

**BIOL 1114**

**Exam #3**

**April 11, 2016**

The following material will appear on the upcoming exam. Use this preview to familiarize yourself with the material, and guide you in studying. Be sure to look up the definitions of any words you do not know. You are free to discuss this material or ask questions about it.

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 “**NoStar**” 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 **1613** 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 <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	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	Arginine	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

Use the following formulas and chart as needed.

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

$$G = rN$$

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

Research geneticists at Oxford University studied mutations in **FOXP2**, a gene associated with the development of speech in mammals and birds. Several mutations in FOXP2 were associated with speech defects in humans and impair the ability of birds to vocalize alarms concerning predators, locate offspring, or attract mates, all of which enhance their fitness.

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MRSA (**m**ethicillin-**r**esistant *Staphylococcus aureus*) has infected a number of OSU athletes and students during the past three years. Methicillin is an antibiotic from the penicillin family. Infected patients were successfully treated with vancomycin.

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Daniel is a precocious boy who just turned 9 years last February 16<sup>th</sup> and he is junior in the Lakeview Middle School. His biology teacher asked him to develop a 6 months long project on his back yard and here is what he did. He selected an area of 20 feet square and constructed a fence around it. He placed 100 snails in that area and observed them for 6 months. Because Daniel is a curious boy, he found some crucial information in the *Journal of Malacology*. For instance, he found that hypothetically in a population of 1000 snails under normal conditions 1,000,000 snails are born and 999,980 die in a month. He used these values for his observations to estimate the dynamics of his snails in the back yard.

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Oleander aphids, *Aphis nerii*, are small insects that suck the sap from oleander plants. They reproduce asexually (i.e. young develop from diploid eggs that do not require fertilization) or sexually (with normal haploid gametes), but both forms are diploid with 8 chromosomes. In the asexual phase, population growth is very rapid. A few (50) aphids from a huge (200,000) population were the first members of that species carried by the wind into an enormous (2000 square meter) field of oleander lacking any of the predators that feed on oleander aphids. A population of oleander aphid is growing as follows:

Week	# of aphids at <b>start</b> of week
1	50
2	600
3	7200
4	

The scientist who is studying this population of oleander aphids is red-green colorblind (the type that is X-linked) and possesses Type O blood. Her brother has normal color vision and type AB blood. She recently suffered from flu, despite the fact that she had been vaccinated against the flu last year.

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X-linked juvenile retinoschisis is a condition characterized by impaired vision that begins in childhood and occurs almost exclusively in males. This disorder affects the retina, which is a

specialized light-sensitive tissue that lines the back of the eye. Damage to the retina impairs the sharpness of vision (visual acuity) in both eyes. Typically, X-linked juvenile retinoschisis affects cells in the central area of the retina called the macula. The macula is responsible for sharp central vision, which is needed for detailed tasks such as reading, driving, and recognizing faces. X-linked juvenile retinoschisis is one type of a broader disorder called macular degeneration, which disrupts the normal functioning of the macula. Mutations in the *RS1* gene cause most cases of X-linked juvenile retinoschisis.

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