Biology 4605/7220 Name _____
Exam #1a 6 October 2004

1. Type I error is a potential problem when rejecting the null (chance) hypothesis, while Type II error is a potential problem when accepting the null hypothesis. Circle either I or II to indicate the potential problem with each of the following decisions. [4]

An entomologist measures 500 trees, doses 250 with nitrogen, leaves 250 undosed, finds that average girth of dosed trees exceeds that of undosed, and concludes that nitrogen increases wood production. I II

A lobby group for the coal industry produces statistics showing that global temperature has not increased in the last 100 years. I II

A government agency analyzes highly variable data on neurological function in relation to mercury uptake and concludes there is no evidence of a relation. I II

A government agency analyzes highly variable data on fish stock size and concludes that stock size has not decreased. I II

2. Hypothesis testing is carried out with frequency distributions, either observed or theoretical.

What is the principal advantage of using an observed distribution ? [1]

What is the principal disadvantage (or cost) or using a theoretical distribution ? [1]

What is the principal advantage of using a theoretical distribution ? [1]

3. According to data from G.C. Gester (1948 World Oil) the rate of petroleum formation ($pV = 10^9$ barrels per 10^6 year) on a logarithmic scale increases as a linear function of time ($T = 10^6$ year). That is $\ln(pV) = \gamma + \alpha T$ or equivalently:

$$pV = \beta e^{\alpha T}$$

What units does β have ? _____ [1]

What dimensions does β have ? _____ [1]

What units does α have ? _____ [1]

What dimensions does α have ? _____ [1]

4. List the 5 parts of a well defined biological quantity then give a five-part example [5]

5. Complete the following computations. [3]

$(100\ km)^{1.5}$ = _____

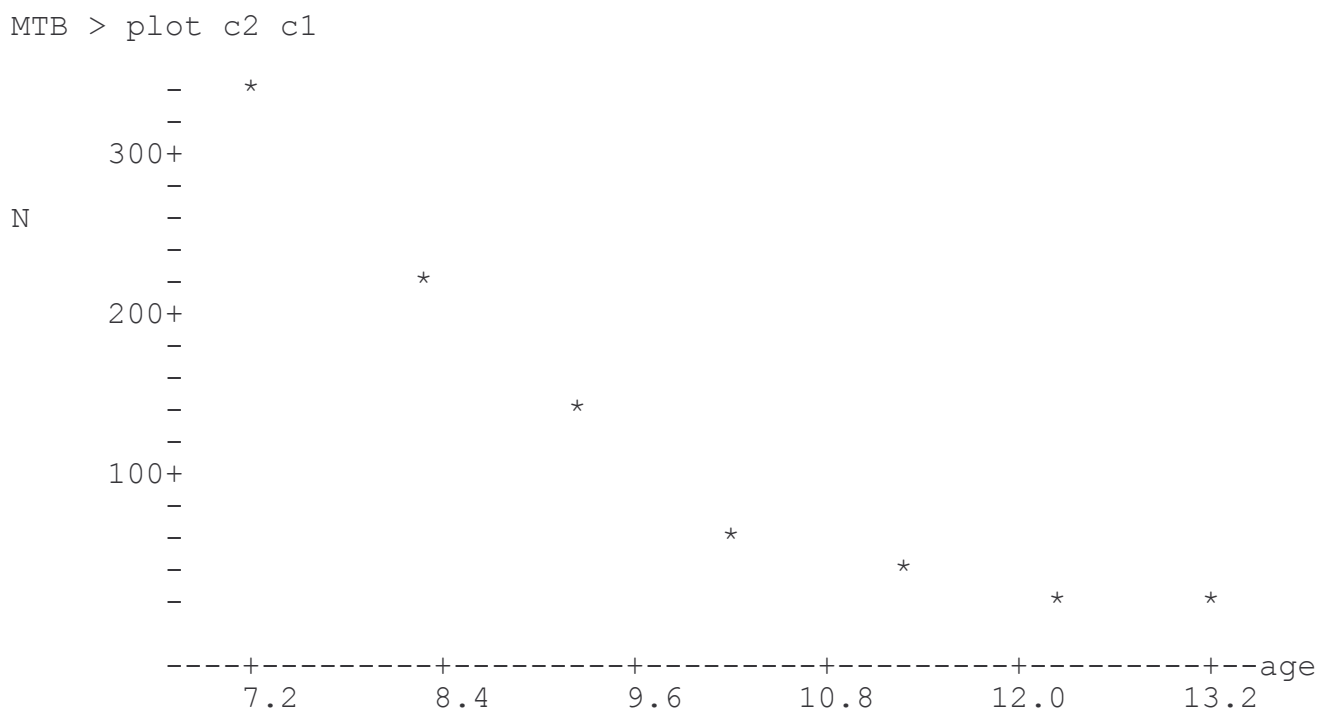
$(64\ km^2)^{0.5}$ = _____

$R = (10\ km)/km$ $\log_{10}(R)$ = _____

6. convert $(10\ km)^{1.5}$ to $m^{1.5}$ _____ [1]

convert 8 kiloseconds to seconds _____ [1]

7. Draw a horizontal line that *approximates* the mean catch at ages less than 9.6 years. (1)
Draw a second horizontal line that *approximates* the mean catch at ages greater than 9.6 years. (1)



Data from Ricker (1975). Halibut catch (N = thousands of fish) in relation to age (years)

8. In words only, state an H_A/H_o pair to test whether halibut catch at ages less than 9.6 years exceeded catch at ages greater than 9.6 years. [2]

H_A

H_o

Then in symbolic notation, state an H_A/H_o pair to test whether halibut catch at ages less than 9.6 years exceeded catch at ages greater than 9.6 years. [2]
A convenient measure of pattern is $\Delta N = \text{Mean}(N_{young}) - \text{Mean}(N_{old})$

H_A

H_o

9. Sandler *et al.* (1985, *American Journal of Epidemiology* 121:37-48) reported the frequency of cancer in smokers with spouses with smoke cigarettes (Passive smokers: yes) and spouses who did not smoke cigarettes (Passive smokers: no):

		Cancer in smokers	
		Yes	No
Spouse smokes (Passive smokers)	Yes	161	130
	No	117	124

Calculate the percent of smokers who developed cancer if their spouse smokes $p_{\text{smoking spouse}}$ = _____[1]

Calculate the percent of smokers who developed cancer if their spouse does not smoke $p_{\text{nonsmoking spouse}}$ = _____[1]

The odds of cancer in the sample are Odds = p/q where q = 1 – p.
Read the expression (Odds = p/q : 1) as "odds are ____ to 1."

What are the odds of developing cancer, for smokers with a spouse who smokes: Odds = _____[1]

What are the odds of developing cancer, for smokers with a spouse who does not smoke: Odds = _____[1]

The odds ratio (OR), for one population relative to another, is defined as the odds for the one population, divided by the odds for the other population. In this study, the odds ratio can be inferred from the sample to a larger population.

What is the odds ratio, for passive smoking relative to no passive smoking ? OR = _____[1]