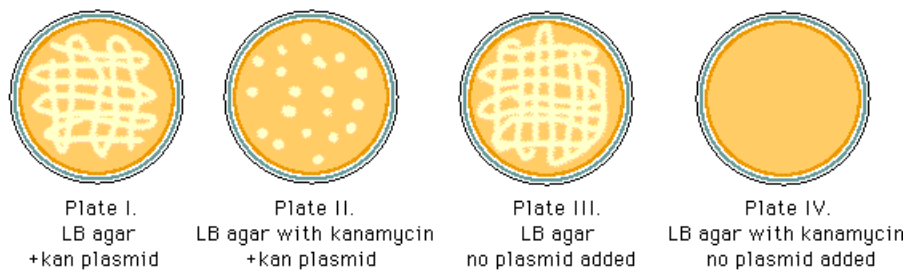


3. The restriction enzyme EcoRI cleaves double-stranded DNA at the sequence 5'-GAATTC-3' and the restriction enzyme HindIII cleaves at 5'-AAGCTT-3'. A 20 kb circular plasmid is digested with each enzyme individually and then in combination, and the resulting fragment sizes are determined by means of electrophoresis. The results are as follows:

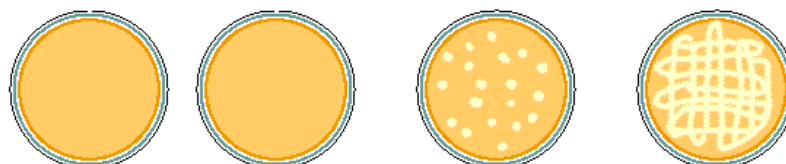
EcoRI alone	fragments of 6 kb and 14 kb
HindIII alone	fragments of 7 kb and 13 kb
EcoRI and HindIII	fragments of 2kb, 4kb, 5 kb and 9kb

Make a diagram of the circular molecule and indicate the relative positions of the EcoRI and HindIII restriction sites. (Hint: place one EcoRI site at '12 o'clock' and position the remainder relative to this site.)

4. In a molecular biology laboratory, a student obtained competent *E. coli* cells and used a common transformation procedure to induce the uptake of plasmid DNA with a gene for resistance to the antibiotic kanamycin. The results below were obtained.



- What is the purpose of Plate IV?
  - Explain the growth you see and the type of bacteria (transformed vs. non-transformed or both) that would be on Plate I.
  - Explain the growth you see and the type of bacteria (transformed vs. non-transformed or both) that would be on Plate II.
5. A student has forgotten which antibiotic plasmid she used in her *E. coli* transformation. It could have been kanamycin, ampicillin, or tetracycline. She decides to make up a special set of plates to determine the type of antibiotic used. The plates below show the results of the test. Which antibiotic plasmid has been used?



Interpretation of Images, Data/Graphs Assignment: Evolutionary Biology

Study the diagrams, graphs, data sets, etc... that are shown below and then answer the questions that follow (with detail when necessary AND IN COMPLETE SENTENCES!!).

1. You sample 1,000 individuals from a large population for the MN blood group, which can easily be measured since co-dominance is involved (i.e., you can detect the heterozygotes). They are typed accordingly:

BLOOD TYPE	GENOTYPE	NUMBER OF INDIVIDUALS	RESULTING FREQUENCY
M	MM	490	
MN	MN	420	
N	NN	90	

Using the data provide above, calculate the following:

- a. Label each of the genotype with the appropriate variable (p<sup>2</sup>, 2pq, q<sup>2</sup>)
- b. Determine the “resulting frequency” of each genotype in the population. SHOW YOUR WORK!!
- c. Determine the frequency of each allele in the population. SHOW YOUR WORK!!

2. Phylogeny is the evolutionary history of a species.

- a. Based on the data in the table below, draw a phylogenetic tree that reflects the evolutionary relationships of the organisms based on the differences in their cytochrome *c* amino-acid sequences.
- b. Explain the relationships of the organisms.
- c. Based on the data, identify which organism is most closely related to the chicken and explain your choice.

