

1. What are the units of a pyramid of energy?

- A.  $\text{kJ m}^{-2} \text{yr}^{-1}$
- B.  $\text{kJ m}^{-1} \text{yr}^{-1}$
- C.  $\text{J m}^{-3} \text{s}^{-1}$
- D.  $\text{J m}^2 \text{s}^{-1}$

**(Total 1 mark)**

2. Which of the following are greenhouse gases?

- I. Oxides of nitrogen
  - II. Carbon dioxide
  - III. Methane
- A. I and II only
  - B. I and III only
  - C. II and III only
  - D. I, II and III

**(Total 1 mark)**

3. What is a potential consequence of the rise in global temperatures on the Arctic ecosystem?

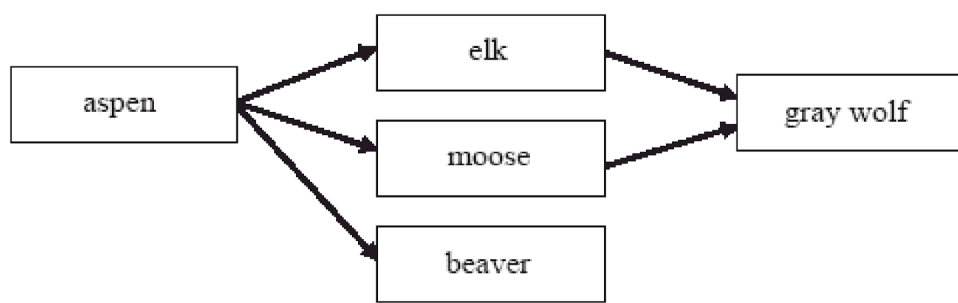
- A. Increased exposure to UV light
- B. Increased rate of decomposition of detritus
- C. Decreased success of pest species
- D. Increase in the ice habitat available to polar bears

**(Total 1 mark)**

4. Which group of organisms in the carbon cycle converts carbon into a form that is available to primary consumers?
- A. Decomposers
  - B. Saprotrophs
  - C. Detritus feeders
  - D. Producers

(Total 1 mark)

5. The following diagram shows part of a food web from Yellowstone Park.



What would be the short-term effects on the populations of the other species if the gray wolf were exterminated?

	<b>Beaver</b>	<b>Moose</b>	<b>Elk</b>	<b>Aspen</b>
A.	Increase	Decrease	Increase	Increase
B.	Decrease	Decrease	Decrease	Decrease
C.	Increase	Increase	Decrease	Increase
D.	Decrease	Increase	Increase	Decrease

(Total 1 mark)

6. Which of the following ecological units includes abiotic factors?
- A. A community
  - B. An ecosystem
  - C. A population
  - D. A trophic level

**(Total 1 mark)**

7. The food web below shows some of the feeding relationships found between the organisms living in or near a river in England.

(a) Identify an organism in the food web that is

(i) an autotroph.

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**(1)**

(ii) both a secondary and tertiary consumer.

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**(1)**

(b) Explain how the flow of energy in the food web differs from the movement of nutrients.

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(2)

(c) Discuss reasons why the levels of a pyramid of energy differ in size.

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(2)

**(Total 6 marks)**

8. The graph below shows the monthly mean values of terrestrial invertebrates from May 1997 to June 1998 in the northern hemisphere. The light line shows the biomass of invertebrates which are prey to forest birds (terrestrial invertebrate biomass). The darker line shows the invertebrates which lived in the stream and have moved to the forest (aquatic invertebrate flux or movement). The black bars on the horizontal line at the bottom show periods when trees have leaves and the white bars show periods of defoliation.

[S Nakano and M Murakami. 2001. "Reciprocal subsidies: Dynamic interdependence between terrestrial and aquatic food webs." *PNAS*. Vol 98, issue 1. Pp 166–170. Figure 1C. Copyright (2001) National Academy of Sciences, USA.]

- (a) State the mean terrestrial invertebrate biomass measured in August.

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(1)

- (b) Describe the trend in the aquatic invertebrate flux.

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(2)

- (c) Suggest the relationship between defoliation and the amount of terrestrial invertebrates in the forest.

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(2)

- (d) Suggest a possible explanation for the pattern in aquatic invertebrate flux to the forest seen between the months of June and December.

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(2)

**(Total 7 marks)**

9. *Up to two additional marks are available for the construction of your answers.*

(2)

- (a) Draw a labelled graph showing a sigmoid (S-shaped) population growth curve.

(4)

- (b) Describe what is meant by a food chain and a food web.

(6)

- (c) Explain the relationship between rises in concentration of atmospheric gases and the enhanced greenhouse effect.

(8)

**(Total 20 marks)**

10. *Up to two additional marks are available for the construction of your answers.* (2)
- (a) Living organisms at every trophic level are part of the carbon cycle. Draw a labelled diagram of the carbon cycle to show the processes involved. (9)
- (b) Explain, using an example of a food chain, how trophic levels can be deduced. (4)
- (c) Explain methods that can be used to measure the rate of photosynthesis. (5)
- (Total 20 marks)**