



**ENVIRONMENTAL SYSTEMS
STANDARD LEVEL
PAPER 1**

Wednesday 13 November 2002 (afternoon)

45 minutes

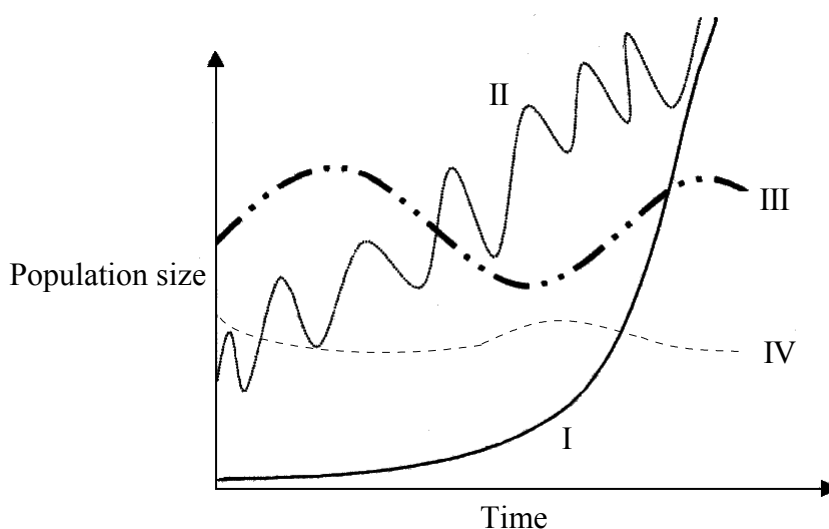
INSTRUCTIONS TO CANDIDATES

- 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. A community is composed of

- A. several habitats.
- B. several populations.
- C. several abiotic factors.
- D. biotic and abiotic factors.

2. The graph below shows how four different populations changed over 30 years.



Which population shows clearest evidence of positive feedback during this time?

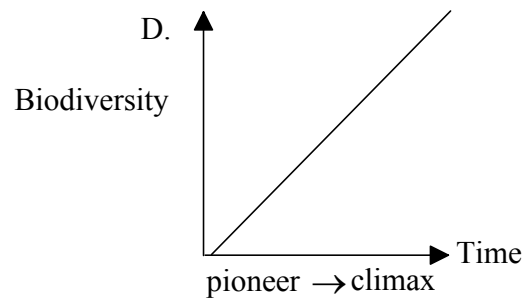
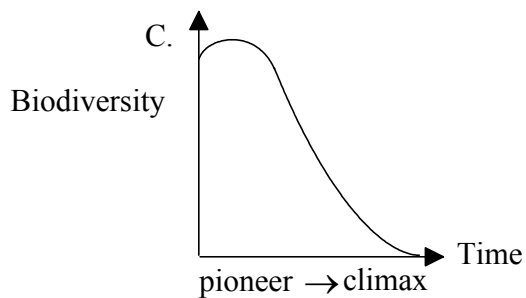
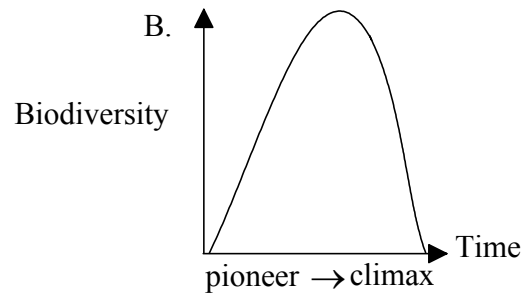
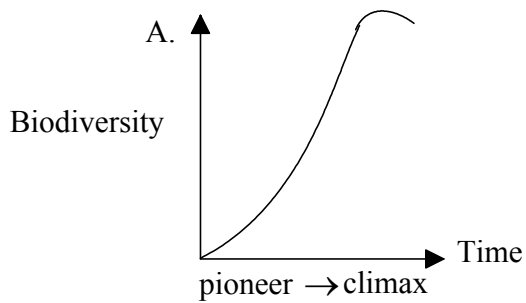
- A. I
- B. II
- C. III
- D. IV

3. The Montreal Protocol was an agreement on

- A. slowing down world population growth.
- B. reducing carbon dioxide emissions.
- C. reducing the production of chlorofluorocarbons.
- D. reducing the number of coal-fired power stations.

4. The human carrying capacity of a country might be increased by
- I. increasing literacy rates among women.
 - II. switching electricity production to renewable energy sources.
 - III. an increase in imported resources.
- A. I only
- B. II only
- C. I and III only
- D. II and III only
5. An input to photosynthesis is
- A. sugar.
- B. carbon dioxide.
- C. oxygen.
- D. soil.
6. Extensive use of recycling might
- A. reduce the life of non-renewable resources.
- B. increase human carrying capacity.
- C. extend the use of fossil fuels.
- D. increase the need for extensive mining.

