



**ENVIRONMENTAL SYSTEMS  
STANDARD LEVEL  
PAPER 1**

Monday 21 May 2001 (afternoon)

45 minutes

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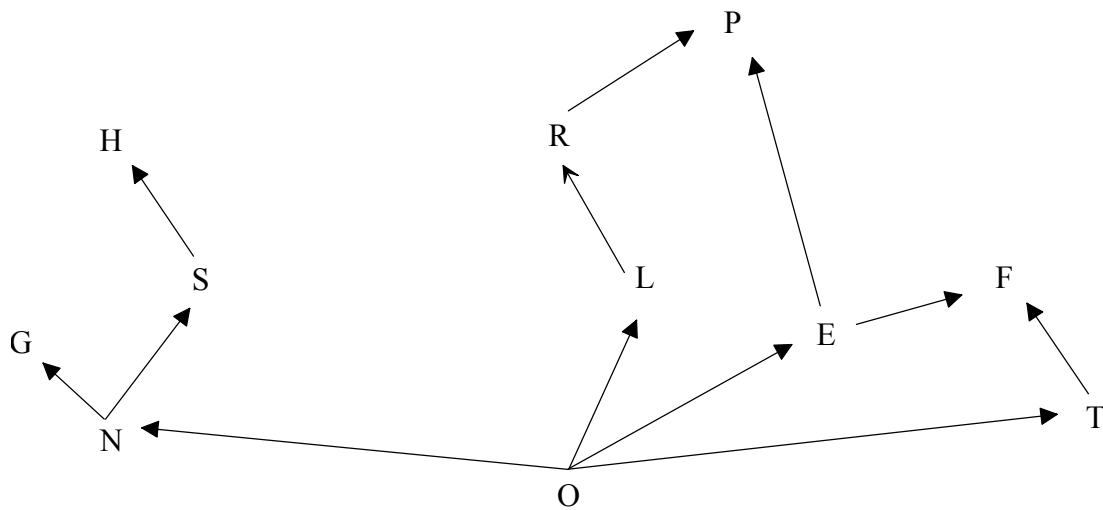
**INSTRUCTIONS TO CANDIDATES**

- Do not open this examination paper until instructed to do so.
- Answer all the questions.
- For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.

1. Major climatic factors affecting ecosystems are

- A. temperature and precipitation.
- B. temperature and salinity.
- C. ocean and air currents.
- D. Rossby waves and Hadley cells.

Questions 2–4 refer to the diagram below which shows a complete food web. Each letter represents a species.



2. Which are producers?

- A. P and H
- B. P, H, R and F
- C. O, N and T
- D. O

3. Which are secondary consumers?

- A. G, S, R, P and F
- B. H and P
- C. N, L, E and T
- D. O

4. If the population size of P decreases through human activity, what would be the likely effect on the population size of L?
- A. It would increase due to greater competition from E.
  - B. It would decrease due to greater predation by R.
  - C. It would decrease due to greater competition from F.
  - D. It would decrease due to less predation by P.

5. The data below refers to the world population in 1998.

Crude birth rate = 23 per thousand  
Crude death rate = 9 per thousand

The Natural Increase Rate was

- A. 1.4.
  - B. 14.
  - C.  $\frac{1.4}{1000}$ .
  - D. impossible to calculate from these data alone.
6. Global air circulation patterns occur because of
- A. uneven heating of the earth's surface.
  - B. the tilt of the earth's axis with respect to the sun.
  - C. the earth rotating on its axis.
  - D. all the above.

7. *Sustainable yield* can be defined as

- I. annual growth and recruitment – annual death and emigration.
- II. (total biomass at time  $t + 1$ ) – (total biomass at time  $t$ ).
- III. the highest rate at which natural capital can be exploited without reducing its original stock.

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

8. Four examples of *natural capital* are

- (i) water stored in a stratum of permeable rock;
- (ii) crude oil stored in an oil-trap in rocks;
- (iii) a stand of coniferous trees in a 25 year old plantation;
- (iv) a seal colony on an Antarctic island.

