BIOL 1114 Exam #3 (Preview) October 24, 2011

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**" or "**No Star**" **in the space above the boxes containing your O-Key Account Username**. Darken the **(S or N)** in the **last column of the name circles**. Enter the number **1133** 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.

The bacterium, *Bordetella pertussis* causes whooping cough. The illness involves a severe cough, can affect both children and adults, and can be fatal (less than 1% of cases). The DPT vaccine commonly given to infants and children includes killed *Bordetella pertussis* bacteria (the P stands for *Pertussis*) and repeated vaccines can result in immunity that lasts for several years. Due to concerns over potential side effects of the vaccine, some parents have been choosing not to vaccinate their children while others have failed to do so simply because they didn't know about the vaccine or how often it should be administered. Recently a minor epidemic of whooping cough has occurred in California and health officials are concerned that this might worsen as the peak season for whooping cough approaches (the winter months).

"Manx" cats do not develop tails. The loss of the tail is caused by the dominant allele (M), while having a tail is caused by the recessive allele (m). The genotype MM is lethal at the level of the embryo.

English political economist Thomas Malthus (1766-1834) had a strong influence upon Charles Darwin. After carefully collecting data from the history of many human civilizations, Malthus wrote that human populations, like animal and plant populations in nature, grow rapidly and deplete their resources, resulting in famine and disease. Darwin incorporated these observations into his ideas on natural selection following his voyage to the Galápagos.

The Farallon Islands are a small set of islands in the Pacific Ocean that are 27 miles west of San Francisco. The islands are very popular nesting site for seabirds, including the endangered Ashy Storm-petrel. The ecosystems on the islands are now being disturbed by the introduction of the common house mouse. Mice somehow got to the islands, perhaps as passengers on a boat, and the size of their population has been increasing. The common murre, a seabird, also lives on South Farallon island. Their population size is limited by nesting space and it is estimated that the carrying capacity (K) for the population is 4000 common murres on the island.

Yersinia pestis was the bacterium responsible for the bubonic plague (known as the Black Death) that claimed the lives of at least 30% of Europeans during a 1347-51 epidemic. The disease was initially caused by infected fleas (who had previously bitten infected rats) biting humans. Molecular biologists recently excavated a mass grave of victims of this plague in London. They extracted DNA from the teeth of these individuals, sequenced it and concluded it came from *Y. pestis*. At the same time they extracted DNA from *Y. pestis* responsible for plague during the early 20th century, prior to treatment with antibiotics. Two basic observations emerged from this study: (1) The base sequences of *Yersinia* DNA in both the 1347-51 samples and 20th century samples were essentially identical; (2) The mortality rate (percentage of sick people who died) was at least 30% in 1347-51 compared to only 3% during the early 20th century

More recent infections from *Yersinia pestis* are commonly treated with either streptomycin or tetracycline, both antibiotics. The solitary chromosome of *Yersinia pestis* consists of a total of 9,307,456 DNA bases.

Jack and Jill fell madly in love and had a child together. While at the hospital, they met another couple, King Cole and Mother Hubbard, who had just had their second child. Unfortunately their babies were mixed up in the nursery. However, the nurses had the following genetics information to help them out. Note that King Cole and Mother Hubbard already had one child.

Person	Sex	Colorblind (Color-blindness is X-linked recessive)	Blood Type	Ear Lobe Type (Free lobe dominant, attached recessive)	Notes
Adults (possible parents)					
Jack	Male	Normal Vision	AB	Attached	Married to Jill
Jill	Female	Color Blind	O	Attached	Married to Jack
King Cole	Male	Normal Vision	A	Free	Married to Mother Hubbard
Mother Hubbard	Female	Normal Vision	B	Free	Married to King Cole
Children					
Little Boy Blue	Male	Color blind	B	Attached	King Cole and Mother Hubbard's first child
Baby 1	Male	Color Blind	A	Attached	One of the babies mixed up at the nursery
Baby 2	Male	Normal Vision	O	Free	One of the babies mixed up at the nursery

In order to make sure neither baby had a genetic disease, they tested part of their DNA to determine the sequence. For Baby 1, the sequence from the middle of a gene was ATA GCC CGG.