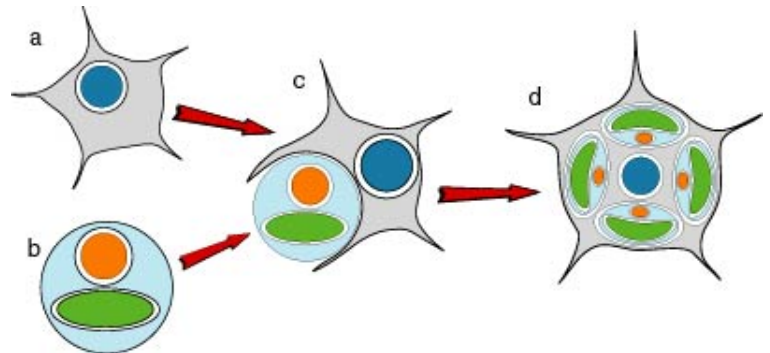
THE NUMBER OF AMINO ACID DIFFERENCES IN CYTOCHROME *c* AMONG VARIOUS ORGANISMS

	Horse	Donkey	Chicken	Penguin	Snake
Horse	0	1	11	13	21
Donkey		0	10	12	20
Chicken			0	3	18
Penguin				0	17
Snake					0

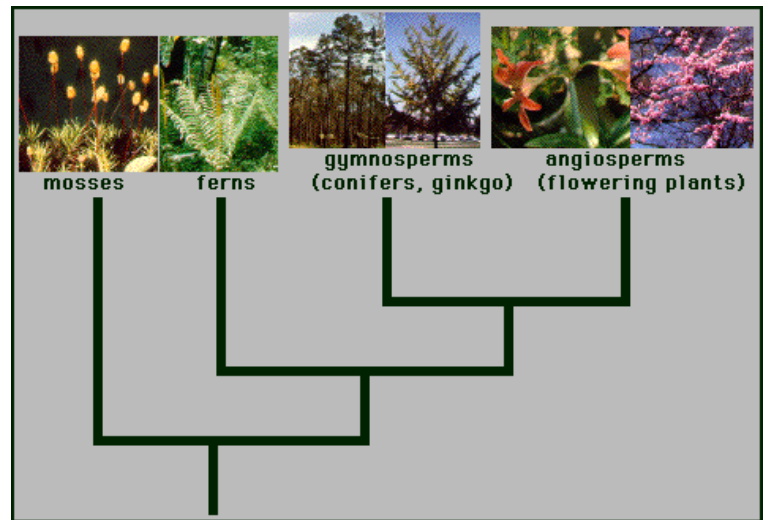
Interpretation of Images, Data/Graphs Assignment: Diversity of Life

Study the diagrams, graphs, data sets, etc... that are shown below and then answer the questions that follow (with detail when necessary AND IN COMPLETE SENTENCES!!).

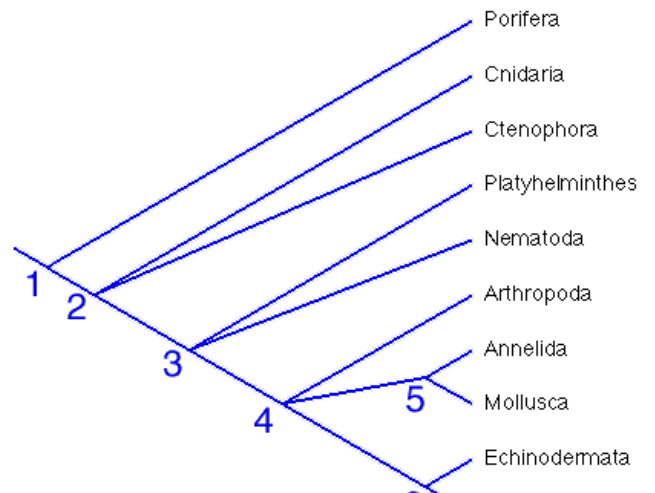
1. The picture at right shows what theoretical process?
2. Is this primary or secondary?
3. Which organisms (a, b, c, or d) are eukaryotic? How do you know?
4. Which organism (a, b, c, or d) are photosynthetic? How do you know?



