

Exam Four – Preview Material

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

- Put your OKEY ID in the boxes indicated for LAST NAME and darken within the corresponding circles.
- Write your name (Last, First) in the space above the boxes containing your OKEY ID.
- Enter the number **1024** and darken within the corresponding circles in the first 3 columns of the “Student ID”.

Read all questions and answers *carefully* before choosing the single BEST response for each question.

Please feel free to ask me questions during the exam!

Use the following formulas and chart as needed.

r = b-d G = rN G = rN $\frac{(K - N)}{K}$

mRNA-Codon-to-Amino-Acid Decoder Chart									
1 st Letter	2 nd Letter								3 rd Letter
U	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	Arginine	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

Jerry has a large pond on his property that receives rainwater runoff from an adjacent property. Toward the end of the summer of 2007, he noticed a lot of his fish died. In February of the following year (2008) he restocked the pond, adding about 24 bass but expecting the population to grow to about 36 bass, which is the average number of bass which typically lived in the pond. In March his pond appeared healthy with a balance of fish, aquatic invertebrates, aquatic plants, and some algae. That month, his neighbor treated his crops with fertilizer which contained nitrogen and phosphorus. After heavy rain in April of 2008, much of the fertilizer washed into Jerry's pond again. In May there were massive algae blooms, which mostly blocked the view of the fish, but Jerry still saw them during feedings. Throughout the summer the water became murkier and the fish began to die. By September of 2008, most of Jerry's fish died. *(Note: In this pond, the water temperature is relatively stable from month to month and does not fluctuate enough to influence organism growth rates)*

It is common practice for many animal farmers, including those who live in Oklahoma, to administer antibiotics to their animals even when they are healthy. This helps the animals combat infections before they spread and therefore increases the survival rates and growth of the animals. A recent concern, however, is that this poses a threat to all animals including humans.

Dr. Stuart Levy documented the potential effects of administering routine antibiotics in livestock more than 30 years ago. After feeding 150 healthy chickens food with low levels of the antibiotic tetracycline for a few months, the bacteria in the intestinal tracts of chickens were tetracycline-resistant. Since this study, there has been increasing evidence that indicates the widespread use of antibiotics in animal farms is creating dangerous drug-resistant bacterial strains that endanger animals and humans. Because the issue is so pressing, earlier this month a congressional hearing was underway to determine whether or not the feeding of antibiotics to healthy farm animals should be regulated.

Pyruvate Dehydrogenase Deficiency (PDH) is a genetic disorder that is a result of a mutation in the DNA of cells. This mutation affects a gene that codes for a critical enzyme which transforms pyruvate into Acetyl CoA, the compound needed to begin the Krebs cycle in aerobic cellular respiration. PDH causes lactic acid buildup in a person's cells which typically results in developmental defects, lack of muscle control, and early death. In reality PDH has an extremely complex inheritance pattern but for our purpose, let's consider it to be an X-linked recessive disorder.

A group of barn cats has a family history which includes some very overweight individuals. The average weight for this breed of cat is 9.5 pounds but some of the individuals in this family weight up to 18 pounds! The landowner's friend is a veterinarian and tells him that the overweight trait is an inherited recessive condition and that it might be treatable.

Commercials advertising *Aricept* claim that this drug has been shown to help treat the symptoms of Alzheimer's by improving overall cognitive abilities (e.g. memory, logical thinking). Although it was approved by the FDA in 1996, many scientists think more research should be done on how and why the drug works because the scientific community is not at a consensus. Thus far, the research shows that the drug works by acting as an acetylcholinesterase inhibitor. Instructions that go along with the prescription warn patients about potential overdose and specifically instruct people to never double up on the medication if they miss a dose.

In April of 2010 a group of biologists published their research on the comparison of mating strategies for two very closely related species of frogs. They observed population growth and environmental conditions in addition to using DNA analyses to determine paternity in all of the offspring. The mimic poison frog breeds in small pools of water which are nutrient-poor. As a result, both parents must care for the developing eggs. The males carry the newly hatched tadpoles to a water pool and watches guard while the female occasionally lays a non-fertile egg for the tadpoles to eat. The variable poison frog lays and hatches its eggs in more nutrient-rich water pools and those tadpoles are cared for only by one parent, the father. Some biologists speculate that the two species evolved from one ancestral species which breed in nutrient-rich water pools.

Mormon cricket males have a lot of competition for mating and have developed an interesting way to attract mates. The males produce a protein-rich food which they attach to a female in an attempt to persuade her to mate. The production of the food costs the males about 30% of their body weight! But, if the female accepts the gift the male will be allowed to mate with her.
