

BIOL 1114 Exam #3 (Preview) November 20, 2017

Use a #2 pencil to fill in the information on your NCS answer sheet.

- Put your **O-Key Account Username** in the spaces indicated for LAST NAME and darken the corresponding circles.
- Write your Name** (Last, First) and the word "**Star**" or "**NoStar**" above the words "Last Name".
- Put your **CWID** in the spaces indicated for "**Student ID**" and darken the corresponding circles.
- Enter **1733** in the spaces indicated for "**Course number**" and darken the corresponding circles.
- Enter **001** (Star) or **002** (NoStar) in the spaces indicated for "**SEC**" and darken the corresponding circles. **Failure to perform this correctly will incur a -10 pt 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		ACA		AAA	Lysine	AGA	A	
	AUG	Methionine; START	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: $r = b - d$ $G = r N$ $G = r N [(K-N)/K]$
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In 1958, the Walt Disney Company released a nature documentary called White Wilderness. In it, they claimed that lemmings (small arctic rodents) committed mass suicide when their populations grew out of control. Even though it was later revealed that Disney threw the lemmings off a cliff to capture the behavior, large populations really can experience rapid declines in subsequent years. Lemming populations grow exponentially then crash, which is why the populations fluctuate so much.

Imagine that a few of the many lemmings thrown off the cliff into the chilly arctic waters survived and swam their way to the uninhabited Island of Misfittoyz and began to reproduce. Further investigation showed that those lemmings, and their offspring, had slightly thicker, insulating fur than did those that died.

Another few of the many lemmings were carried by a current to the deserted Trezur Island and immediately formed a breeding population. Among the lemmings that arrived were an unusually high proportion that had a grey streak of fur and curly tails. Many generations later, the population had the

same high proportion of individuals with grey streaks of fur and curly tails (many more than the mainland), indicating they had the same fitness as those without the grey streaks and curly tails. The population of lemmings that reached Island of Misfittoyz was 22 and the next year the populations was 44

Several generations later, Drs. Michael Maus and D. Duc collected lemmings from the islands and bred them with lemmings from the mainland. Here are some of their results

Cross	Male	Female	Male Offspring (%)	Female Offspring (%)
1	Thick Fur	Thick fur	75 Thick fur: 25 Thin fur	75 Thick fur: 25 Thin fur
2	Thick Fur	Thin Fur	100 Thick fur	100 Thick fur
3	Thin Fur	Thin Fur	100 Thin Fur	100 Thin Fur
4	Grey Streak	Grey Streak	100 Grey Streak	100 Grey Streak
5	Grey Streak	All Black	100 All black	100 All Black
6	Grey Streak	All Black	50 Grey Streak: 50 Black	50 Grey Streak: 50 Black
7	Grey Streak	Grey Streak	100 Grey Streak	100 Grey Streak
8	All Black	All Black	75 Black: 25 Grey Streak	75 Black: 25 Grey Streak
9	Curly-Tailed	Straight-Tailed	100 Straight-Tailed	100 Straight-Tailed
10	Straight-Tailed	Curly-Tailed	100 Curly-Tailed	100 Straight-tailed
11	Straight-tailed	Straight-Tailed	50 Curly-Tailed: 50 Straight-Tailed	100 Straight-tailed
12	Curly-Tailed	Curly-Tailed	100 Curly-Tailed	100 Curly-Tailed
13	Curly-Tailed	Straight-Tailed	50 Curly-Tailed: 50 Straight-Tailed	50 Curly-Tailed: 50 Straight-Tailed

Lemmings, being mammals, are diploid. The part of the template portion of the gene Drs. Duc and Maus hypothesize as responsible for **thick** fur is TAC/ATA/CTA/GTT/CAT/ATC and is found on Chromosome 6. They propose that it produces an enzyme, not found in lemmings with thin fur, responsible for adding thickening components into the hair fibers.

Dr. Duc was bitten while collecting lemmings in the field and was unable to properly care for the wound, so it became infected, despite Dr. Duc’s recent vaccination against tetanus.

Some birds, crustaceans and butterflies have been observed to produce rare individuals that are bilateral gynandromorphs, in which half of the animal is male and half female. An example is the pictured specimen of *Papilio glaucus*, a common butterfly in eastern North America in which males and females have different color patterns on their wings. In butterflies, females have the sex chromosomes ZW, while males are ZZ (opposite from humans, in which XX = female and XY = male). Sex-linked traits in butterflies thus are on the Z chromosome (Z-linked). Butterfly gynandromorphs apparently result from abnormal egg cells that have two nuclei (each of which is a “normal” egg nucleus); sperm fertilize both nuclei and the fertilized nuclei end up in different cells during subsequent cell divisions in the embryo, resulting in the half-and-half sex. Researchers so far have been unable to get these individuals to lay eggs, so they cannot reproduce.

The European population size decreased rapidly during the bubonic plague outbreak beginning in 1347. Rats carried the plague-infected fleas that would then bite humans (infectious bacterium = *Yersinia pestis*).

Mitochondria inside eukaryotic cells today are theorized to be the results of a two-billion-year-old acquisition of bacteria by some cells.

Bob (blood type A) and Toni (blood type AB) are the proud parents of Ronnie (blood type B).

A rabbit moves from the shade of a bush to a nearby area in the sunlight, where the ambient temperature is 10 °C warmer but still within the thermal neutral zone of the rabbit.

Pat was vaccinated for flu last month and developed flu anyway six weeks later. Perturbed, Pat asked the physician why. Several years later, Pat lost immunity to a strain of the flu.