5. Place the “synapomorphies” on the tree at right.
  - a. Identify what the Advantage of each of the “synapomorphies” would be...
    - i. flowers
    - ii. seeds
    - iii. vascular tissue



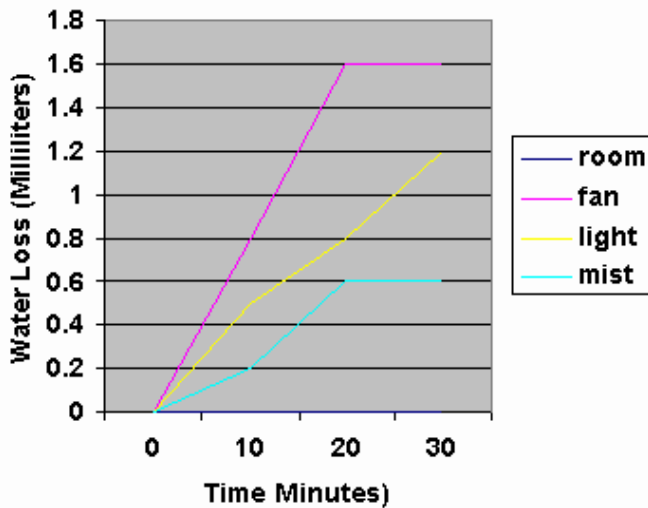
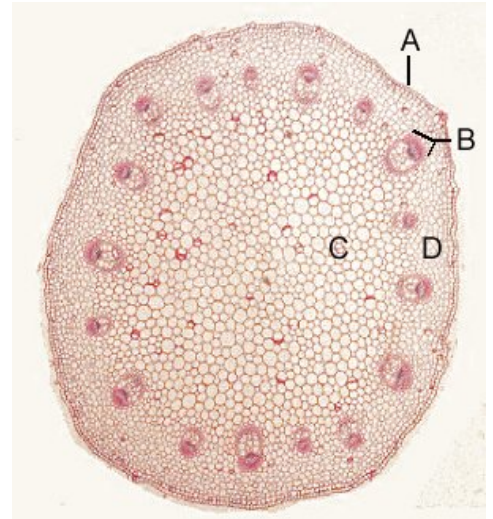
6. Place the “synapomorphies” on the tree at right. (Don’t worry about the numbers).



Interpretation of Images, Data/Graphs Assignment: Plant Structure and Function

Study the diagrams, graphs, data sets, etc... that are shown below and then answer the questions that follow (with detail when necessary AND IN COMPLETE SENTENCES!!).

1. This is a cross section through what part of the plant?
2. Is this a monocot or a dicot? How do you know?
3. What type of tissue is labeled A?
4. What is the name of structure B?



5. The graph at right shows the results of a transpiration experiment. Use this information to answer the following questions.
  - a. Why would you expect the fan and light conditions to have a higher rate of water loss than room?

- b. Why would you expect the mist to have a lower rate of water loss than room?

- c. Calculate the Transpiration rate for each condition.  
 Use the equation  $\rightarrow \frac{\text{mL water loss @ 30 min} - \text{mL water loss @ 0 min}}{(30 \text{ min} - 0 \text{ min})}$

SHOW YOUR WORK!!!

