

Exam 3 Preview Material - Summer 2010

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 **1023** 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.

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

mRNA-Codon-to-Amino-Acid Decoder Chart										
1 st Letter	U		C		A		G		3 rd Letter	
U	UUU UUC	Phenylalanine	UCU UCC UCA UCG	Serine	UAU UAC	Tyrosine	UGU UGC	Cysteine	U C	
					UAA UAG		STOP		UGA UGG	STOP Tryptophan
	CUU CUC CUA CUG	Leucine	CCU CCC CCA CCG		Proline	CAU CAC	Histidine	CGU CGC CGA CGG	Arginine	U C A G
						CAA CAG				Glutamine
A	AUU AUC AUA	Isoleucine	ACU ACC ACA ACG	Threonine	AAU AAC	Asparagine	AGU AGC	Serine		U C
					AUG					Methionine; START
	G	GUU GUC GUA GUG	Valine		GCU GCC GCA GCG	Alanine	GAU GAC	Aspartate	GGU GGC GGA GGG	Glycine
GAA GAG				Glutamate						

Chocolate contains theobromine which is a naturally occurring stimulant found in the cocoa bean. When ingested, theobromine acts as a diuretic (meaning it increases dilute urine production) and stimulates the central nervous and cardiovascular systems. In humans, the effect is minimal but for other animals theobromine can be poisonous if they cannot produce the enzyme needed to metabolize (break down) the compound quickly. Dogs are especially prone to theobromine toxicity because they have a “sweet tooth” and are clever in seeking out chocolate treats. If a dog eats chocolate it can cause vomiting, diarrhea, muscle spasms and, if eaten in large quantities, epileptic seizures and death.

A population of a particular plant species lives in an area near a developed shopping center. The space and soil conditions limit the population to near 36 plants. Among this species, rounded leaves are a dominant trait over oval leaves.

Rabbits have 22 pairs of chromosomes. When a rabbit reproduces, egg from a female and sperm from a male join to produce a single, fertilized egg cell called a zygote. In rabbits, hair length is a heritable trait coded for by a single gene. There is a trait for long and short hair but when an individual receives a gene copy of each trait, they have medium hair.

During the War of Independence, more men died of smallpox than they did from battle. When a person is infected, the smallpox virus causes severe headache, fever, nausea and pus-filled blisters. Several strains of the virus are known, some more deadly than others. In the mid-1700s, smallpox had already spread through England but not in America. As a result, the British army brought the virus to the colonies but was less affected by the spread of the disease than the American soldiers.

Beginning in the winter of 1777, General George Washington decided to expose all new army recruits to the smallpox virus. During the procedure, a person’s skin was broken by a knife or needle that had been embedded in the rash of a person who suffered from a non-deadly strain of the disease. Although they would become ill for a couple of weeks, it was determined that the controlled illness was better than the risk of catching smallpox while in combat or encountering a more deadly form. George Washington’s secret decision to expose his troops to smallpox was key to our ability to win the war.

In the 1770s, disease, war and famine limited the population of Americans to about 2 million people. Since that time, our population has grown to over 300 million and it continues to grow with no known limit to our population size.

Progeria is a condition which causes premature aging in children. Although mental and motor development remain normal, the child is below average in height and weight accompanied with a narrowed face, hair loss, aged skin, and stiff joints (among other symptoms).

Researchers have discovered that a single gene mutation is responsible for the disorder. Known as lamin A, this gene codes for a protein which is necessary for holding the nucleus of a cell together. Without the protein, the cell is unstable, which appears to lead to progeria's characteristic aging process. Unlike many other genetic mutations, progeria is not passed within families but is genetically (not environmentally) determined. When a person has progeria, all of his/her cells contain the DNA mutation.

Sadly, children with progeria often die young due to atherosclerosis, when the walls of the arteries stiffen and thicken resulting in heart attack or stroke.

In May of 2010, scientists created a synthetic life form. Dr. Craig Venter built a 100,000 base sequence genome from scratch, piecing together the four letters of the genetic code and transferred it into a bacterium, where it replaced the native DNA. Using that synthetic genome, the microbial cell made new proteins on its own. So that the assembled genome would be recognizable as synthetic, four of the ordered DNA sequences contained strings of bases that, in code, spell out an e-mail address, the names of many of the people involved in the project, and a few famous quotations.