**Student Instructions: Investigating the Biospheric Carbon Pool in Ohio: Pre-lab (15 points)**

**Pre-lab.** This is an *individual* assignment that must be submitted separately by all students. Please see the “Graphing and Statistics Guide” for detailed instructions on completing all needed figures and statistics for this lab.

Include citations for your responses to questions 1-4. Remember to use *reputable, unbiased sources for your information.* Governmental agencies like NASA or NOAA and peer reviewed articles are excellent sources.

1. Provide the photosynthesis equation. Briefly describe where land plants attain each of the reactants and the end point of the products of the reaction (i.e. in the plant, in the soil, in the atmosphere, etc.) Remember to include a citation. (1 point)

2. Define greenhouse gases and list the major gases associated with global warming. Remember to include a citation. (1 point)

3. What human activities release greenhouse gases like CO2 and methane? What human activities result in most CO2 emissions? Remember to include a citation. (1 point)

4. What was the average CO2 concentration at the beginning of the 1960s? What was the average CO2 concentration last year? (0.5 points each, 1 point total)

CO2 concentration in early ‘60s: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

CO2 concentration last year: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5. Consider the change in CO2 concentrations over roughly the past 60 years in your answer to the previous question. Given the greenhouse gas definition your provided in question 2, what is the logical outcome for global temperatures given your reported change in CO2 concentrations? Explain your answer. (1 point)

6. Consider your answer to the first question. If global photosynthesis rates *increased,* would you predict the rate of climate warming to increase, stay the same, or decrease? Explain your prediction. (1 point)

7. Line graphs and bar graphs are commonly used forms of data presentation and they are appropriate for different types of data. Line graphs are used to depict changes in a **continuous variable** over time. Bar graphs are used when data is **categorical.** Use a reputable source to define each of these variable types and include your citation. (0.5 points each, 1 point total)

 **Continuous variable:**

 **Categorical variable:**

|  |  |
| --- | --- |
| Year | Number of Red-Tailed Hawks |
| 1987 | 12 |
| 1988 | 18 |
| 1989 | 14 |
| 1990 | 17 |
| 1991 | 20 |
| 1992 | 21 |
| 1993 | 20 |
| 1994 | 23 |
| 1995 | 26 |
| 1996 | 23 |
| 1997 | 28 |
| 1998 | 29 |
| 1999 | 29 |
| 2000 | 35 |
| 2001 | 37 |

8. Now we’ll practice making line graphs in excel as you will be making several line graphs and using lines of best fit to interpret trends in data over time. Make a line graph of the data in the table to the right with a trend line and equation of the line. Remember that all graphs must have a descriptive title, axes with labels and units (as appropriate), and reasonably scales axes and font sizes. Follow ***all*** the instructions below to produce a complete graph of the number of red-tailed hawks over time. (Note that the instructions use seagull populations over time but your graph should use the data in the table to the right.)

**Copy your graph below this question prompt.** (1.5 points)

a. What is the slope of the line (include units)? (1 point) \_\_\_\_\_\_\_\_\_\_\_\_\_\_

b. Describe what this slope tells you about the change in number of hawks over time on average. (1 point)

9a. Finally, we’ll practice making bar graphs in excel. Using the instructions provided below, make a bar graph comparing mean mosquito populations sizes between two different habitat types (data provided below). Remember that all graphs must have a descriptive title, axes with labels and units (as appropriate), and reasonably scales axes and font sizes. Follow ***all*** the instructions below to produce your graph. (1.5 point)

**Copy and paste your complete figure below this question prompt.**

b. T-tests are a statistical analysis we use to determine if two groups are different from one another and you will perform several in this lab. Use the instructions at the end of this pre-lab to conduct a t-test using the mosquito data.

Provide the p-value you calculated from your t-test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1 point)

c. Using a reputable source, define what a p-value is using *your own words*. Remember to cite your sources! (1 point)

d. Given your p-value for the comparison of mosquito populations in different habitats and the definition of p-values, what can you say about mosquito populations between wetlands and forests. (Hint: are the differences statistically significant? If so, which group mean was larger than the other?) (1 point)

|  |  |
| --- | --- |
| Habitat Type | Mosquito Population Size |
| Forest | 789 |
| Forest | 862 |
| Forest | 657 |
| Forest | 799 |
| Forest | 648 |
| Forest | 387 |
| Forest | 598 |
| Wetland | 987 |
| Wetland | 1089 |
| Wetland | 987 |
| Wetland | 932 |
| Wetland | 871 |
| Wetland | 756 |
| Wetland | 973 |