Room =

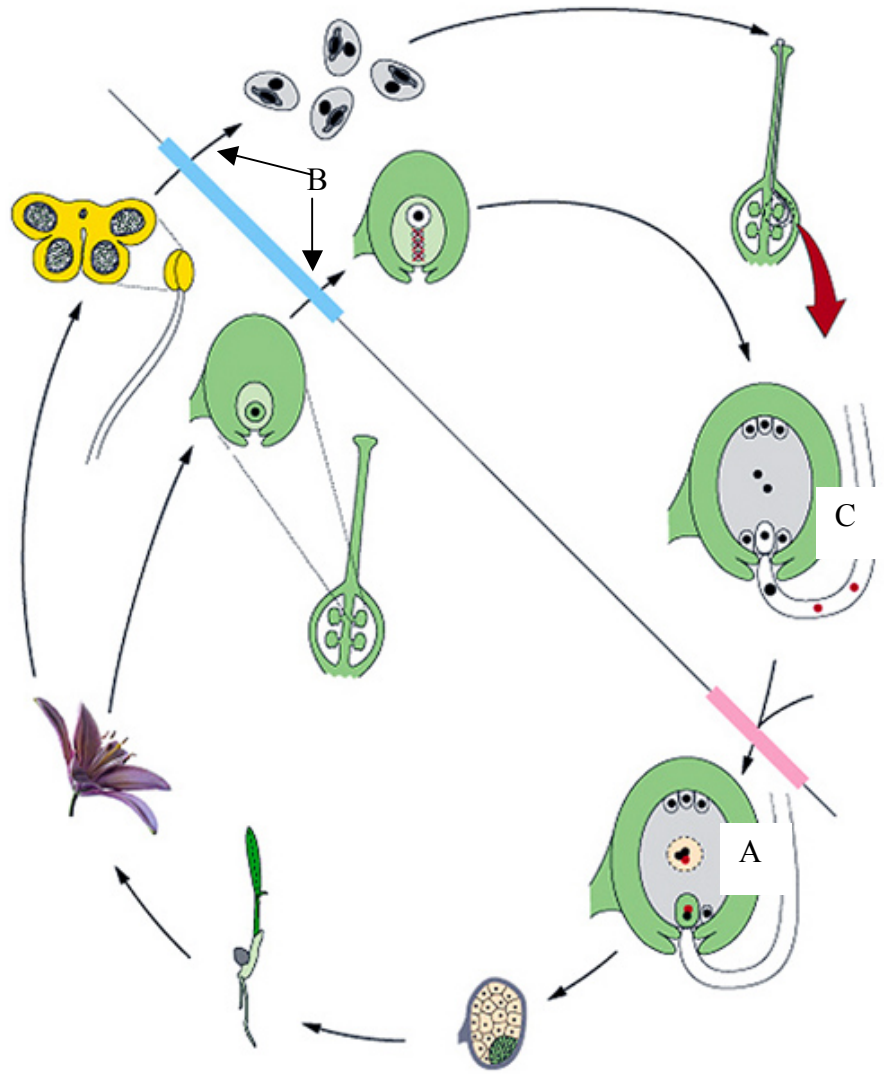
Fan =

Light =

Mist =

6. What is summarized in the diagram at right?

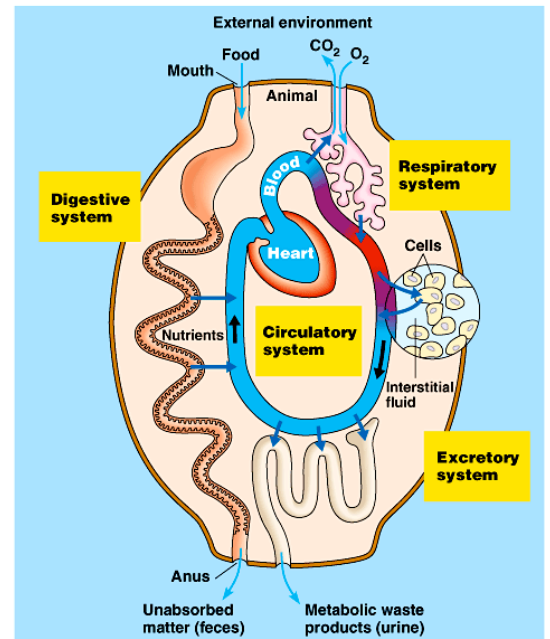
- Label the following in the diagram: Mature Sporophyte, Ovule, Anther, Microsporangium, Megasporangium, Pollen Tube, Egg, Sperm, Synergids, Polar Nuclei, Micropyle
- What Process is occurring at the point labeled B?
- Are the red and black dots at the point labeled C diploid or haploid? Why is this important?
- What process is taking place at the point labeled A? Why is this important?



Interpretation of Images, Data/Graphs Assignment: Animal Structure and Function

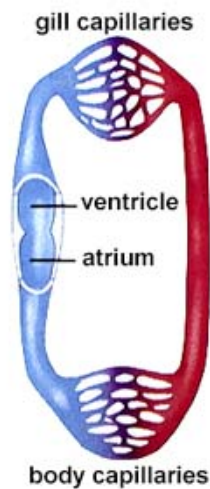
Study the diagrams, graphs, data sets, etc... that are shown below and then answer the questions that follow (with detail when necessary AND IN COMPLETE SENTENCES!!).

1. What do the “internal” surfaces of the digestive, Respiratory, and excretory systems have in common?
2. Using the picture at right of an “idealized” complex animal, identify which systems are related to each other and describe how they are related.

