Topic 2: Ecosystems and Ecology

Topic 2.1 and 2.2: Review Sheets

Review Questions - ***(these are not exam questions but are similar to some exam questions)***

1. Ecologists sometimes investigate one population and at other times do research into a whole community. Define the terms population and community. (Total 4 marks)

2. What is an ecosystem?

A. A species and its abiotic environment

B. A community and its abiotic environment

C. The habitat where a species lives

D. A population of organisms in a specific habitat. (Total 1 mark)

3. What name is given to an organism that is able to manufacture its own food from simple chemical materials?

A. Heterotroph

B. Saprotroph

C. Autotroph

D. Detritivore. (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. Detritus feeders

C. Producers

D. Secondary consumers (Total 1 mark)

There are 38 marks in this paper - so it should take you about 55 minutes to complete it at the pace you need for the real assessment

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Review Questions

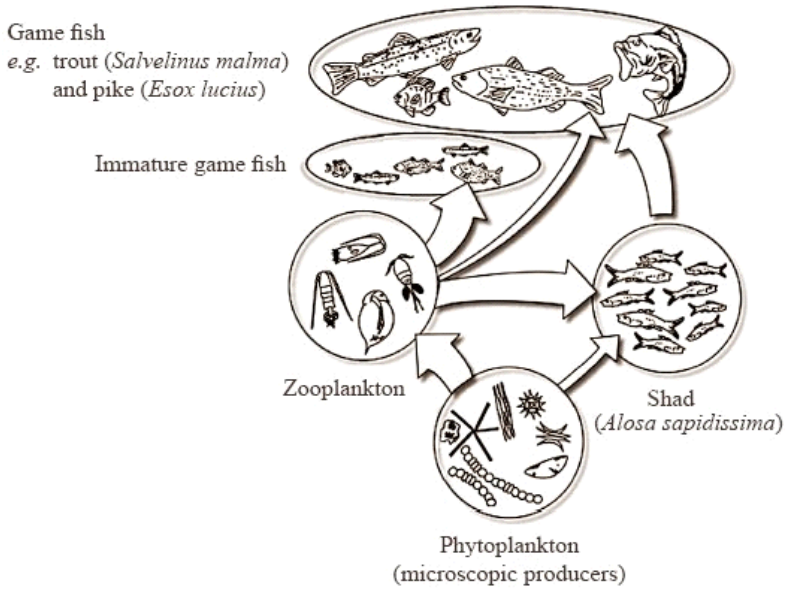
5. (a) Outline why the a lake system is considered an open system

……..

……..

…….. (2)

(b) The diagram below shows a simplified food web for a lake.



[Source: Water on the Web (2004), Monitoring Minnesota Lakes on the Internet and Training Water Science Technicians for the Future – A National On-line Curriculum using Advanced Technologies and Real-Time Data,
www.waterontheweb.org/under/lakeecology/11_foodweb.html,
reprinted with the permission of Water on the Web project, University of Minnesota, Duluth, MN 55812]

(i) State the initial energy source for the above food web.

…… (1)

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Review Questions

(ii) Define the term trophic level.

……

…… (1)

(iii) Deduce the trophic level of the immature game fish.

…… (1)

(iv) In the food web shown, identify one heterotroph and one autotroph.

heterotroph: ……

autotroph: …… (1)

(Total 6 marks)

6. Explain how energy and nutrients enter, move through, and exit a food chain in an ecosystem.

(Total 6 marks)

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Review Questions

7. Ecosystems require an input of energy, water and nutrients to maintain themselves. Nutrients may be reused through recycling within ecosystems.

Nutrient cycling within an ecosystem has been studied in many biomes. One factor studied is the mean residence time (MRT), which is the amount of time needed for one cycle of decomposition (from absorption by organism to release after death). The table below gives the mean residence time for certain nutrients in four different biomes. In addition, the plant productivity is also shown. (Plant productivity gives an indication of the quantity of biomass potentially available to consumers.)

	Mean residence time / years						
Biome	**Carbon**	**Nitrogen**	**Phosphorus**	**Potassium**	**Calcium**	**Magnesium**	**Plant productivity /g Cm^{-2} yr^{-1}**
Sub-arctic forest	353.0	230.0	324.0	94.0	149.0	455.0	360
Temperate forest	4.0	5.5	5.8	1.3	3.0	3.4	540
Chaparral	3.8	4.2	3.6	1.4	5.0	2.8	270
Tropical rainforest	0.4	2.0	1.6	0.7	1.5	1.1	900

[Source: W H Schlesinger (1991), in M Bush, *Ecology of a Changing Planet* (1997), Prentice Hall, page 67]

(a)

(i) State which nutrient shows the shortest mean residence time in a temperate forest.

…… (1)

(ii) Identify the biome in which potassium has the longest mean residence time.

…… (1)

(b) Compare the mean residence time for nutrients in the temperate forest and chaparral.

……

……

……

…… (2)

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Review Questions

(c) Evaluate the relationship between the mean residence time and plant productivity for the different biomes.

……

……

……

……

…… (2)

(d) Suggest one reason for the difference in mean residence time of nutrients in the tropical rainforest and the sub-arctic forest.

……

…… (1)

(e) Define the term ecosystem.

