Biology 4605/7220 Name ________________

Exam #1b 6 October 2004

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

		Cancer in non-smokers	
		Yes	No
Spouse smokes (Passive smokers)	Yes	120	80
	No	111	155

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

Calculate the percent of non smokers who developed cancer if their spouse does not smoke $p_{nonsmoking\ spouse}$ = __________[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 non smokers with a spouse who smokes: Odds = ______________[1]

What are the odds of developing cancer,
for non 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]

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

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

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

What is the principal disadvantage (or cost) or using an observed distribution ? [1]

3. Complete the following computations. [3]

$(25\ kg^2)^{0.5}$ = ______________________

$(10\ kg)^{1.5}$ = _______________________

R = (100 km)/km $\log_{10}(R)$ = _______________________________

4. List the 5 parts of a well-defined biological quantity, then construct an example. [5]

5. According to Hattori (1973 Microbial Life in the Soil p.384) oxygen uptake in the soil [M = ml/(ml-second)] depends on
oxygen concentration at the soil surface (C_o = ml O_2 per ml liquid)
the diffusion coefficient of oxygen (D = cm^2/second)
the thickness of the oxidative surface layer (z = cm)

$$M = C_o z^2 / 2D$$

What dimensions does D have ? ________________________________[1]

What dimensions does z^2 have ? ______________________________[1]

Is the equation dimensionally correct ? _____________________[1]

Show how you arrived at this conclusion [1]

6. Type I error is a potential problem when rejecting the null (just 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]

A pathologist chooses 8 rats at random, exposes 4 of them to a new drug, then examines all 8 for lesions 2 years later. No lesions were detected, and the pathologist concludes that the drug does not cause lesions. I II

A government agency analyzes highly variable catch data and concludes there has been a decline in a lobster catch rate. I II

A government agency analyzes highly variable data on cancer rates in relation to amount of butter in the diet and concludes that there is a relation. I II

A tobacco company produces statistics showing that smoking does not increase the risk of lung cancer. I II

7. Draw a horizontal line that *approximates* the mean catch in 1933-1940. (1)
Draw a second horizontal line that *approximates* the mean catch in 1941-1942. (1)

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MTB > plot c2 c1

        -                                                     *
        -
    2400+
        -
C       -
        -
        -                                                *
    1600+
        -
        -
        -                       *
        -
     800+                                 *
        -                  *
        -        *                   *         *    *
        -            *
        -
          --+---------+---------+---------+---------+---------+--year
       1932.0    1934.0    1936.0    1938.0    1940.0    1942.0
```

Data from Ricker (1975). C = Catch of salmon, in tonnes

8. In words only, state an H_A/H_o pair to test whether salmon catch after 1940 differs from catch in the period 1933-1940. [2]

H_A

H_o

Then in symbolic notation, state an H_A/H_o pair to test whether salmon catch after 1940 differs from catch in the period 1933-1940. [2]
A convenient measure of pattern is $D = \text{Mean}(C_{early}) - \text{Mean}(C_{late})$

H_A

H_o

9. Convert $(100\text{ kg})^{1.5}$ to $g^{1.5}$ ______________________________ [1]

Convert 0.5 kiloseconds to seconds _______________________________ [1]