

**BIOL 1114 Exam #4 (Preview) December 9, 2014**

Use a #2 pencil to fill in the information on your NCS answer sheet. Put your **O-Key Account Username** in the boxes indicated for **LAST NAME** and darken the appropriate circles. **Write your Name (Last, First)** and **“Star”** in the space above the boxes containing your **O-Key Account Username**. Darken the **(S)** in the **last column of the name circles**. Enter the number **1434** and **darken the corresponding circles** in the **first 4 columns** of the **“Student ID.”** Failure to perform this correctly will incur a **-10pt handling fee**. Read all questions and answers **carefully** before choosing the **single BEST response** for each question. Feel free to ask the instructor for clarification.

**Use the following formulas and chart as needed.**

$$r = \frac{\text{\# of births} - \text{\# of deaths}}{N}$$

$$G = rN$$

$$G = rN \frac{(K - N)}{K}$$

mRNA-Codon-to-Amino-Acid Decoder Chart									
1 <sup>st</sup> Letter	U	2 <sup>nd</sup> Letter						3 <sup>rd</sup> Letter	
		C	A	G					
U	UUU	Phenylalanine	UCU	Serine	UAU	Tyrosine	UGU	Cysteine	U
	UUC		UCC		UAC		UGC		C
	UUA	Leucine	UCA		UAA	STOP	UGA	STOP	A
	UUG		UCG		UAG		UGG	Tryptophan	G
C	CUU	Leucine	CCU	Proline	CAU	Histidine	CGU	Arginine	U
	CUC		CCC		CAC		CGC		C
	CUA		CCA		CAA	CGA	A		
	CUG		CCG		CAG	CGG	G		
A	AUU	Isoleucine	ACU	Threonine	AAU	Asparagine	AGU	Serine	U
	AUC		ACC		AAC		AGC		C
	AUA	Methionine; START	ACA		AAA	Lysine	AGA	Arginine	A
	AUG		ACG		AAG		AGG	G	
G	GUU	Valine	GCU	Alanine	GAU	Aspartate	GGU	Glycine	U
	GUC		GCC		GAC		GGC		C
	GUA		GCA		GAA	GGA	A		
	GUG		GCG		GAG	GGG	G		

Controlling insect pests of corn is a problem for farmers. Currently, farmers use a variety of strategies such as traditional pesticides that disrupt the insect pest’s nervous system and strategies where scientists have inserted a new gene into a plant so that it produces a new protein. For example, *Bt* corn produces proteins toxic to beetles, one of their primary pests. The *Bt* protein was found in a bacterium (*Bacillus thuringiensis*) and scientists moved the gene that codes for the *Bt* protein into corn plants. The toxins that *Bt* produces causes the formation of pores in cell membranes that allow for the passage of ions (charged atoms or molecules). One of the North American beetles that cause damage to corn is very similar in appearance to a beetle in Europe.

In a simple trophic food chain within a pond, largemouth bass eat fathead minnows, which eat water fleas, which eat algae. Methylmercury is a contaminant that biomagnifies in trophic food chains.

A jar containing a large amount of green algae was kept under white light in a normal day:night cycle.

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California mussels (*Mytilus californianus*) are sessile, ectothermic, marine invertebrates. They live in the intertidal zone, where they are submerged in water and exposed to air on a daily bases. As a result of emersion (when they are exposed to air), mussels close their shells and switch to anaerobic respiration because oxygen is not available to them. Mussels eat by straining small algae from the water. Kate is an undergraduate marine biology major studying mussels in the laboratory.