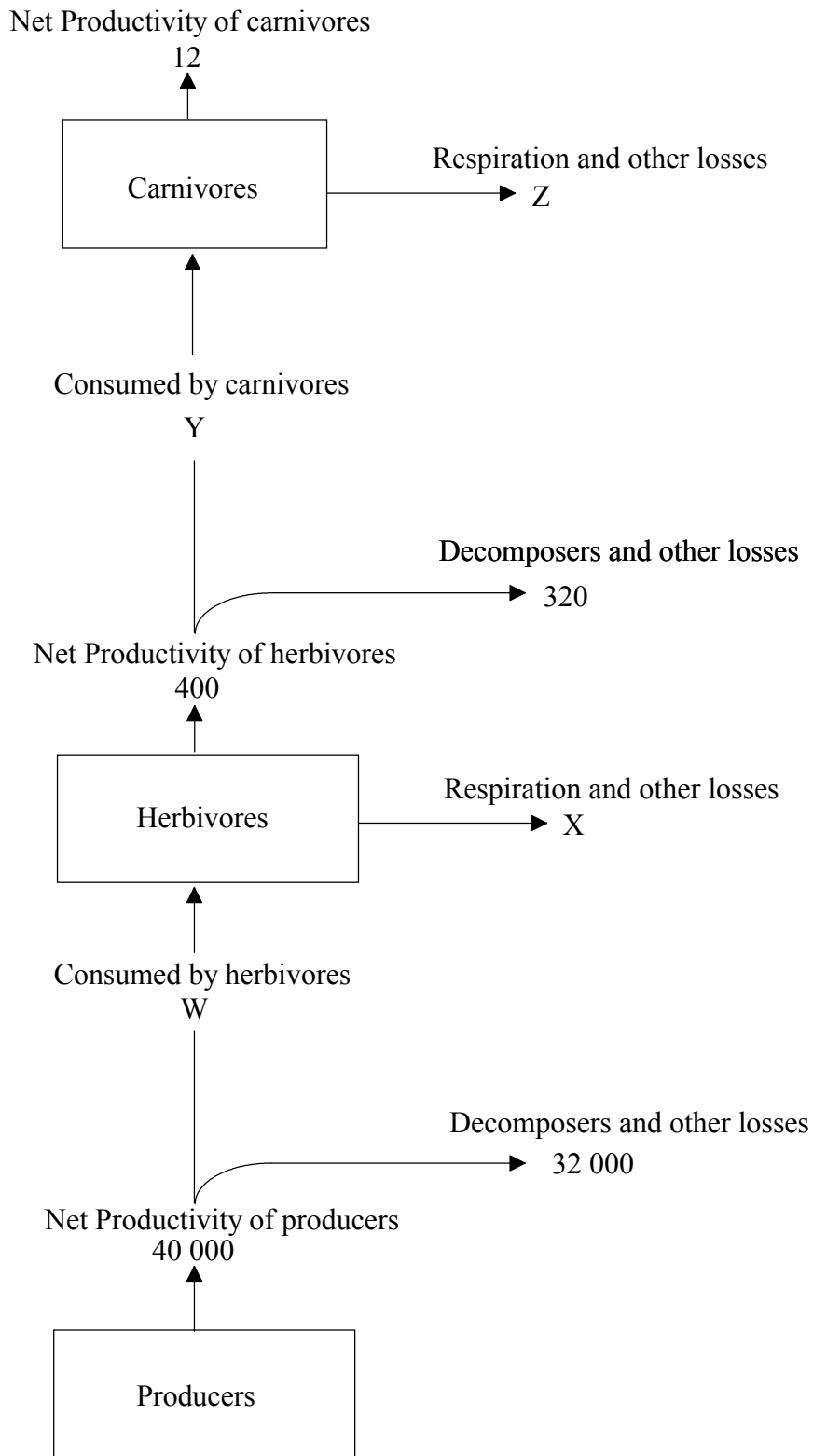
To which of the three broad classes of natural capital (given below) do each belong?

R = renewable  
N = non-renewable  
Rp = replenishable

- |    | <b>(i)</b> | <b>(ii)</b> | <b>(iii)</b> | <b>(iv)</b> |
|----|------------|-------------|--------------|-------------|
| A. | N          | N           | R            | R           |
| B. | Rp         | Rp          | Rp           | N           |
| C. | Rp         | N           | R            | R           |
| D. | Rp         | N           | R            | Rp          |

9. The major greenhouse gases are
- A. nitrous oxide and chlorofluorocarbons.
  - B. water vapour, carbon dioxide, ozone and methane.
  - C. carbon dioxide, nitrogen and ozone.
  - D. ozone, water vapour and chlorine.

Questions 10 and 11 refer to the diagram below. All values are in  $\text{kJ m}^{-2} \text{yr}^{-1}$ .



[Data source: Bradbury I, *The Biosphere*, Wiley (1991)]

10. The values of W, X, Y and Z are

	W	X	Y	Z
A.	72 000	8400	720	92
B.	8000	8400	720	92
C.	8000	7600	80	92
D.	8000	7600	80	68

11. The carnivores' productivity as a percentage of primary productivity is

- A. 0.003.
- B. 0.03.
- C. 0.3.
- D. 3.