Question 7 refers to the graphs below.



7. Which graph shows the most probable change in the biodiversity (measured as the number of species present per unit area) of an ecosystem undergoing succession?

- A. A
- B. B
- C. C
- D. D

8. Strategies that may help to reduce fossil fuel use and reduce global warming are

- I. improving the energy efficiency of motor vehicles.
- II. increasing the proportion of energy obtained from renewable sources.
- III. switching to unleaded petrol (gasoline).

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

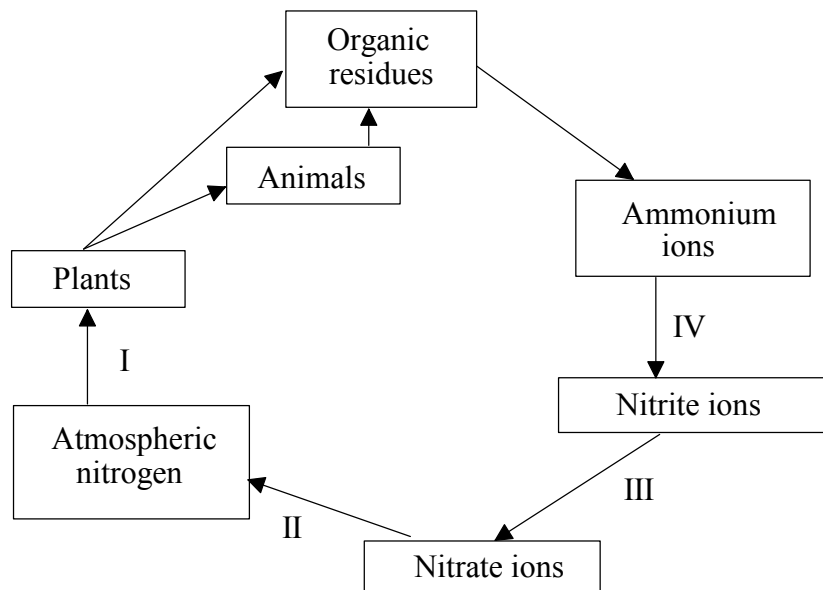
9. Net Primary Productivity (NPP) is the total amount of energy fixed in an ecosystem by
- A. photosynthesis minus the amount used by producers and consumers in respiration.
 - B. photosynthesis.
 - C. photosynthesis minus the amount used by producers in respiration.
 - D. herbivores.
10. For a population of herbivorous insects, which of the statements below is **not** true?
- A. The carrying capacity can never be exceeded.
 - B. The carrying capacity may change if limiting factors change.
 - C. The population may be maintained close to its carrying capacity by negative feedback processes.
 - D. Populations much smaller than the carrying capacity may grow exponentially.
11. Which combination of abiotic factors is typical of the tropical forest biome?
- A. Low insolation and high rainfall
 - B. Wide range of temperatures and high rainfall
 - C. Narrow range of temperatures and high rainfall
 - D. High insolation and low rainfall
12. Which list shows the major biomes of the world in their correct relative positions with increasing latitude?
- A. tropical rainforest, hot desert, tundra, temperate forest
 - B. tropical rainforest, temperate forest, hot desert, tundra
 - C. tropical rainforest, hot desert, temperate forest, tundra
 - D. hot desert, tropical rainforest, tundra, temperate forest

13. The fact that more solar energy is received at equatorial latitudes than at polar latitudes, is partly due to
- A. high latitudes lying slightly nearer to the sun.
 - B. high latitudes having clearly defined seasons.
 - C. the angle of incidence of the sun's rays spreading energy over a larger area at high latitudes.
 - D. the direction of the earth's axis tilting low latitudes towards the sun.
14. There are similar species of flightless birds in South America, Africa, New Zealand and Australia. This is most likely to be because
- A. there are few predators in these areas and therefore the power of flight is not necessary.
 - B. the vegetation of the continents is similar and the birds are adapted to it.
 - C. the southern land masses were once closer together, and the ancestors of the birds were able to walk from one area to another.
 - D. flightlessness evolved separately in each of the areas.
15. At a constructive plate margin
- A. new oceanic crust is formed.
 - B. new continental crust is formed.
 - C. one plate is subducted beneath another.
 - D. plates slide past each other, but crust is neither created nor destroyed.
16. Which of the following greenhouse gases are produced **only** by human activities?
- A. Methane and chlorofluorocarbons (CFCs)
 - B. Carbon dioxide and water vapour
 - C. CFCs
 - D. Methane and water vapour