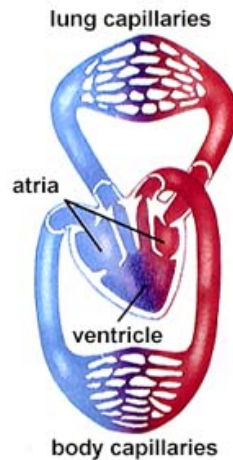


3. a. Which diagram represents YOU? Which one represents a fish?

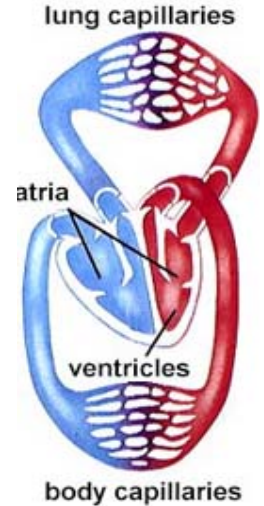
A



B



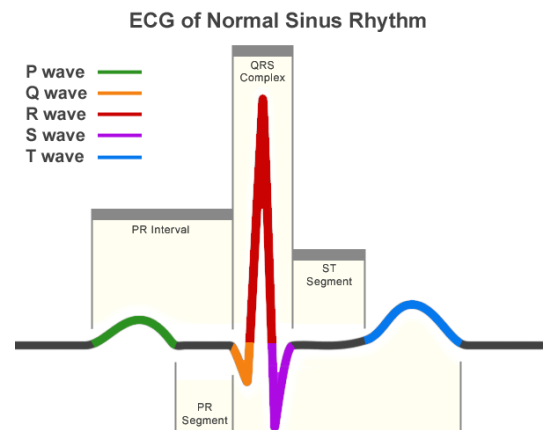
C



- b. What advantage do B and C have over A?

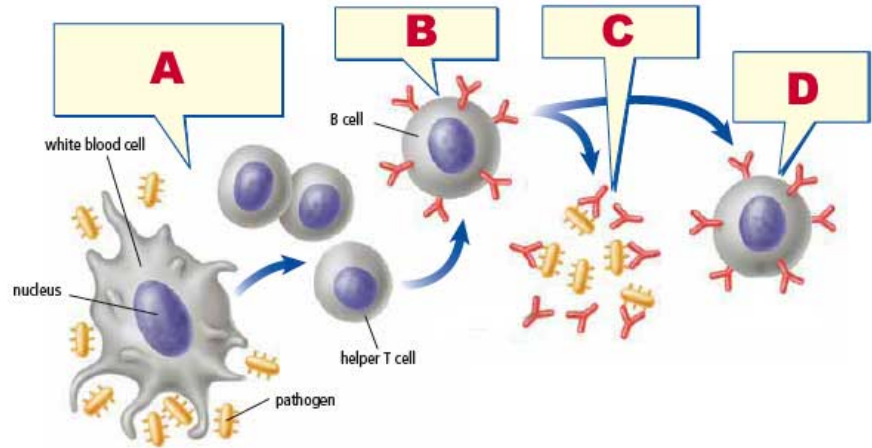
What is the disadvantage of B?

4. In the ECG/EKG at right, what is happening electrically in the heart during the P wave? What is happening electrically in the heart during the Q, R and T waves?

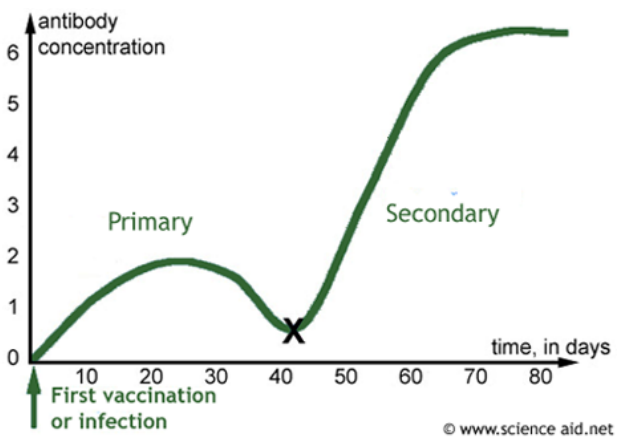


5. Which immune response is shown in the picture below: cell mediated or humoral. Explain how you know.

a. What are the “Y” shaped molecules called? What is their role in the immune response?