12. Which is **least** likely to be an example of mutualism?

- A. Bacteria fixing nitrates in the roots of a tree
- B. Birds feeding on fruit containing indigestible seeds
- C. Small plants of another species attached to the surface of a tree
- D. Fungi on roots increasing uptake of minerals by a tree

13. Which aspect of plate activity has contributed **least** to global biodiversity?

- A. The separation of continental land masses
- B. The formation of volcanic islands
- C. The movement of land masses to new latitudes
- D. The release of minerals on the deep ocean floor

14. The rise in the earth's mean surface temperature between 1860 and the present is considered to be caused by
- I. release of methane from wetlands.
  - II. deforestation.
  - III. burning of fossil fuels.
- A. I, II and III
  - B. I and II only
  - C. II and III only
  - D. I and III only
15. In what stage of the demographic transition model would a population be that had a very high natural increase rate?
- A. Pre-industrial (stage 1)
  - B. Transitional (stage 2)
  - C. Industrial (stage 3)
  - D. Post-industrial (stage 4)
16. A *diversity index* of an ecosystem typically takes into account
- A. genetic variability within a species.
  - B. community resilience and stability.
  - C. number of species and their abundance.
  - D. rate of change in species composition.
17. Which is true about Rossby waves?
- A. They are waves in the northern hemisphere which transfer warm air to the north and cold air to the south.
  - B. They are waves in the polar easterlies which transfer warm air to the north and cold air to the south.
  - C. They are deep ocean currents driven by changes in the density of the water.
  - D. They are also known as Hadley cells.



Questions 18 and 19 refer to the data below.

The following data were collected in a study of secondary productivity in a population of woodlice. Some of the woodlice produced offspring during the experiment.

	Estimated Dry Mass at start of experiment (g)	Estimated Dry Mass at end of experiment (g)
<b>Adult woodlice</b>	1.53	1.59
<b>Young woodlice</b>	–	0.63
<b>Food (dead leaves)</b>	22	19.45
<b>Faecal matter</b>	–	0.84

18. Gross productivity (g) of this population over the period of the experiment was

- A. 2.55.
- B. 2.22.
- C. 1.71.
- D. 1.59.

19. Net productivity (g) of this population over the period of the experiment was

- A. 0.06.
- B. 0.63.
- C. 0.69.
- D. 2.22.

20. Problems with replacing CFCs (chlorofluorocarbons) with HFCs (hydrofluorocarbons) are that HFCs
- I. are powerful greenhouse gases.
  - II. remain in the atmosphere much longer than CFCs.
  - III. are expensive to produce.
- A. I and II only
  - B. II and III only
  - C. I and III only
  - D. I, II and III
21. The fact that India has a very high rate of recycling plastics and metals from domestic rubbish (garbage),
- A. reduces India's consumption of renewable resources.
  - B. increases India's consumption of renewable resources.
  - C. reduces India's consumption of non-renewable resources.
  - D. increases India's consumption of non-renewable resources.
22. The amount of water present in the hydrosphere as freshwater is approximately
- A. 3 %.
  - B. 6 %.
  - C. 10 %.
  - D. 20 %.
23. A *system* may best be defined as
- A. a set of components that function predictably.
  - B. an assemblage of parts and their relationships forming a whole.
  - C. a set of components that function unpredictably.
  - D. an assemblage of functioning parts without inputs or outputs.

24. Which could **not** be described as natural capital?
- A. A stand of forest on a hillside
  - B. The fish stocks of a fish farm
  - C. The fish harvested from the inshore waters of one country in one year
  - D. A waterfall
25. Compared to a pioneer community, a climax community would have
- A. higher net productivity.
  - B. higher gross productivity.
  - C. more available mineral nutrients.
  - D. more short-lived species.
26. *Biomass* is best defined as
- A. living material.
  - B. non-biodegradable material.
  - C. the dry weight of organic material.
  - D. the total mass of organic and inorganic material.
27. Which statement about tropical cyclones is correct?
- A. They move both matter and energy from high to lower latitudes.
  - B. They move both matter and energy from low to higher latitudes.
  - C. They move energy, but not matter, from low to higher latitudes.
  - D. They move matter, but not energy, from high to lower latitudes.

- 28.** If a lake is sprayed with a non-biodegradable insecticide to kill mosquitoes, after a few years the highest concentrations of insecticide are most likely to be found in the
- A. upper layers of the lake.
  - B. tissues of the mosquitoes and other insects.
  - C. tissues of the freshwater plants.
  - D. tissues of predatory fish and fish-eating birds.
- 29.** In a deer population of 1000, each year an average of 100 die from natural causes and 250 are born. Assuming no immigration or emigration, the sustainable yield is
- A. 100.
  - B. 150.
  - C. 350.
  - D. 1150.
- 30.** The carrying capacity of a country depends mostly on
- A. the rate of increase of its population.
  - B. the amount of insolation it receives.
  - C. the quantity of its mineral resources.
  - D. its state of economic and technological development.
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