BIOL 1114 Exam #4 (Preview) May 8, 2018

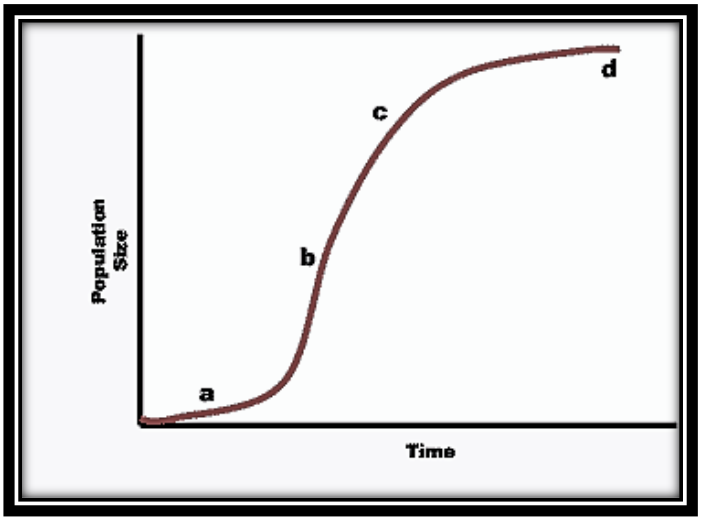
Use a #2 pencil to fill in the information on your NCS answer sheet.
1. Enter your **last name** and **first name** as indicated and darken the corresponding circles.
2. Enter your **CWID** in the spaces indicated for "Student ID" and darken the corresponding circles.
3. Enter **1814** in the spaces indicated for "**Course number**" and darken the corresponding circles.
4. Enter the **form** of the exam **001 or 002** in the spaces indicated for "**SEC**" and darken the corresponding circles
5. Write your **O-Key Account Username** above the words "Last Name".

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

1st Letter	2nd Letter: U		C		A		G		3rd 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	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

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



Like any loyal OSU fan, many **harlequin poison dart frogs** of the Amazon rainforests have bright orange-and-black webbings covering their bodies. Potential but wary predators of this frog usually associate the brilliant webbed colors with a poison (histrionicotoxin) secreted from the harlequin frog's skin cells. This toxin **blocks acetylcholine receptors** on the membrane of post-synaptic muscle cells. Harlequin males alert females to their presence with a high-intensity call. Females lay their eggs upon litter covering the rainforest floor. The **Venezuelan glass frog**, often found in the same rainforest habitats as the harlequin, have a nearly translucent skin, making them difficult to detect in the rainforest. The glass frog secretes no known toxins.

Animal biologists have correlated the sound intensity of male harlequin's calls to its size, which is an inherited trait. Louder males attract more potential mates. Their toxin protects all size males from predators.

Scientists currently hypothesize that harlequin frogs acquire the toxins that they secrete from their skin from the insects they eat. The toxins do not harm the frog nor protect the insects from the frog.

An earthquake separates and isolates a small population of Venezuelan glass frogs in a small valley. About 30% of the frogs in the valley have brown spots, while only about 2% of the original population had such spots.

A jaguar was transported from a tropical rainforest to a zoo in New England. In Fall, the temperatures in the jaguar's outdoor enclosure drop well below that of the rainforest in which the jaguar lived.

In a simple food chain at a North Carolina alligator sanctuary, several species of grasses (family Poaceae) produce seeds, which are eaten by deer mice (*Peromyscus maniculatus*), which are eaten by raccoons (*Procyon lotor*), which are eaten by American alligators (*Alligator mississippiensis*). The sanctuary is built next to an abandoned lead (Pb) mine.

Lead compounds cannot be efficiently excreted (removed) from the animal or plant cells. The soil in the sanctuary is high in lead, which the grasses absorb along with water.

Raccoons living in this sanctuary can survive nearly twice the level of lead poisoning as raccoons living in regions farther away from the lead mine.

Like many wetlands, the sanctuary has limiting levels of nitrogen (N) in the soil, and grasses have to survive with less N.

The Center for Rehabilitation of Obese Wildlife (CROW) has been studying the effects of overfeeding on raccoons by comparing populations in sanctuaries like that in North Carolina and in small towns such as Stillwater. During their work, scientists at the center, affectionately known as CROWS, discover that some of their raccoons do not lose weight even when living in conditions in which other raccoons do. They are lethargic and tend to eat continuously, preferring to eat graham crackers, chocolate, and marshmallows. The CROWS label them the

Super Massively Obese Raccoons (SMORS). Alligators find SMORS that have warmed themselves near campfires particularly tasty. The CROWS extract blood to measure the leptin levels in the SMORS and normal raccoons. They then set up experiments in which they inject SMORS and Normal raccoons with leptin. Here are their results:

Table 1. Results of leptin injection

Raccoon Type	Mean weight before injection	Mean weight 2 weeks after leptin injection	Mean weight 2 weeks after saline injection
SMORS	19 kg	20 kg	20 kg
Normal	8 kg	6.8 kg	8 kg

They also mated SMORS and Normal Raccoons with the results as follows:

Table 2. Results of mating experiments

Cross	Average % of SMOR offspring	Average % Normal Offspring
SMORS X SMORS	100	0
Normal X Normal	0	100
Normal X SMORS	0	100

They then bred the offspring of all those crosses. During the experiments, one of the CROWS, was bitten by a SMOR, which was later determined to have rabies.

A lab is testing the reactions of fruit flies (*Drosophila melanogaster*) to sounds to better understand how small organisms can determine the directionality of noises. Fruit flies have specialized organs within their antennae comprised of approximately 500 Johnston's organ neurons or JONs. There are five types of JONs: two detect sounds, two aid the fly in flying by sensing gravity and wind, and one which does both. Flies can determine the direction of sound because sound preferentially stimulates JONs oriented perpendicular to the source of the sound.

Using overripe fruit, the lab trains the flies to move towards a high-pitch tone. All tests are conducted in a well-lit lab space at room temperature (approximately 23ºC).

The lab discovers that a strain of fruit flies responds to the high-pitched tone, but moves in a random direction rather than towards the source of the tone. These flies also fly in erratic patterns. The scientists decide to label these flies as "Z-type".

When two Z-type flies mate, they produce only Z-type offspring. When a Z-type fly is mated with a "normal" wild-type fly, they produce only Z-type offspring, but when those Z-type offspring are mated with each other, approximately 75% of the offspring are Z-type, and 25% are wild-type.

Adrian (blood **type O**) is taken to the ER for an emergency blood transfusion: Unfortunately, an orderly brings a bottle of **type B** blood (mislabeled “type O”) to the transfusion, and Adrian immediately experiences potentially fatal “hemolytic anemia”. The medical staff rapidly realizes the error, filters Adrian’s blood supply of all red blood cells and supplements it with type O blood. Adrian recovers.