Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_\_\_

Modeling Ecosystems Virtual Lab

**Background** Information:

An \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ consists of a community of living organisms \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ with each other and the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. The source of energy that fuels most ecosystems is the \_\_\_\_\_\_\_\_\_\_\_. Plants use the Sun’s energy to produce food in a process called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Organisms that use energy from the Sun or energy stored in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ compounds to produce their own nutrients are called autotrophs. They are also called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ because most other organisms depend on autotrophs for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Heterotrophic organisms that can’t make their own food may obtain nutrients by eating other \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. A heterotroph that feeds only on plants is called an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Herbivores are also called \_\_\_\_\_\_\_ order heterotrophs. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that feed on other herbivores are \_\_\_\_\_\_\_ order heterotrophs. Carnivores that feed on other carnivores are \_\_\_\_\_\_\_\_ order heterotrophs. A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is a simple model of how \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ move through an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Each level of production and consumption in a food chain is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ level. The autotrophs form the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ trophic level, the herbivores the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ level, followed by second and third order heterotrophs.

In a pyramid of energy, the energy moves in only one direction and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ at each succeeding trophic level. The total energy transfer from one trophic level to the next is only about \_\_\_\_\_\_\_\_\_\_\_ %. This is called the energy conversion transfer. The food consumers ingest is used to metabolize and build body tissues; some food is given off as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Energy lost at each trophic level enters the environment as heat.

A pyramid of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the weight of living \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ at each trophic level. Biomass is calculated by finding the average weight of each species at that trophic level and multiplying the weight by the estimated \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of organisms in each population. In \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ecosystems, biomass decreases as the trophic level increases. In aquatic ecosystems, the biomass pyramid is inverted as phytoplankton and algae are more edible than land plants, have a shorter \_\_\_\_\_\_\_\_\_\_\_\_\_ span and are more rapidly \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Table 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Ecosystem Type | Producers | First Order  Heterotrophs | Second Order  Heterotrophs | Third Order  Heterotrophs |
| Deciduous Forest | Organisms:  Energy:  Number: | Organisms:  Energy:  Number: | Organisms:  Energy:  Number: | Organisms:  Energy:  Number: |
| Hot Desert | Organisms:  Energy:  Number: | Organisms:  Energy:  Number: | Organisms:  Energy:  Number: | Organisms:  Energy:  Number: |
| Grassland | Organisms:  Energy:  Number: | Organisms:  Energy:  Number: | Organisms:  Energy:  Number: | Organisms:  Energy:  Number: |
| Antarctic Ocean Shore | Organisms:  Energy:  Number: | Organisms:  Energy:  Number: | Organisms:  Energy:  Number: | Organisms:  Energy:  Number: |
| Freshwater Lake | Organisms:  Energy:  Number: | Organisms:  Energy:  Number: | Organisms:  Energy:  Number: | Organisms:  Energy:  Number: |

Table 2 – Energy Conversion Efficiency

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | First Order Heterotroph | | Second Order Heterotroph | | Third Order Heterotroph | |
| Ecosystem Type | **Decimal** | **%** | **Decimal** | **%** | **Decimal** | **%** |
| Deciduous Forest | 623/6011 = 0.104  0.104 x 100 = 10.4 | 10.4 |  |  |  |  |
| Hot Desert |  |  |  |  |  |  |
| Grassland |  |  |  |  |  |  |
| Antarctic Ocean Shore |  |  |  |  |  |  |
| Freshwater  lake |  |  |  |  |  |  |

Analysis & Conclusion Questions:

1. Suggest reasons why the information represented in the pyramid of numbers of one of the ecosystems you studied may have not truly represented that ecosystem?

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2. According to your data, what is the ratio of 3rd order consumers to producers? Explain your answer.

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3. Compare and contrast two of the ecosystems you studied. How is the energy conversion efficiency similar or different? (Look at your percentages in Table 2.)

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4. Does the population size increase or decrease at higher trophic levels in a pyramid of numbers for an ecosystem of a tree, insects (herbivores), and birds feeding on insects? Explain your answer.

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1. What might happen to an ecological pyramid of numbers in a forest ecosystem if most of the deer were killed due to hunting by people and disease?

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6. What could happen to an ecosystem if the decomposers disappeared?

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7. Could there be a food chain without herbivores and carnivores? Explain.

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