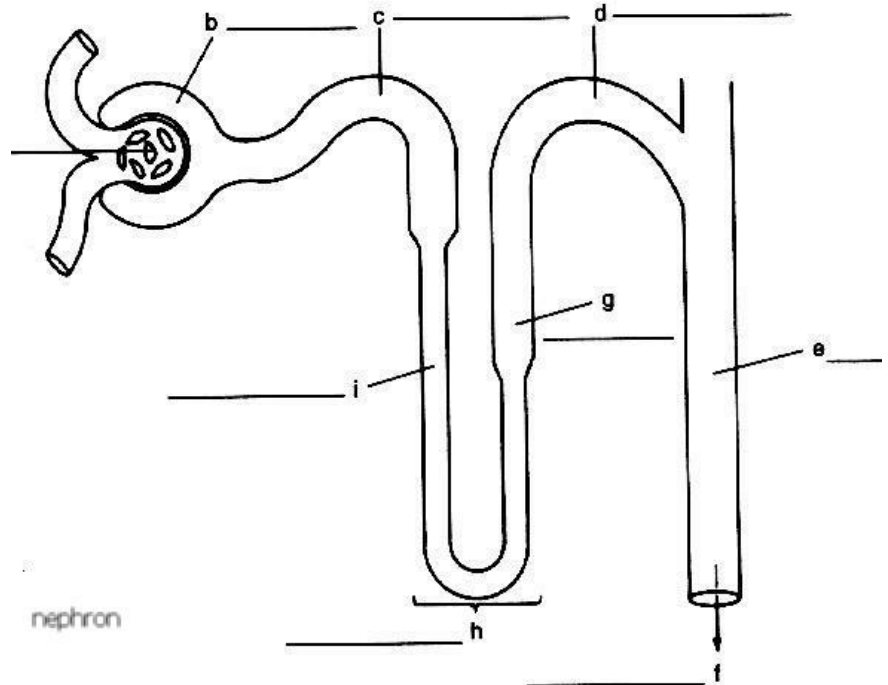
b. How are the “Y” shaped Molecules responsible for Immunological memory? How relate to the diagram at right → → → → →



6. Fill in the blanks with the correct names of the parts of the nephron.

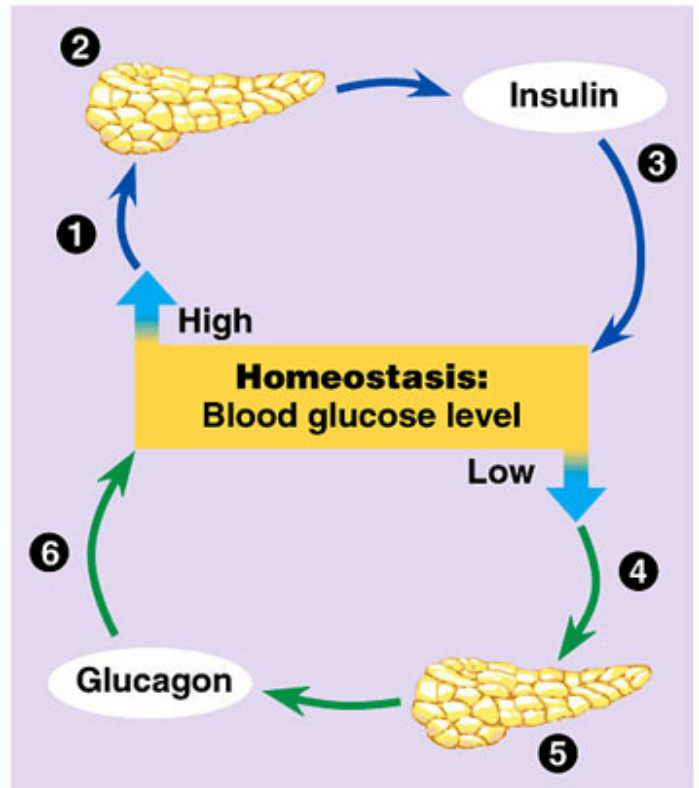
a. Where is glucose and bicarbonate reabsorbed?

b. Where would there be a high concentration of ADH receptors? What would ADH do here?



