

BIOL 1114 Exam #3 (Preview) April 11, 2011

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 **933** and **darken the corresponding circles** in the **first 3 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. You may only use the calculator provided during the test.

mRNA - Codon - to - Amino - Acid Decoder Chart									
1 st Letter	U	2 nd Letter						3 rd 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	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: $r = b - d$ $G = rN$ $G = rN [(K-N)/K]$
You may only use the calculator provided during the test!!!

The Island Fox is native to 6 of the 8 Channel Islands off of the coast of California near Santa Barbara. It has become an endangered species mostly because of increased predation by Golden Eagles on the fox pups. The Golden Eagles became more common on the islands after the Bald Eagle populations on the islands were reduced by chemical contamination. In 2000 there were 14 foxes left on Santa Rosa Island. The area of the island is 83 sq miles. On Santa Cruz Island there were 100 foxes in 2001. The National Park service has began a recovery plan for these foxes including removing the Golden Eagles and restoring the habitat. The efforts have been successful and the death rate (d) of the population has been reduced to 0.1 deaths/year/fox and the birth rate (b) is 0.25 births/year/fox. There are differences in fur color between individual foxes. Let's assume that it has been discovered that fox fur color is affected by a single gene with two alleles. FF and Ff individuals are grey and ff individuals are brown.

To better understand the effect of food availability on the choice of foraging patches by mice, our behavioral ecologist wants to expand her range of experiments. Again she divides a study area into equally sized grids. This time, within each grid she evenly distributes 20 nuts onto round plates of different sizes: Plate sizes are recorded in square centimeters (cm²) below. The ecologist hypothesizes that the density of nuts will influence mouse foraging behavior. The number of mice visiting the plate is recorded by camera over a 3 hour time period. Mice most often feed simultaneously.

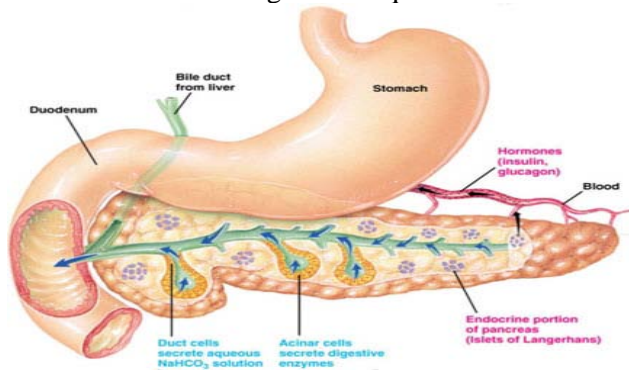
Plate	Plate area (cm ²)	Nut density (# nuts/cm ²)	# Mice visiting plate
1	150	0.133	5
2	120	0.166	8
3	80	0.250	10
4	60	0.333	15

5	30	0.666	25
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Bacteria make excellent experimental models for cell growth and genetics because they are easily manipulated and have short generation times.

time→	1 hr	2 hr	3 hr	4 hr	5 hr
# bacteria	1,000	2,000	4,000	8,000	16,000

The pancreas is a versatile organ for the body's "food processing". The pancreas secretes hormones such as insulin that are involved in glucose metabolism, as well as various digestive enzymes. These enzymes (catalytic proteins) are in a solution known as pancreatic juice and are secreted into a duct that empties into the small intestine. Pancreatic enzymes include trypsin - which breaks down proteins; steapsin - which breaks down fats; and amylopsin - which breaks down complex carbohydrates, including starches. The failure of the pancreas to secrete enough of the insulin hormone can lead to insulin-dependent diabetes, which is an inability to absorb glucose into cells. The molecular biologist estimated the amylopsin gene to consist of 600 base-pairs of DNA. A detailed molecular analysis of the amylopsin gene reveals that 300 of its bases are guanine (G). The scientist identifies the following DNA sequence: CCTTACTGTGGAATAATT



In areas of the world where diseases such as, West Nile virus, yellow fever, or malaria are prevalent, insecticides are often used in an attempt to eliminate the disease vector, mosquitoes. Mosquito resistance to carbamate pesticides has been attributed to a change in the gene for the enzyme acetylcholinesterase. This change at the center of the gene alters a single amino acid at the center of the acetylcholinesterase so that the acetylcholinesterase continues to function and the pesticide can no longer block the active site of the acetylcholinesterase.

Daphnia are small crustaceans that inhabit most lakes. *Daphnia* populations grow exponentially in the spring and then the population size becomes stable in the summer. It then declines through the fall and winter, before growing exponentially again the following spring. A researcher interested in understanding the impact of a bacterial pathogen on *Daphnia* populations builds an artificial lake.

After a hurricane hit the *Texas Shore*, the hospital records for that resort town were destroyed leaving several summer resident couples unable to determine which of the surviving newborns were theirs (luckily there were only these few babies in the hospital at the time. Life was further complicated by a rescue worker who claims to be a long lost relative. Here is what we know about them.

Person	Blood type	Dislikes Brussels Sprouts (Dislike is autosomal dominant)	Ear Wax (dry is autosomal recessive)	Vision (Colorblindness is X-Linked recessive)
Samantha	O	Dislikes	Wet	Normal
Nicole	AB	Likes	Dry	Normal

Jenny	O	Dislikes	Dry	Colorblind
Pauli B	O	Likes	Dry	Normal
Michael "circumstances"	A	Dislikes	Wet	Colorblind
Vincent (baby)	O	Dislikes	Wet	Colorblind

There are some genes associated with risk taking. For one of those genes, those who are more likely to avoid risk possess 2 copies of the "short" allele. Those with one or more copies of the "long" allele are more likely to take risks, e.g. have a tendency toward gambling. It is thought that Nicole and Pauli each have only one copy of the short allele.