17. Rossby waves tend to occur at
- A. high altitudes and high latitudes.
 - B. low altitudes and low latitudes.
 - C. low altitudes and high latitudes.
 - D. high altitudes and low latitudes.
18. Which of the following combinations is typical of r-selected organisms?
- I. A high number of offspring
 - II. A tendency to be associated with temporary habitats
 - III. Completion of the life-cycle in a relatively short period
 - IV. A low number of offspring
 - V. A high level of parental care
 - VI. A rapid rate of growth
- A. IV and V only
 - B. I, II and III only
 - C. I, II, III and VI only
 - D. II, IV and V only
19. Which is an example of an aesthetic justification for conservation?
- A. The need for essential life-support functions of the biosphere
 - B. The idea that everything has a right to exist
 - C. The use of the biosphere for human activities
 - D. The idea that the biosphere gives pleasure to humans

20. Hadley cells transport
- heat only to higher latitudes.
 - heat only to lower latitudes.
 - heat and water vapour to higher latitudes.
 - heat and water vapour to lower latitudes.

Questions 21 and 22 refer to the diagram of the nitrogen cycle below.



21. Denitrification is
- I.
 - II.
 - III.
 - IV.
22. Which is the most important flow **not** shown in the diagram?
- nitrite ions → animals
 - atmospheric nitrogen → ammonium ions
 - nitrate ions → plants
 - animals → atmospheric nitrogen

23. Which is the correct set of statements?

| | Troposphere | Stratosphere |
|----|---|---|
| A. | Absorbs large proportions of long-wave radiation from above; temperature increases with altitude | Absorbs large proportions of short-wave radiation from below; temperature decreases with altitude |
| B. | Absorbs large proportions of long-wave radiation from below; temperature decreases with altitude | Absorbs large proportions of short-wave radiation from above; temperature increases with altitude |
| C. | Absorbs large proportions of short-wave radiation from above; temperature increases with altitude | Absorbs large proportions of long-wave radiation from below; temperature decreases with altitude |
| D. | Absorbs large proportions of short-wave radiation from below; temperature decreases with altitude | Absorbs large proportions of long-wave radiation from above; temperature increases with altitude |

24. Compared to pioneer communities, climax communities usually have

- A. a higher net productivity.
- B. a higher gross productivity.
- C. inverted pyramids of biomass.
- D. shorter food chains.

25. Methane is produced by

- I. bacterial activity.
 - II. decomposition in landfill sites.
 - III. digestive systems of cattle.
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

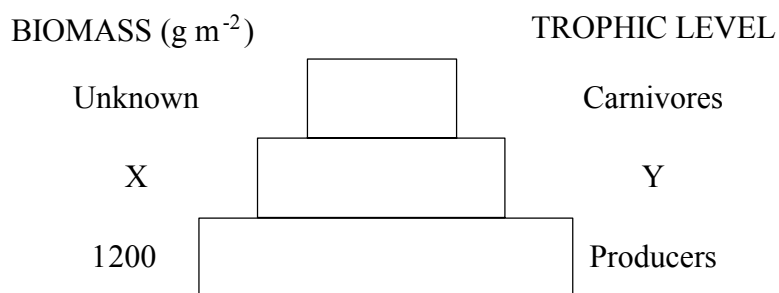
26. The largest store of carbon on earth is in
- A. rocks and soils.
 - B. living organisms.
 - C. the oceans.
 - D. the atmosphere.
27. An increase in parasitism, causing reduced survival in a host population as that population increases in size, is an example of
- A. an internal regulating factor.
 - B. a density independent factor.
 - C. positive feedback.
 - D. a density dependent factor.
28. An area of forest contains a volume of 1.5 million m^3 of timber. On average, each year bushfires destroy 50 000 m^3 and pests destroy 100 000 m^3 of timber. Normal tree growth adds 200 000 m^3 . What is the approximate sustainable yield of the forest in $\text{m}^3 \text{ yr}^{-1}$?
- A. 50 000
 - B. 1 550 000
 - C. 0
 - D. 350 000

29. Calculate the missing values in the table.

| Country | Crude birth rate | Crude death rate | Natural increase rate |
|----------------|------------------|------------------|-----------------------|
| Uganda | 45 | Y | 2.4 |
| United Kingdom | X | 10 | 0.3 |
| Russia | 11 | 16 | Z |

- | | X | Y | Z |
|----|------|------|------|
| A. | 10.3 | 42.6 | –5 |
| B. | 9.7 | 47.4 | –5 |
| C. | 13 | 21 | –0.5 |
| D. | 13 | 21 | 0.5 |

30. The diagram below shows a pyramid of biomass for an ecosystem (not drawn to scale).



X and Y are most likely to be

- | | X | Y |
|----|-----|-------------|
| A. | 1.2 | Decomposers |
| B. | 120 | Consumers |
| C. | 120 | Herbivores |
| D. | 1.2 | Herbivores |