……

…… (1)

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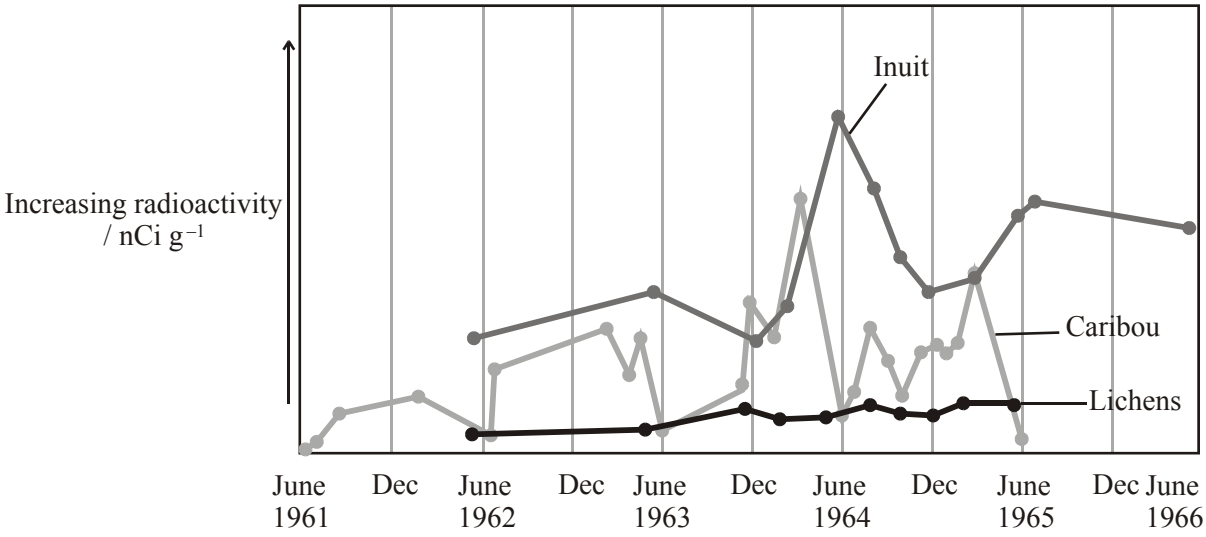
Review Questions

In addition to nutrients, other atmospheric elements may also enter the ecosystem. Radioactive cesium-137 was released into the atmosphere by atomic bomb tests in 1961. The cesium-137 was deposited in the soil and on to plants. The graph shows the amount of radioactivity found in the tissues of lichens (an alga and a fungus growing together), caribou (a member of the deer family) and the Inuit (people of Alaska and Northern Canada) in the Anaktuvuk Pass of Alaska.



[Source: W G Hanson, "Cesium-137 in Alaska Lichens, Caribou and Inuit." *Health Physics*, (1967), **13**, pages 383–389, Pergamon Press; reproduced with permission from the Health Physics Society]

(f) Describe the level of cesium-137 in the Inuit from 1962 through to 1965.

……

……

……

…… (2)

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Review Questions

(g) The three organisms form a food chain. Deduce the trophic level of

(i) lichens; ……

(ii) the Inuit. …… (2)

(h) Suggest a reason for the difference in the amount of cesium-137 found in lichens, caribou and the Inuit.

……

…… (1)

(Total 13 marks)

8. What units are used when constructing pyramids of energy?

A. J

B. J m^{-2}

C. J m^{-2} $year^{-1}$

D. J kg^{-1} m^{-2} $year^{-1}$

(Total 1 mark)

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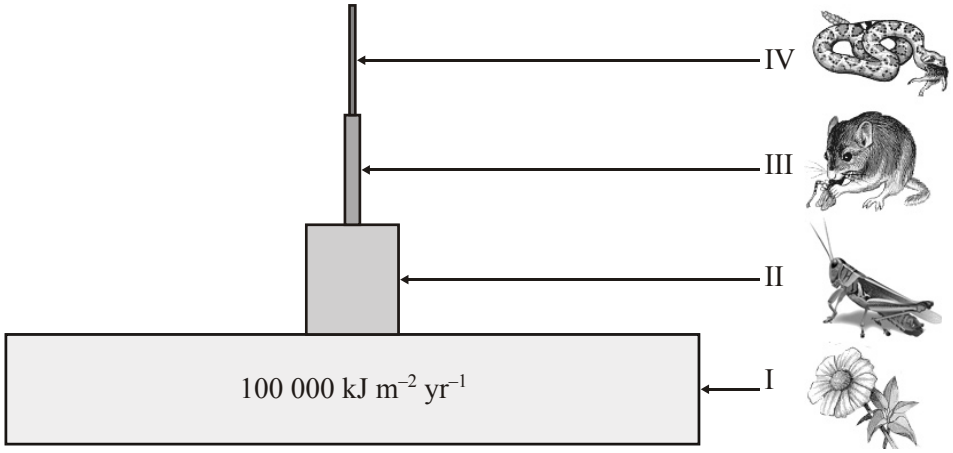
Review Questions

9. The diagram below represents an energy pyramid and four trophic levels.



[Source: adapted from www.bio.miami.edu/dana/160/pyramid.gif]

(i) Identify the trophic level of the organisms indicated below.

I. ……

IV. …… (2)

(ii) Calculate the approximate amount of energy in kilojoules transferred in m–2 yr–1 from trophic level I to trophic level II.

..... kJ (1)

(Total 3 marks)

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