**1.** Complete the following passage by inserting the most suitable terms in the blank spaces.

Living organisms are interacting constantly with each other and with the environment.

Each individual organism is a member of a group, the ........................................ ,

which consists of all the individuals of a species in an area. This area is known as the

........................................ . All the organisms of the different species in an area form a group

called the ........................................ . All the species and the non-living components

interacting within an environment are collectively known as the ........................................ .

Photosynthetic organisms such as green plants form the first feeding or

........................................ level in the food chain and are known as ........................................

because they can manufacture their own food. Animals are dependent upon the

photosynthetic organisms to obtain energy and are known as ........................................ .[7 marks]

**2.** The diagram shows some of the feeding relationships in a food web for a forest.



(a) Name an organism that is both a primary **and** a secondary consumer in this food web.

.................................................................................................................................... (1)

(b) Name a group of organisms, not shown in the web, which is needed to recycle nutrients.

.................................................................................................................................... (1)

(c) With reference to the food web, explain the effect that deforestation has on the species diversity (the no. of different species and the no. of individuals of each species) of an area.

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.................................................................................................................................... (3)(Total 5 marks)

**3.** The diagram shows a simplified food web in an aquatic ecosystem.



(a) In this food web, which organisms feed as tertiary consumers?

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(b) Explain why food chains rarely have more than five trophic levels.

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..................................................................................................................................... (2)(Total 3 marks)

**4.** Starfish feed on a variety of invertebrate animals that are attached to rocks on the seashore.  
The diagram shows part of a food web involving a species of starfish.



(a) Explain why a starfish can be described as both a secondary and a tertiary consumer.

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..................................................................................................................................... (1)

(b) When starfish feed on mussels they leave behind the empty shell. Explain how quadrats could be used to determine the percentage of mussels that had been eaten by starfish on a rocky shore.

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..................................................................................................................................... (3)

(c) The table shows the composition of the diet of starfish.

|  |  |  |  |
| --- | --- | --- | --- |
| **Prey species** | | | |
| Chitons | Limpets | Mussels | Barnacles |
| Percentage of total number of animals eaten | 3 | 5 | 27 | 65 |
| Energy provided by each species as a percentage of total energy intake | 42 | 5 | 38 | 15 |

(i) The percentage of barnacles in the diet is much higher than the percentage of energy they provide. Suggest **one** explanation for this difference.

........................................................................................................................... (1)

(ii) The table shows that the amount of energy provided by chitons is greater than the amount of energy provided by limpets. Calculate the number of limpets a starfish would need to eat in order to obtain the same amount of energy as it would obtain from one chiton.

Number of limpets ............................................

(1)

(Total 6 marks)

**Answer**

**1.** population;  
habitat;  
community;  
ecosystem;

(first) trophic; **R** *tropic*producers/(photo) autotrophs/autotrophic;  
(primary) consumers/heterotrophs/heterotrophic/herbivore;

**R** *carnivore/other qualified consumer* 7

[7]

**2.** (a) Wood mouse; 1

(b) Decomposers/bacteria/fungi/saprophytes/saprotrophs/detritivores; 1

(c) {trees form food source for many species/wide range of primary consumers;  
{(primary consumers/named example/are eaten by other species)  
{idea that trees are the basis of food chains/food webs;  
productivity of area is reduced (with loss of trees);  
so fewer organisms can be supported;  
habitats are lost/ecological niches are lost (with each tree species lost); max. 3

[5]

**3.** (a) stickleback and dragonfly nymphs; 1

(b) some energy lost at each stage in the food chain / transfer of energy not  
100% efficient / lost in respiration;  
only a limited amount of energy is available / each stage less available  
for next stage / little energy left at top of food chain; 2

[3]

4. (a) secondary – algae *→* limpet *→* starfish

*OR*

plant plankton → mussel → starfish,  
tertiary – plant plankton →animal plankton → barnacle

*OR*

mussel *→* starfish; 1

(b) use of random numbers;  
large number of quadrats;  
count number of dead and live mussels in unit area; 3

(c) (i) different size organisms/different composition  
(of carbohydrate/fat/protein)/  
low digestability/not all eaten; 1

(ii) 14; 1

[6]