



BIOL 1114 Exam #4 (PREVIEW) December 12, 2013

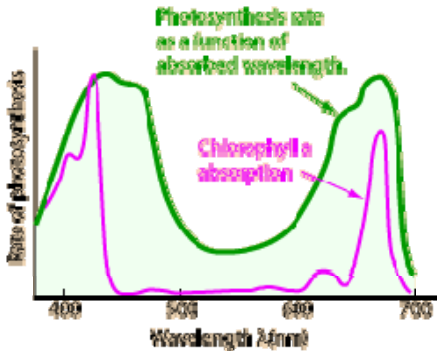
Use a #2 pencil to fill in the information on your NCS answer sheet. Put your **O-Key Account Username** in the boxes indicated for **LAST NAME** and darken the appropriate circles. **Write your Name (Last, First)** and “**Star**” or “**No Star**” in the space above the boxes containing your O-Key Account Username. Darken the (**S** or **N**) in the last column of the name circles. Enter the number **1334** 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.

mRNA-Codon-to-Amino-Acid Decoder Chart									
1 st Letter	2 nd Letter							3 rd Letter	
	U		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	Glutamine	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	Glutamate	GGA		A
	GUG		GCG		GAG		GGG		G

important equations: r = b - d G = r N G = r N [(K-N)/K]

One afternoon, while rummaging through your grandmother’s root cellar, you and a friend find a jar of canned corn beef hash. Your friend is very fond of corn beef hash, so he opened the jar and ate half the contents in just a few bites. He offered you the rest, but you declined. You resealed the jar and put it in your grandmother’s refrigerator as you went back up stairs. The next morning, your friend woke up complaining of nausea and began to vomit. Within an hour he suffered from muscle paralysis which worsened quickly and his breathing became shallow. He was rushed to the hospital, where he was placed on a ventilator (breathing apparatus) to help him breathe. Medical investigators find that the corn beef contained a contaminant which caused his condition.

Chameleons (family Chamaeleonidae) are a highly specialized group of lizards found in Africa, Madagascar and Southeast Asia. They are well known for their color changing abilities, their prehensile tails, distinctive eyes that move independently from each other, and projectile tongues. Most chameleons are oviparous (lay eggs). The Jackson’s chameleon is an ovoviviparous species, where the young develop internally within the female chameleon’s body. Dr. Krystal Tolley studies adaptive radiation in chameleons. In some species of chameleons, color changes are used in social signaling and often times an aggressive chameleon will turn black. Chameleons can make use of their color-changing abilities for thermoregulation. In some chameleon species, males have tusks that can be used in intimidating displays and territorial defense of females against other males. A dominant male chameleon that can successfully defend a territory will also be able to mate with more female chameleons. Chameleons feed on insects by ballistically projecting their long tongues from their mouths to capture prey located some distance away. In a simple food chain, chameleons eat crickets, which eat grass.



Based on the graph, a researcher designs an experiment testing the effect of using a single light source that only emits light that has a 650nm wavelength (which humans see as red) on the photosynthetic activity of young tomato plants. Ten plants are placed in 650nm only light and ten plants are placed under full sunlight of the same intensity. For each of the plants a rate of photosynthesis is measured.

Two scientists, Chris and Pat, discover a mutation in a line of laboratory mice which affects the gene involved in the production of pyruvate, so that the last step occurs much slower than normal. It is inherited as an autosomal recessive trait. Chris suggests that it is too bad that the slower metabolism trait is not dominant, because then it would spread throughout the population of wild mice making them easier to catch. The DNA sequence in a portion of the normal allele was GCC CCC CCG. A mutation was found in this portion of the allele carried by some of the slow metabolizing mice resulting in a new sequence of GCC CCC CCC.

