

BIOL 1114 Exam #3 (Preview) for November 18, 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 **1333** 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	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		ACA		AAA	Lysine	AGA	A	
	AUG	Methionine; START	AAG		AGG		Arginine	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: $r = b - d$ $G = r N$ $G = r N [(K-N)/K]$
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Recently, an unusually heavy snowfall hit the western South Dakota region. It dumped as much as 4 feet of heavy wet snow with drifts as high as 10 feet. Many ranchers in the region lost 80-90% of their cattle. Many of the cattle that survived were found standing on the downwind side of large stands of spruce trees (an evergreen tree). Assume that cattle have a thermal neutral zone of 50-90°F.

One rancher lost 280 of his 300 cattle. Luckily for him, one of his bulls survived and he has decided to rebuild his herd starting with his 20 surviving cattle. While only 30% of his original herd were white-faced cattle (black body and white head), this dominant trait is present in his surviving bull and thirteen of the cows (a total of 70%). Other nearby ranches, which started with similar ratios, had herds that were 5%, 20%, and 90% white-faced cattle after the storm.

Assume there is a protein in cattle that causes a cow to be white-faced. When the amino acid sequence of this protein was compared to that of solid black cattle, a change from Glutamate-Aspartate-Valine-Aspartate (solid black cattle) to Glutamate-Aspartate -Aspartate -Aspartate (white-faced cattle) was discovered.

Beginning with the 20 cattle that survived (2012), 18 calves are born in the first year (2013) after the storm and only 2 die.

A bachelorette has three suitors for marriage. As she loves each of them dearly, she decides to choose based on potentially phenotypes of her offspring. (Strangely, she loves genetics almost as much the three men!) She compiled the following table to help her in her decision making process.

Person	Sex	Colorblind (Color-blindness is X-linked recessive)	Blood Type	Earlobe Free/Attached (free is dominant; attached is recessive)
<i>Bachelorette</i>				
Lily	Female	N	A	Attached
<i>Suitors</i>				
Brad	Male	N	B	Attached
Channing	Male	N	O	Free
Jake	Male	Y	AB	Free

Lily thinks children are much cuter if they have attached earlobes. Jake’s mom had attached earlobes Lily’s father was colorblind. Both Lily’s mom and Brad’s dad were passionate about giving blood since they were universal donors. O-blood type results from an added nucleotide within the coding portion of the ABO blood group gene that creates a stop codon.

A flu epidemic seems to invade the campus practically every fall. Our health clinic recommends you visit them to receive the current flu vaccine. Just as they did last year, the state health department has warned our campus that last year’s flu vaccine will not protect students from this year’s flu epidemic.

The popular website “23andMe.com” promises their customers a genetic analysis of the DNA isolated from customers’ buccal epithelia (inner cheek linings) cells that have detached and are suspended within the saliva. The scientists collecting the saliva specimens observed that there are more bacteria within the saliva than human cells.

Recently the U.S. Fish and Wildlife Service have proposed that the Northern Long-eared bat (*Myotis septentrionalis*) be added to the endangered species list due to deaths from white-nose syndrome. This species of bat can be found throughout the Midwestern U.S. and parts of Canada where it lives in mature forests and forages on insects. The northern long-eared bats are small compared to other bats in the genus *Myotis*, and females typically produce one pup per summer breeding season. During the past 5-7 years, many populations of bats, including the northern long-eared bat, have been decimated by an outbreak of white-nose syndrome. Caused by the fungus *Pseudogymnoascus destructans*, white-nose syndrome develops in nasal passages of bats during hibernation and is spread through close contact with other bats. It causes severe dehydration and tissue damage, ultimately waking the bat from hibernation in the middle of winter. Unable to forage for insects or thermoregulate, infected bats often die. White-nose syndrome has been responsible for the loss of approximately 90% of some bat species, including the northern long-eared bat.

Several bats in the population were affected by white-nose syndrome and awoke from hibernation early when ambient temps were low and insects (food) are scarce. Several members of bat populations exposed to white-nose syndrome die, with as little as 10% of the population surviving. Scientists want to know why these bats survived while others did not. A laboratory technician studying white-nose syndrome examines a tissue sample from an infected bat. Sometimes the growth of bat populations are limited by roosting space in caves or trees.