

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	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	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

We return to Saint Vincent Island. The island is a roughly 10,000 acre barrier island off the gulf coast of Florida, and is inhabited by Sambar deer as well as native white tailed deer. These two species co-exist on St. Vincent and occupy different ecological niches. Generally, the white-tailed deer prefer the hotter, drier uplands habitats, while the Sambar deer spend most of their time in the marshes and other wetlands. The islands carrying capacity for Sambar deer is 100 animals. The population never exceeds this number. Red Wolves have been introduced to the island as a means to increase the wolf population in a protected environment. In addition, the Florida Fish and Game Commission holds yearly limited hunts for Sambar and white tail deer in an effort to manage their numbers.

You decide to study population dynamics of Sambar deer and found the starting population to be 70. In the first year of the study, 30 calves (baby Sambar deer) were born. 5 were killed by wolves and 5 were killed in the limited hunts.

As the Sambar deer population approaches the carrying capacity of the island, you notice a number of the deer become sick and die.

At the end of the third year a violent hurricane hits St. Vincent and randomly kills 40 Sambar deer.

After many years the St. Vincent island Sambar deer were found to have very efficient NaCl (salt) transporters in their cellular membranes. When the amino acid sequence of this protein was compared to that of Sambar deer still residing in asia, a change from Glutamine-Aspartate-Valine-Aspartate (asian Sambar deer) to Glutamine-Aspartate -Aspartate -Aspartate (St. Vincent Sambar deer) was discovered in the active site of the transporter.

Chris (Blood Type A; Widows Peak (an autosomal dominant trait)) and his wife Pat (Blood Type B; No Widows Peak; Albino (an autosomal recessive trait) have four children. One of Chris' siblings has cystic fibrosis (an autosomal recessive trait), but Chris appears normal, as does his parents. Chris is colorblind (an X-linked recessive trait), but Pat is not.

In late February of this year, Taco Bell restaurant chain experienced an outbreak in *E. coli* (*Escherichia coli*). The bacteria were thought to be contaminating green onions used by the restaurant chain. Before the Centers for Disease Control and Prevention, or CDC, could contain the outbreak, 64 cases of illness were reported. Most of the hundreds of types, or strains, of *E. coli* are harmless to humans and other animals but some pathogenic strains produce a toxin that causes diarrhea and occasionally can cause severe blood problems and kidney failure. Scientists have been attempting to develop *E. coli* vaccines for many years. To test vaccine effectiveness, scientists measure the presence of *E. coli* in the blood.

Some of the individuals ate the food contaminated with *E. coli* but did not suffer from any of the typical symptoms.

Scientists are working to develop a vaccine for *E. coli*. Hopefully, such a vaccine would prevent humans from suffering symptoms if exposed to *E. coli*. Scientists working to develop these vaccines need data from clinical trials to determine whether the vaccines are effective. They have already determined the vaccine itself is not harmful to people.