Atmospheric deposition of polychlorinated biphenyls (PCBs), a banned chemical that was used in electrical transformers and is known to biomagnify, results in contamination of grain and vegetables grown in nearby fields. The grain is used to make bread and to feed cattle. You have just visited *Johnny Rockets* for lunch and consumed a hamburger on a bun topped with pickles, lettuce and tomato. The hamburger is rich in both protein and fat.

Some farm workers who handle a pesticide called *X-Wheat* have complained of numbness and difficulty in moving their fingers. Following *X-Wheat* exposure, an insect dies and rapidly undergoes bacterially-induced decomposition.

Meningitis is a highly contagious disease in which the tissues lining the brain (meninges) become inflamed. The infection can result in severe disability, amputations or even death. Recently, at least seven Princeton University students, all housed in dormitories, were suffering from meningitis. The *New York Times* (11/18/13) reported that “University officials have encouraged students to stop sharing drinks and to avoid kissing.” The university’s medical staff also received permission to use a new meningitis vaccine called “Bexsero” because they predict that current vaccines would be ineffective against the “serotype B” strain of bacteria that was infecting their students. Meningitis can be caused by different bacterial, viral or fungal pathogens.

In a park in Seattle there are squirrels and their fur color is affected by a single gene. The allele for brown fur is dominant over the allele for white fur. That gene may be X-linked. The white fur squirrels are easier for predators to see and they thus have higher death rates than brown squirrels, but their birth rates are the same. In the same park there is a population of raccoons. For the raccoons the birth rate (b) is 1.0 raccoons/raccoon/year and the death rate (d) is 0.6 raccoons/raccoon/year.

Tufted Puffins (*Fratercula cirrhata*) are pelagic seabirds from the auk family (Aves: Alcidae) found throughout the North Pacific Ocean. Besides their characteristic thick bills for catching fish, their most distinctive feature are the yellow tufts that appear annually on birds of both sexes during the summer reproductive season. Puffins are very active birds with short wings and feet adapted for diving in cold northern seas. In 2001 a biologist went to the Cook Inlet in Alaska and found that 10% of tufted puffins (a species of bird) had yellow beaks and 90% had orange beaks. Previous research had



shown that puffin beak color was partially determined by genetic inheritance. In 2010 the same scientist found that the frequency of different beak colors had changed so that 60% of tufted puffins had yellow beaks and 40% had orange beaks. Puffins have 80 total chromosomes in skin cells, which are diploid.

Corn is a staple crop in the Midwest, and found in almost every food we eat. The majority of corn is grown to be used as animal feed or to be converted into high-fructose corn syrup. However, growing corn can cause environmental damage as farmers often apply fertilizer and pesticides to produce a crop. If not applied carefully, fertilizers, which contain N and P, can contaminate the environment. Fertilizer, which contains N and P, is used to increase the growth of corn.

The locals of Creston, Iowa, a small farming community where corn is king, noticed that after a heavy rain the water in nearby McElliot's Pond became green and choked with algae. A week later the algae and fish began to die. Oldtimers at the local diner can be heard to complain that "fishing in McElliot's Pond ain't as good as it used to be!" Additionally, boys who have been skinny-dipping in the pond have all become sick. The locals know of your stellar reputation as a biology student at OSU, and you are brought in to investigate the cause of the algal bloom and the poor fishing conditions.

In addition to finding dead fish and algae at the bottom of the pond, you analyzed a water sample taken from the pond first thing in the morning and recorded the following information in a table:

	Levels in Pond	Normal Levels
Oxygen Level	0.2 mg/L	10 mg/L
Bacteria Level	663 bacteria/L	175 bacteria/L
Nitrogen (fertilizer) Level	17 ppm	28 ppm

In Iowa spring can be cold. Corn grows better in July as the temperature warms up. Genetically modified corn, called *Bt-corn*, was developed by scientists at Pioneer Hybrid Labs. *Bt-corn* produces its own pesticide. The gene for pesticide production in *Bt-corn* came from a bacterium. Fungicides that block the electron transport chain in the mitochondria of fungi are also sprayed on corn to prevent fungal disease.