

BIOL 1114 Exam #4 (STAR Form) May 4th, 2015

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 **1514** 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	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	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:	$r = b - d$	$G = rN$	$G = rN [(K - N) / K]$
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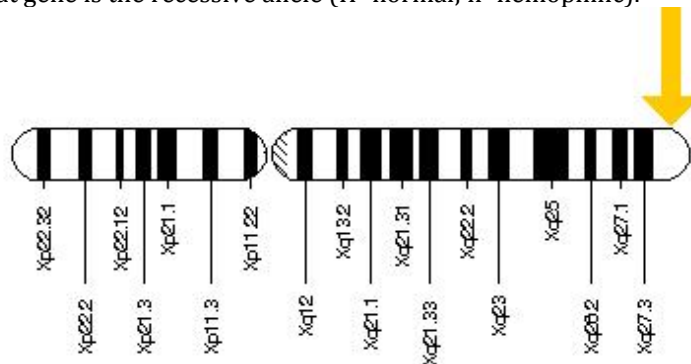
The Hawaiian Islands are home to honeycreepers, a diverse group of birds with curved beaks that feed on the nectar of different flowers. The Iiwi and Apapane are two species of Hawaiian Honeycreepers. The Iiwi is endangered. To protect the species, conservation planners are trying to engage students of Hawaiian high schools to grow and plant more lobelid flowers. They set up an experiment to test the best conditions to grow lobelid flowers. The high school students are very engaged in this project and apply their knowledge of plant growth to create a successful experiment, however Dan the Beagle is on vacation in Hawaii and wants to participate. He gets some lobelid seedlings and puts them in a dark closet where he waters them regularly.

Treatment	Number of seedlings	Number of plants surviving after 1 year	Mean plant height after 1 year (cm)
water only	30	5	10
water and nitrogen fertilizer	30	7	12
water and phosphorus fertilizer	30	20	10
water and nitrogen + phosphorus fertilizer	30	30	15

Mosquitoes have been introduced to the Hawaiian Islands and transmit microbial parasites that cause avian malaria. This disease is negatively impacting Hawaiian Honeycreepers. One way to minimize harm to endangered honeycreepers is to control mosquito populations with pesticides. Organophosphates interfere with the action of acetylcholinesterase.

While on his Hawaiian vacation, Dan the beagle noticed a lack of dog toys to play with while in the ocean. Therefore, Dan sets out to create the world's greatest ocean dog toy! Dan has hired you, to be a part of his research and development team to create Woofderful Water Fun (WWF). Dan decides that the research team should focus on creating a toy that is made from an artificial cell membrane. Since this toy will be used in the ocean, you suggest filling the toy with a solution, so its volume does not change over time. After looking at the first model, Dan realizes that he is happy with the shape but not happy with the size of the toy, and suggests that the toy should be larger. While testing the WWF in the ocean, Dan wonders how organisms get their oxygen while living underwater. Dan thinks that the oxygen content of the ocean affects how the WWF works, but the ocean is overrun with algae! Dan notices that even though he is standing in water, his face feels hot. Later, Dan decides to go for a run! He wonders what is happening during cellular respiration in his body while he runs. Dan asks if all mutations cause changes that result in cancer. Dan is really curious about how cells divide, and wants to know about meiosis and mitosis.

A genetic counselor is meeting with a man who has two sons with hemophilia and two phenotypically normal daughters. Hemophilia is a disorder linked to the F8 gene on the X chromosome in humans. The normal version of gene *F8* produces the clotting factor VIII and is a dominant allele. Mutations in *F8* produce an abnormal version of the coagulation factor VIII, a protein. If this protein is modified or missing, blood does not clot efficiently. The abnormal variant of that gene is the recessive allele (H=normal; h=hemophilic).



<http://ghr.nlm.nih.gov/dynamicImages/chromomap/F8.jpeg>

In 1980 the U.S. Fish and Wildlife Service calculated the population of Rocky Mountain elk in Yellowstone Park to be 126 individuals. Ten years later the elk population had grown to 234 individuals. Rocky Mountain bull elk antlers, often weighing over 40 pounds and measuring 4 feet wide, may limit a male's ability to outrun packs of wolves, especially in heavily wooded areas.

Sickle cell anemia is a disorder in which red blood cells (RBCs) present abnormal shape. The cause of sickle cell anemia is a single base substitution in the DNA, resulting in the replacement of the amino acid glutamate by valine. Only humans with two copies of the sickle cell mutation develop the disorder. However, humans that carry the sickle cell mutation are less likely to die from malaria. Malaria is caused by a unicellular parasite (*Plasmodium falciparum*) carried by mosquitos. The parasite reproduces within red blood cells.

The North American beaver (*Castor canadensis*) is the largest rodent in North America, and second only in size to the capybara (*Hydrochoerus hydrochaeris*), which inhabits the savannas of South America. Beavers range as far north as the cold boreal forests of Canada but the capybara only occurs in the hot tropics. Both species of mammals live near permanent fresh water bodies where they feed

on plants. Beavers are best known for their dam-building capabilities and their flattened, paddle-like tails, which serves as fat reserves in winter. Beavers mate for life, while capybaras live in large social groups.