Name _____ Date _____ Per/Box#_____

Productivity Practice Problems

A) This is the simplified equation for <u>photosynthesis</u>:

$CO_2 + H_2O \rightarrow CH_2O + O_2$

B) Using the simplified equation above, write the simplified equation for <u>respiration</u>:

CALCULATE the following problems – remember to include units into your setup and answer! Place a box around your answers.   Remember: NPP = GPP – Respiration _{plants}

1. The net annual primary productivity of a particular wetland ecosystem is found to be 8,000 kcal/m^2. If respiration by the aquatic producers is 12,000 kcal/m^2 per year, what is the gross annual primary productivity for this ecosystem, in kcal/m^2 per year?

2. If you measure the available biomass for a patch of forest as 10 kg C/ m^2-year, and the amount of CO_2 given off into the atmosphere as 5 kg C/ m^2-year, what is the GPP? (Use *the simplified reaction so the proportions are 1:1.)*

3. In the patch of forest in problem #2, how much energy is ***available*** in the primary producer level for herbivore consumption? Assume 1 kg of carbon produces 10,000 kJ.

4. Imagine we run an experiment on the algae *Cladophora glomerata.* We place equal amounts of algae into a light bottle and a dark (covered) bottle. We measure the dissolved oxygen in both bottles and find it is at 10 mg/L (Initial). We let both bottles sit for a week. In one week, the light bottle has a dissolved oxygen value of 11 mg/L and the dark bottle has a value of 5 mg/L. CALCULATE the amount of respiration, the NPP (Light – Initial) and the GPP (Light – Dark) for the species of algae.

5. Imagine we run an experiment on a simulated grassland ecosystem. We measure their starting weight (using an identical third sample, dried) and place equal amounts of a grass species in light and dark locations. After one week, we end up with the following data. Each sample is in a 10 cm^2 container.   What is the NPP, respiration, and GPP of the "grassland"?

Express your answers in grams/cm^2/day (**Hint: this requires some dimensional analysis from the units listed above**).

Week	Dry Weight
Start	10 grams
One Week Later	17 grams (light bottle)
One week Later	7.2 grams (dark bottle)

6. Imagine we run an experiment on a marine diatom. We place equal amounts of the diatom species in light and dark settings, and measure their starting weight (using an identical third sample) and dry it out. After one week, we end up with the following data.

What is the percent moisture of the samples (weight of the water/wet weight).
Find NPP, respiration, and GPP of the species of diatom? Express your answer in grams/bottle.

Week	Wet Weight	Dry Weight
Start	14 grams	9 grams
One Week Later	19 grams	11 grams (light bottle)
One week Later	12 grams	8 grams (dark bottle)