Biology 4605/7220 Name _____
Quiz #8a 12 November 2003

The General***ized*** Linear Model allows one to use non-normal errors.
Generalized Linear models are written as follows.

Identity Link: $Response = \mu + \varepsilon$

Log Link: $Response = e^{\mu} + \varepsilon$

Logit Link: $\frac{p}{1-p} = e^{\mu} + \varepsilon$

Power Link: $Response = \mu^{k}$

Error is	Canonical link is
Normal	Identity
Poisson	Log
Binomial	Logit

where μ is the systematic or structural model ($\beta_o + \beta_1 X_1 + \beta_2 X_2$ ... *etc)* ϵ is the error, and the canonical link is the link typically used with a particular error type.

1. Obligate cave-dwelling organisms (troglobytes) are potentially interesting models for a number of evolutionary questions, including those of population genetics. One question is the extent to which apparently isolated cave populations contain genetically-differentiated populations, and how cave populations are genetically related to surface populations. Kane et al (1992 *Evolution* 46: 272-278) studied 10 populations of the amphipod *Gammarus minus* and generated (in part) the following data:

Population	Gene Locus ACO-1		
	AA	Aa	aa
Spring	40	15	2
Cave	13	18	7
Cave 2	8	13	4

1a. Compute the odds of being heterozygous (Aa) for the spring and cave 1 populations.

	Spring	Cave 1	Odds ratio
Heterozygous	_____	_____	_____

1b. Compute the odds ratio for Cave 1 relative to spring.

1c. Write a generalized linear model to test whether the odds of being heterozygous differ between all three populations.

1d. Complete the first two columns of the analysis of deviance table for your model. ----------> Source df

2. An earth scientist is interested in the mineralogic composition of an intensely metamorphosed schist. She obtains 150 samples, 5 at each of 3 depths in an exposed bed, at each of 10 locations. Define a symbol for the odds of biotite mica occurrence in each group of 5 samples. Write a generalized linear model to analyze whether the odds of finding biotite mica depend on location and depth in the bed.