<http://en.wikipedia.org/wiki/Mussel>

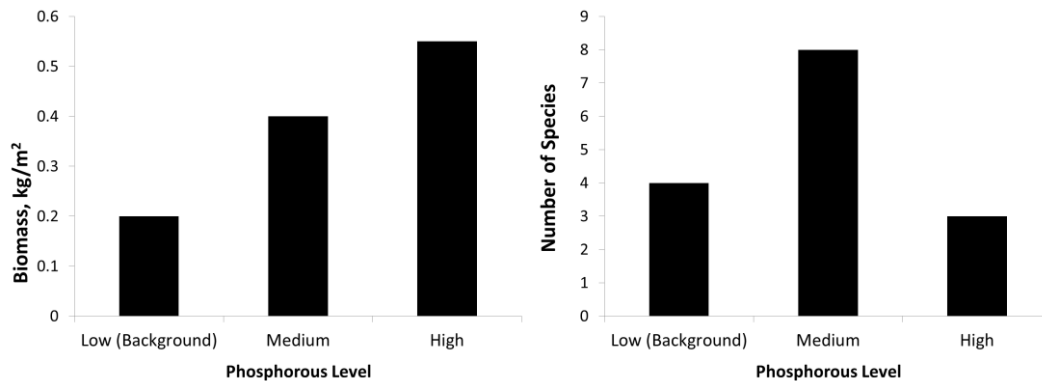
<http://oceanlink.island.net/oinfo/tides/tides.html>

Kate wants to study if increased ocean water temperatures due to climate change affect mussels. Kate learns that heat-shock proteins in the cell cytoplasm are associated with an animal's tolerance to different temperatures. Research shows that in mussels one gene that codes for a heat shock protein has a mutation in the 154th nucleotide that causes an amino acid replacement from Serine to Arginine. Kate also learns that mussels are diploid and have 28 chromosomes.

Kate's experiments are going well until she asks one of her classmates to change the water in the aquaria during the weekend when she is away. When Kate comes back to the lab all the mussels are dead. Her classmate confesses that he forgot to add the artificial seawater (3.5 % salt) to the tanks and used tapwater (0.01 % salt) instead.

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Scientists were studying the effects of phosphorous (P) on plants and communities of plants. They constructed nine plots of the same soil that contained low P, but high nitrogen (N). In three of the plots, they left the P low, for three plots they added a medium level of P, and three plots received high P. Water, light, and nitrogen were maintained at constant levels for all plots. After three years, they measured biomass and the number of species on each plot. They predicted that higher phosphorous will result in higher biomass. Here are their results.

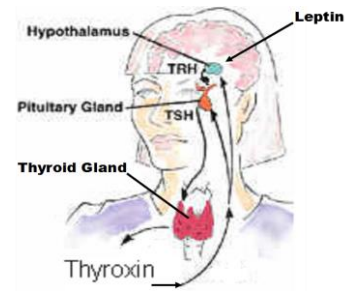


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Once bacteria are covered in antibodies, macrophages engulf those bacteria, using receptors on their surface that recognize the antibodies. Macrophages also secrete cytokines. Cytokines are molecules produced by macrophages during infection or other diseases/conditions that activate the immune system (like arthritis, inflammation etc...). One of the effects of cytokines is to induce fever.

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Dr. O. B. City has found a new mutant, overweight mouse; he calls the phenotype cuddly. To determine the nature of the mutation, Dr. City crosses two cuddly mice and notes that all their offspring are cuddly. That is not the case when Dr. City crosses a normal mouse with a cuddly mouse. Dr. City measures the levels of thyroxin in the cuddly mice and finds them to be below normal. Dr. City later crosses a cuddly mouse with a normal mouse that had previously produced cuddly mice. To gather evidence about the underlying cause of weight gain in cuddly mice, Dr. City injects a cuddly mouse with leptin. It results in weight loss.



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In yellow-headed jawfish, females invest heavily in producing eggs and then males guard the eggs by holding them in their mouths until they hatch.

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The bright red combs of roosters (male chickens) are an honest signal of the ability of males to resist parasites. The redder the comb, the better its immune system. Females are attracted to males with the brightest combs. In a room lit by blue light only, females are no longer attracted to males with the brightest red combs.

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Ten (10) bluegill sunfish are stocked into a pond with unlimited resources and no predation. After 1 year, there are 20 sunfish.