Biology 4605/7220 Name______________________

6 November 2002 Exam #2b

For each of the following situations (1 and 2):

nv = number of variables
nt = number of terms
A. score = 3nv
B. score = nt
C. score = 2nv + 2
D. score = 1

(A) Define variables in a tabular format, as follows.

name	symbol	scale

scale = nominal, ordinal, or cardinal
cardinal = interval or ratio scale.

(B) Using the symbols, write a general linear model relating the response variable to explanatory variable(s) and interaction terms (if appropriate).

(C) Complete the first two columns of the ANOVA table

source	df

(D) State the name of the analysis, from the following list.
t-test, one-way ANOVA, two-way ANOVA, three-way ANOVA
paired comparisons, randomized blocks,
hierarchical (nested) ANOVA
regression, multiple regression,
ANCOVA (at least 1 nominal and at least 1 cardinal scale explanatory variable)
none of the above.

1. Height is frequently named as a good predictor variable of weight among people of the same age and gender. Roberts (*American Journal of Clinical Nutrition* 54:499) measured the heights (cm) and weights (kg) of 14 males between the ages of 19 and 26 years of age. Does weight depend on height ? A=6 B=3 C=6 D=1

A.

name	symbol	scale

C.

source	df

B. ________ = ____ + ε [3]

D. [1]

2. Skinner and Allison (*J. Agric. Res.* 23:433-445) studied the effect of date of planting and amount of fertilizer (borax) on cotton growth, measured in pounds. Amount of borax was 0, 5, or 10 pounds. Three methods of borax application were (borax in drill & seed planted immediately, borax in drill & seed planted one week later, or borax broadcast). The experiment was carried out on 3 dates. When the analysis is carried out, all of the interaction terms were found to be non significant, with p-values of 0.173 or more. Write the model with no interaction terms.

A=12 B=5 C=10 D=1

A. name	symbol	scale

C. source	df

B. ________ = ____ + ε [3]

D. [1]

3a. Define a symbol for scutum width (units of μm) of ticks on rabbit #1 (Sokal and Rohlf, 1995, p 210), then define a symbol for the observed (sample) mean and the true (population) mean ....[3]

3b. For the data on scutum width (8 values below) write the observed mean. ________ = ________[1]

(Symbol) = (Value)

3c. Write a probability statement for the 95% confidence limits around the true mean ....[2]

3d. What value of the t-distribution should you use for the 95% limits ? __________[1]

```
MTB > invcdf c1;   SUBC> t 7.
    0.0100   -2.9980
    0.0250   -2.3646
    0.0500   -1.8946
    0.1000   -1.4149
    0.9000    1.4149
    0.9500    1.8946
    0.9750    2.3646
    0.9900    2.9980
```

3e. Compute the 95% confidence limits ....[2]

```
MTB > print c2

 ScWidth  380    376    360    368    372    366    374    382

MTB > describe c2

                N     MEAN   MEDIAN   TRMEAN    STDEV   SEMEAN
       ScWidth  8   372.25   373.00   372.25     7.36     2.60
```

4a. Construct an ANOVA table for which the total Sum of Squares is 100, 15% of this variability is due to regression, and the sample size is 10. Be sure to compute MS and F-ratio ....[12]

4b. Explain how you would compute a p-value for the F-ratio in the table you have constructed, if the residuals were heterogeneous and non normal ....[2]

4c. Circle the effect (increase/decrease) of <u>doubling</u> the sample size, in the ANOVA table you constructed (or any ANOVA table for regression)...[3]

increase decrease in MS error

increase decrease in F-ratio

increase decrease in p-value