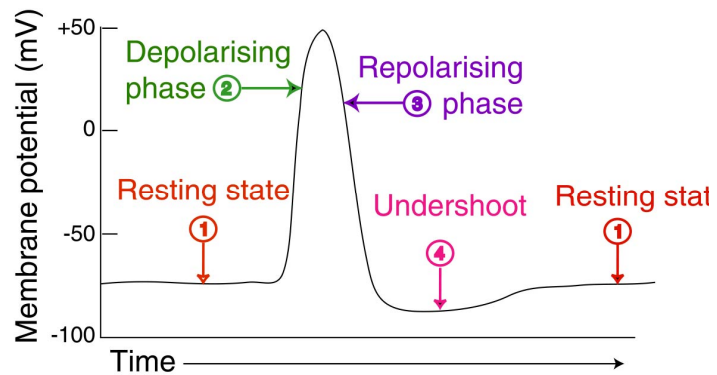
7. Name 3 responses to insulin that would happen at point number 3.

8. Name 3 responses to glucagon that would happen at point 6.

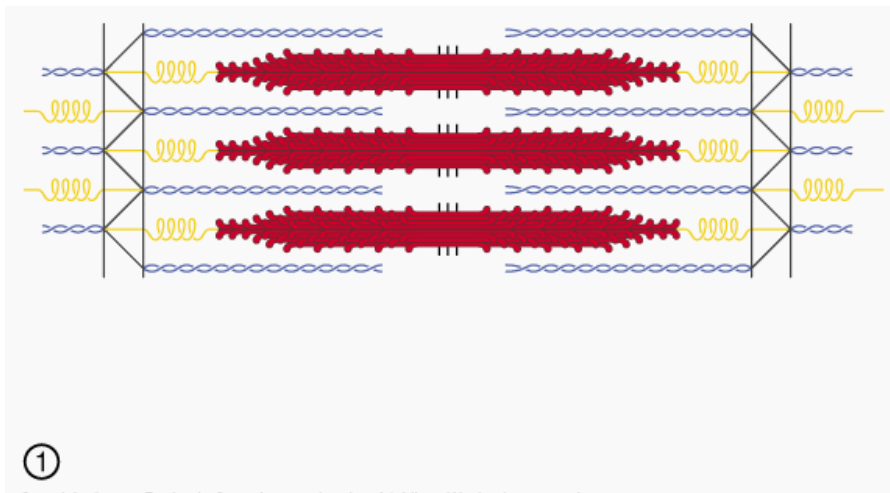


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9. a. At what point(s) are the Na/K pump working?  
 b. At what point(s) do the Na gates open? Close?  
 c. At what point(s) do the K gates open? Close?



10. Label the following in the picture below: I band, A band, Z line, H zone, M line, actin filament, myosin filament



1

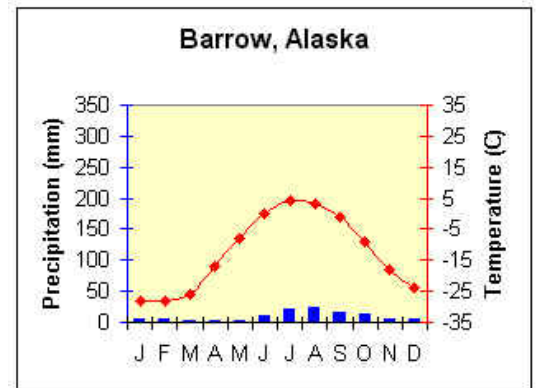
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Interpretation of Images, Data/Graphs Assignment: Ecology and Behavioral Biology

