



**ENVIRONMENTAL SYSTEMS
STANDARD LEVEL
PAPER 1**

Monday 21 May 2001 (afternoon)

45 minutes

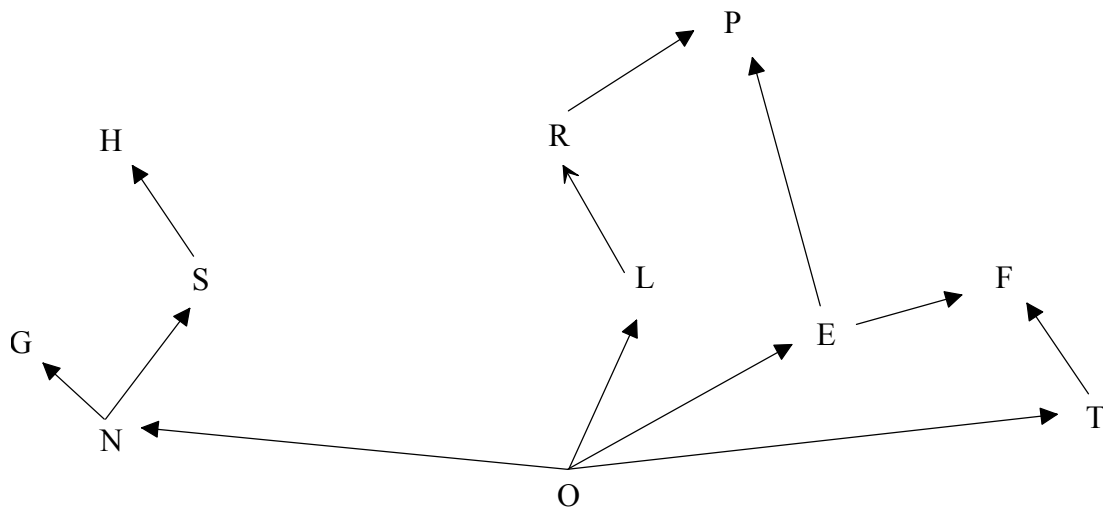
INSTRUCTIONS TO CANDIDATES

- 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.

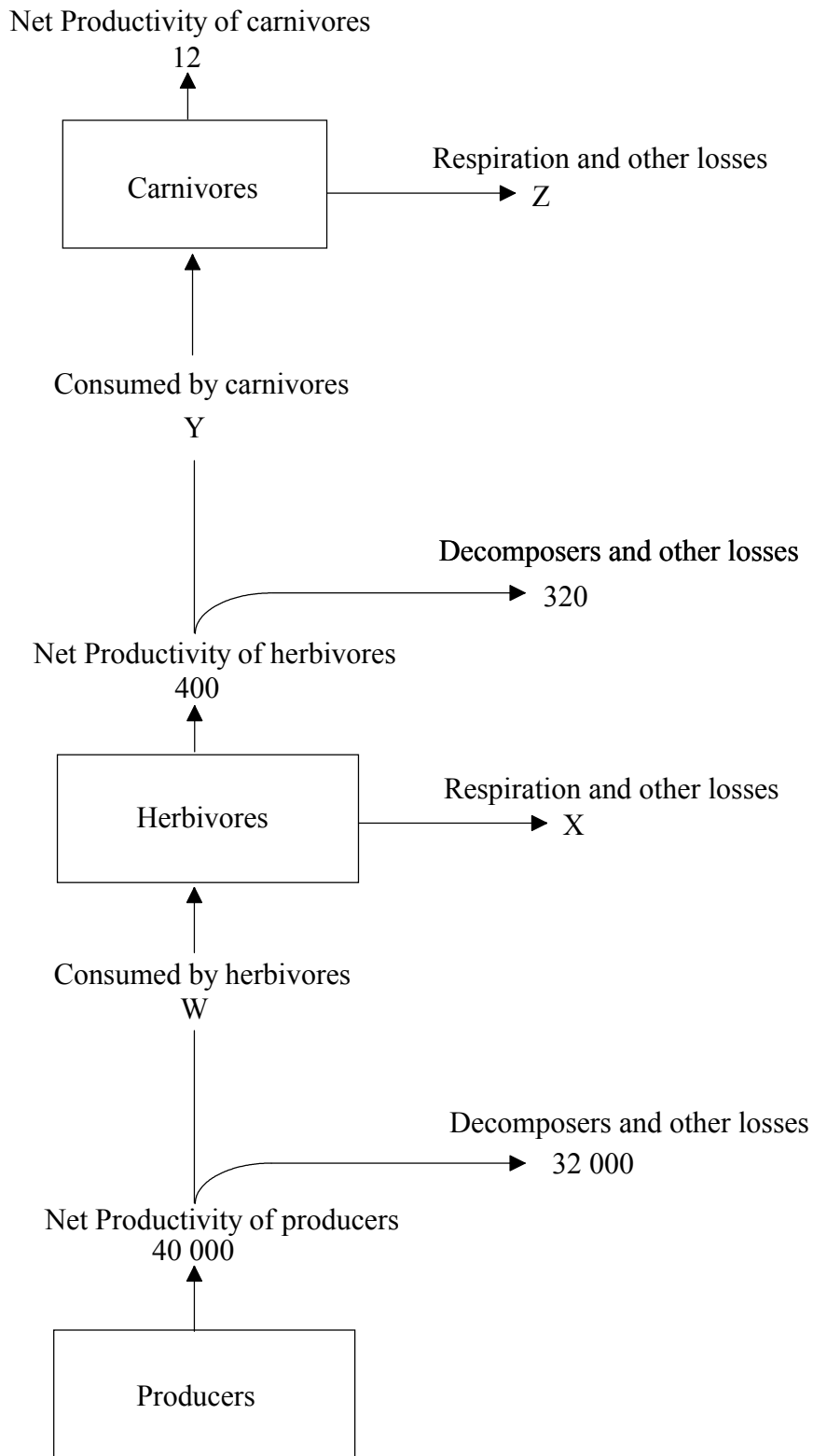
To which of the three broad classes of natural capital (given below) do each belong?

R = renewable
N = non-renewable
Rp = replenishable

	(i)	(ii)	(iii)	(iv)
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)
Adult woodlice	1.53	1.59
Young woodlice	–	0.63
Food (dead leaves)	22	19.45
Faecal matter	–	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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