



BIOL 1114 Exam #4: Final Exam (Preview), May 10th, 2017

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.

1. Put your **O-Key Account Username** in the spaces indicated for **LAST NAME** and darken the corresponding circles.
2. **Write your Name** (Last, First) and the word **“Star” or “NoStar”** above the words “Last Name”
3. Put your **CWID** in the spaces indicated for **“Student ID”** and darken the corresponding circles.
4. Enter **1714** in the spaces indicated for **“Course number”** and darken the corresponding circles
5. Enter **001 or 002** in the spaces indicated for **“SEC”** and darken the corresponding circles.

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.

Use the following formulas and chart as needed.

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

$$G = rN$$

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

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

Deforestation is one of the main human impacts on our planet as it destroys the forests and affects many species. Also decaying plant matter can be washed downstream to ponds and lakes.

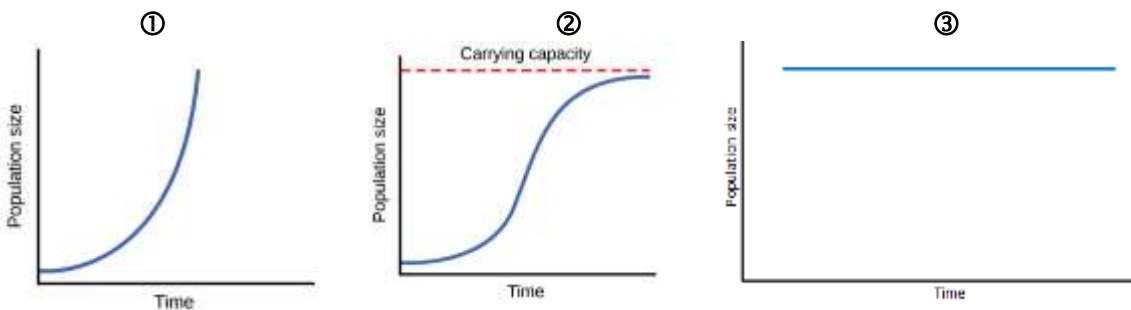
In 2011 the Departments of Health and of Environmental Quality in Oklahoma discouraged people from swimming in Grand Lake due to a photosynthetic cyanobacteria bloom and the bad



water quality. In the worst cases dogs or people exposed to the water in Grand Lake exhibit tremors and seizures.

A food chain in an Indian rain forest involves three species: tigers, wild boars, and one species of plant. In a simple food chain, plants are consumed by caterpillars, and caterpillars are consumed by birds

A student is trying to understand if a high concentration of fertilizers (with nitrogen and phosphorus) can be toxic to fish (negatively affecting their survivorship), as she knows that fertilizers are moved from the soil to the lakes. She is performing a controlled experiment with fish in aquariums exposed to different treatments.



Dr. Chargaff isolated DNA from the South African toad and analyzed the amount of nitrogenous bases quite precisely. He noted that 24% of the bases were **adenine**. Dr. Chargaff had also isolated 24% **adenine** bases from the DNA of the bacterium *Mycobacterium tuberculosis*.

A scientist was checking the sequence of a gene that normally codes for a protein of 250 amino acids. A severe form of mutation in this gene, which is known to increase the chances of an individual to develop cancer, is the occurrence of a stop codon near the start codon of the coding region of the gene. Here are the first 18 nucleotides the scientist found in the template strand of the coding region: TACGTATTGATTCTAGGC.

The insecticide known as DDT was banned in the USA in 1972 as it was found in tissues of organisms in different trophic levels, with the highest concentration being recorded in top predators



Male widowbird





Female widowbird

In a group of gorillas, male A mated with several females and fathered several babies during the breeding season, whereas other males in the group have not mated

Males of the seahorse *Hippocampus whitei* carry clutches of eggs (one at a time) in a sealed brood pouch. Each male has a lasting relationship with only one female, who provides him with a series of clutches during the breeding season.

A large lake was divided into numerous isolated lakes because rapid geological changes occurred 5 million years ago. At present, scientists found that the most abundant fish species in each of the lakes have similar shapes and yet they are not interbreedable. Studies of the genes in these fish species clearly indicate they are all very closely related.

Royal marriages were usually arranged in earlier times for political reasons. In 1840, Queen Victoria of England married Prince Albert of Germany (whom she actually liked). Victoria and Albert had nine children. Unfortunately, some of their sons and grandsons had the often fatal blood-clotting disorder hemophilia (most victims are males who die long before they reproduce). The mutant allele causing hemophilia is recessive and located on the X chromosome. None of Queen Victoria's ancestors are known to have had hemophilia. The distribution of blood types (multiple alleles) and that of curved thumbs (dominant) and straight thumbs (recessive) are also listed below.

Person	Sex	Hemophilia (X-linked recessive allele)	Blood Type (multiple alleles)	Curved thumb is dominant ; Straight thumb is recessive . (autosomal trait)
Adults				
Victoria	female	No	A	 curved
Albert	male	No	B	 straight
Some Children of Victoria & Albert				
Alexandra	female	No	B	curved
Helena	female	No	B	straight



Leopold	male	Yes	AB	curved
Edward	male	No	O	straight

Potential spouses for their Daughters

Nicholas	male	No	B	curved
Alphonso	male	No	AB	curved

As a hemophiliac, Leopold needed frequent blood transfusions. Nicholas married Alexandra and had four daughters and one son. Only the son had hemophilia. Nicholas and Alexandra's first daughter had straight thumbs.

Sarin gas ($C_{14}H_{10}FO_2P$) has made the news again. Within ten minutes this lethal gas rapidly kills its victims who had suffered severe convulsions, spasms and constricted chest muscles used in breathing. Autopsies of sarin gas victims indicate a higher than normal amount of acetylcholine within the synapses at the neuron-neuron and neuron-muscle junctions. Army medics often carry "injector pens" of atropine as a rapid antidote for exposure to sarin.

North American black bears secrete large quantities of leptin from their brown fat (adipose) tissue during winter "hibernation" periods, generating heat (*i.e.* thermogenesis). Leptin causes the inner mitochondrial membranes to become "leaky" to protons (H^+). The leptin hormone is 167 amino acids long.

An experimental mutant mouse that produces an excessive amount of leptin in non-fat tissues, and has functional receptors for it. An experimental mutant obese "O" mouse has been mated with a mouse heterozygous for the allele related to leptin production.

A woman is studying effects of ferrous (iron) from contaminated mine soils on a plant species as she thinks that excess iron can be toxic and can affect leaves. This same woman is planning to visit sites around iron mines in order to study and mark plants to compare the concentration of this metal in the soil and the concentration in the stems and leaves of the plants, as well as growth of these plants in subsequent visits.