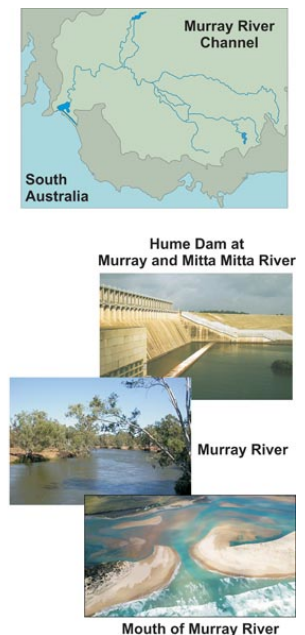
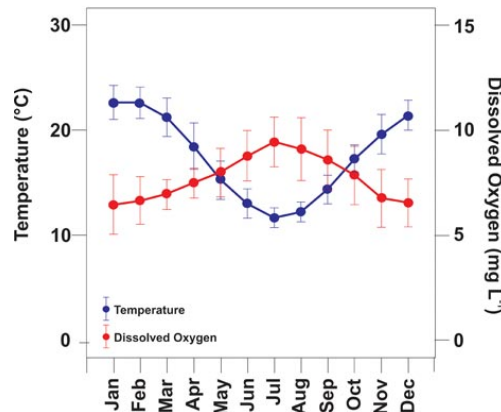
Study the diagrams, graphs, data sets, etc... that are shown below and then answer the questions that follow (with detail when necessary AND IN COMPLETE SENTENCES!!).

1. What biome is represented by the climatogram shown at right?
  - a. How do you know?



2. The diagram and graph at right shows data obtained from the Murray River in Australia.

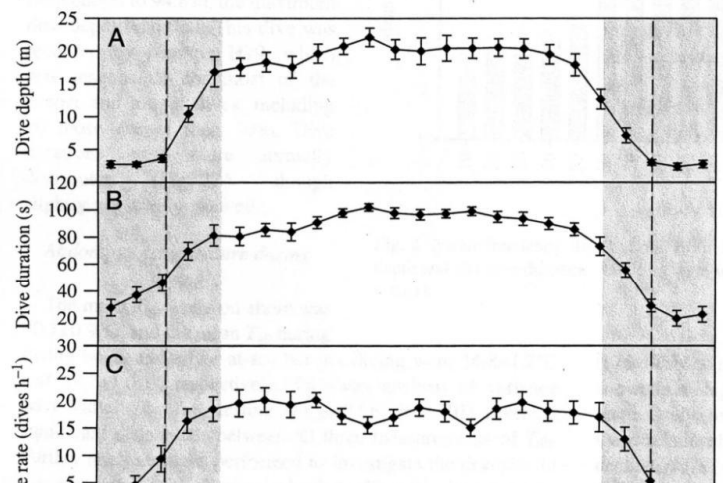
- a. What is the relationship between the temperature of the river and the time of year?



- b. What is the relationship between the temperature and the dissolved oxygen?

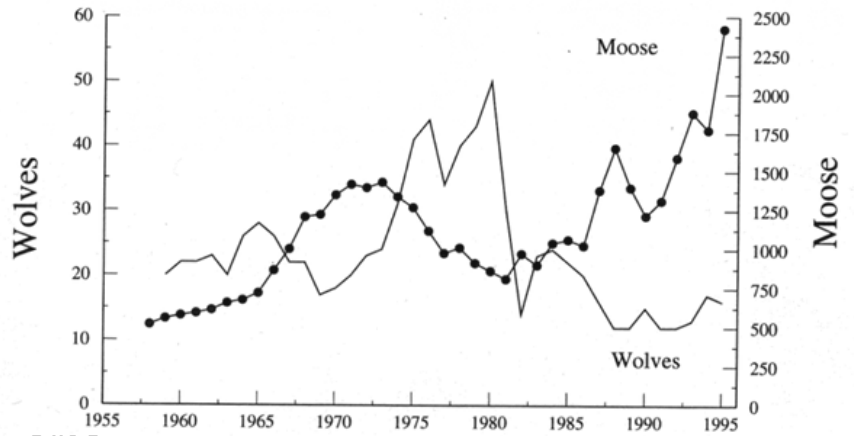
3. The graph at right shows penguin dive behavior studied over a 24 hour period.

- a. At what time of day do the penguins Make their deepest and longest dives?
  - i. Give at least two reasons for this behavior pattern.
- b. What relationship does there seem to be between penguin diving behavior and time of day?



4. What type of relationship is shown in the graph?

a. Explain how the population numbers of the wolves and the moose are related to each other?



Rolf O. Peterson:  
Ecological Studies of Wolves in Isle Royale  
Annual Report 1994-95

5. What relationship is summarized in this graph?

a. Give at least one reason that a forest and/or a grassland would have less runoff than an orchard.

