

## BIOL 570 Lab #11 worksheet

Name: \_\_\_\_\_

Sorting #: \_\_\_\_\_

Question #1:

Question #2:

Question #3: Write an appropriate null and alternative hypothesis for this research.

$H_0$ :

$H_A$ :

Question #4: What is the response variable? Is it numerical or categorical? What is the explanatory variable? Is it numerical or categorical?

Question #5: Write out an ANOVA table . Fill in the degrees of freedom column. From looking at the data set, you should know the “groups degrees of freedom” and the “total degrees of freedom” and thus be able to calculate the “error degrees of freedom”

Question #6: Fill in the rest of the ANOVA table above using the R output.

Question #7: Think about theoretical concepts with ANOVA. **Assume that the null hypothesis is true.** Under that situation, write down the two numbers in the ANOVA table that both estimate  $\sigma^2$  (the true population variance in flower length).

Question #8: Clearly the numbers you wrote down for Q7 seem quite different. These two numbers are different because: (SELECT ONE)!

- There are large differences between species means.
- There are large differences between individual flower lengths within a species.

Question #9: What number in the ANOVA table is the test statistic? Show how this number is calculated from other numbers in the table.

Question #10: What do we know about the probability of getting this test statistic, or a number more extreme, if the null hypothesis is true?

Question #11: When you looked at the column of flower lengths, there was considerable variability (i.e. some flowers were as large as 50 mm while others were as small as 34 mm). What proportion of the variability in flower length can be explained by knowledge of what plant species the flower was on?

Question #12: Write a complete conclusion for this study, including all important pieces of information we have emphasized in lecture. (Note that the ANOVA output includes descriptive statistics for the groups.)