**Biotic Components of the Ecosystem and Energy Flow**

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

**Part 1 Research for Task 3 due Tuesday 22 March**

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| * producers, consumers and decomposers have a role in the transfer of energy in an ecosystem * food chains and food webs show the feeding relationships between organisms within a community * the amount of energy transferred between trophic levels in food chains and food webs diminishes as the trophic level increases |

**Ecosystems require an energy source** Nature of Biology p 441

The energy source for ecosystems is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy from the \_\_\_\_\_\_\_\_\_\_\_\_ .

**The role of producers** Nature of Biology p 443

Green plants contain the leaf pigment \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .

In the ecosystem green plants are called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .

Another name for **producer** is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

1. Describe the role of producers in energy transfer in the ecosystem.

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| Figure 1: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Source: <http://russgeorge.net/wp-content/uploads/2014/06/Global_greening_map1.png> |

Producers in the Oceans are single-celled organisms called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .

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| Macintosh HD:Users:localadmin:Desktop:antarctic.jpg | Figure 2 shows a colour-coded image of the phytoplankton in the Southern Ocean around Antarctica.  The code:  Red and yellow indicates regions of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  and blue indicates regions of  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Figure 2: Corrected concentrations of phytoplankton chlorophyll observed by satellites in the Southern Ocean averaged over summer from 2002 to 2012.  Source: <http://www.antarctica.gov.au/magazine/2011-2015/issue-25-december-2013/science/measuring-phytoplankton-from-space> | |

1. Explain why phytoplankton are important to the marine ecosystem.

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| Figure 3: Solar energy coming into Earth has various fates. | Figure 3 shows the energy input to an ecosystem is in the form of the radiant energy of sunlight.  It is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ organisms, such as plants, that capture the radiant energy and transform it to chemical energy stored in organic matter, such as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  What percentage of this energy is immediately reflected out? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .  State the percentage of light energy captured by producers from the sun. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

**Chemical energy is transferred from producers to consumers.** Nature of Biology p 444

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| BackUp:Home:Pictures:Pictures Personal:2013:2013-11 basil:IMG_2257.jpg  Figure 4: A food chain in action at the herb garden, John Curtin COA. | Label Figure 4;  a) Producer organism, basil, captures radiant energy of sunlight and transforms it to chemical energy of organic matter. Chemical energy in this form can be transferred from one organism to another.  (b) Herbivore organism, caterpillar, consumes the chemical energy of the producer and uses it for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .  c) Carnivore organism, preying mantis, consumes the chemical energy of the herbivore and uses it for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ . |

1. State which is easier to transfer; radiant energy or chemical energy.

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1. Explain why it is more difficult to put light into a box than it is to put sugar in a bag or petrol in a tank.

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**Consumers at different feeding levels** Nature of Biology p 445

All the organisms in an ecosystem can be classified in terms of the major source of their nutrition;

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ plants,
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ animals or primary consumers.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_carnivorous animals.

Consumers that mainly feed directly on the organic matter of producers are termed \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ consumers, for example, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and other sap-sucking insects and herb-eating wallabies, or birds that eat \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .

Consumers that feed on primary consumers are termed\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ consumers, such as insects or birds that eat \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Birds such as eagles that eat these carnivorous birds are termed \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ consumers or top carnivores.

Decomposers cannot be identified easily in terms of their major source of nutrition since they feed on the dead remains of plants and animals. Examples of decomposers in the herb garden ecosystem are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Producers and the various consumers in an ecosystem can also be identified in terms of their ‘feeding’ level or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ level.

Summarise the information on the previous page in Table 1. Refer to Nature of Biology p 445

Table 1: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| Trophic level | Organisms at that level | Source of chemical energy or ‘food’. |
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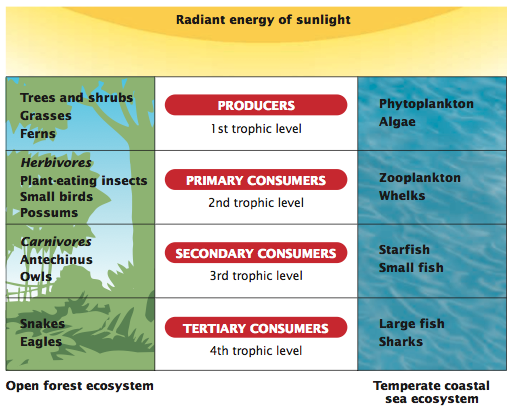


Figure 5: Comparison of producers and consumers in a terrestrial and an aquatic ecosystem.

1. State the organisms that are the producers in each ecosystem.

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1. Compare and contrast the energy source for organisms at the first and third trophic levels.

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**Energy flows through an ecosystem** Nature of Biology p 447

The energy input to an ecosystem is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy of sunlight that is trans-formed by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ into chemical energy stored in organic matter.

Once transformed to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy, the energy is transferred within an ecosystem through feeding activities.

At each transfer, some energy is ‘lost’ from the ecosystem as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy.

**Energy is lost at each transfer**

Complete Figure 6 below.

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| Figure 6: Energy flow in an ecosystem. The values are averages. |

1. Describe what happens to the amount of energy that enters a trophic (feeding) level equal to the amount that flows to the next level.

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1. Explain why energy is lost at each transfer.

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1. Draw Figure 14.14 from Nature of Biology page 447

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| Figure 7: The chemical energy in sugars from sunlight energy trapped by producers is used mainly by the producers themselves for staying alive. A small amount of this energy is available to consumers in the ecosystem. |

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| Figure 8: Examples of what happens to the chemical energy ingested as food by  (a) a typical mammalian herbivore, and (b) a typical invertebrate herbivore |

1. Summarise how energy is “lost” from the ecosystem.

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1. State the “Ten Percent” Rule of energy transfer in ecosystems.

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