

ENVIRONMENTAL SYSTEMS

Standard Level

Wednesday 10 November 1999 (afternoon)

Paper 1

45 minutes

This examination paper consists of 30 questions.

Each question offers 4 suggested answers.

The maximum mark for this paper is 30.

INSTRUCTIONS TO CANDIDATES

Do NOT open this examination paper until instructed to do so.

Answer ALL questions.

For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.

EXAMINATION MATERIALS

Required:

Optically Mark Read (OMR) answer sheet

Allowed:

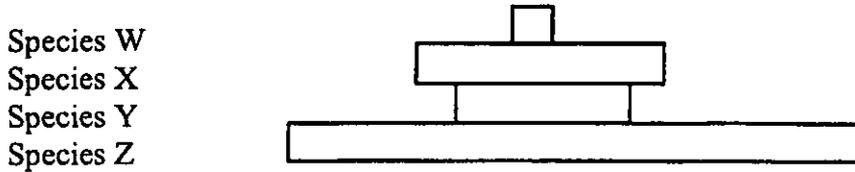
A simple translating dictionary for candidates not working in their own language

1. Which of the following are most important in transferring heat from the equator to the poles?
 - A. Lithosphere and atmosphere
 - B. Hydrosphere and lithosphere
 - C. Atmosphere and hydrosphere
 - D. Hydrosphere only

2. Which of the following pieces of information are **not** normally obtainable from an age/sex pyramid?
 - A. The natural increase rate for the population
 - B. The percentage of individuals of each sex in different age groups
 - C. A difference in life expectancy of males and females
 - D. The likely position of the population on a demographic transition model

3. Which of the following is most similar to a closed system?
 - A. A leaf on a tree
 - B. A stone in a cave
 - C. A hot spring
 - D. A cloud

Questions 4 and 5 refer to the diagram below which represents the pyramid of biomass for an ecosystem that is a managed nature reserve.



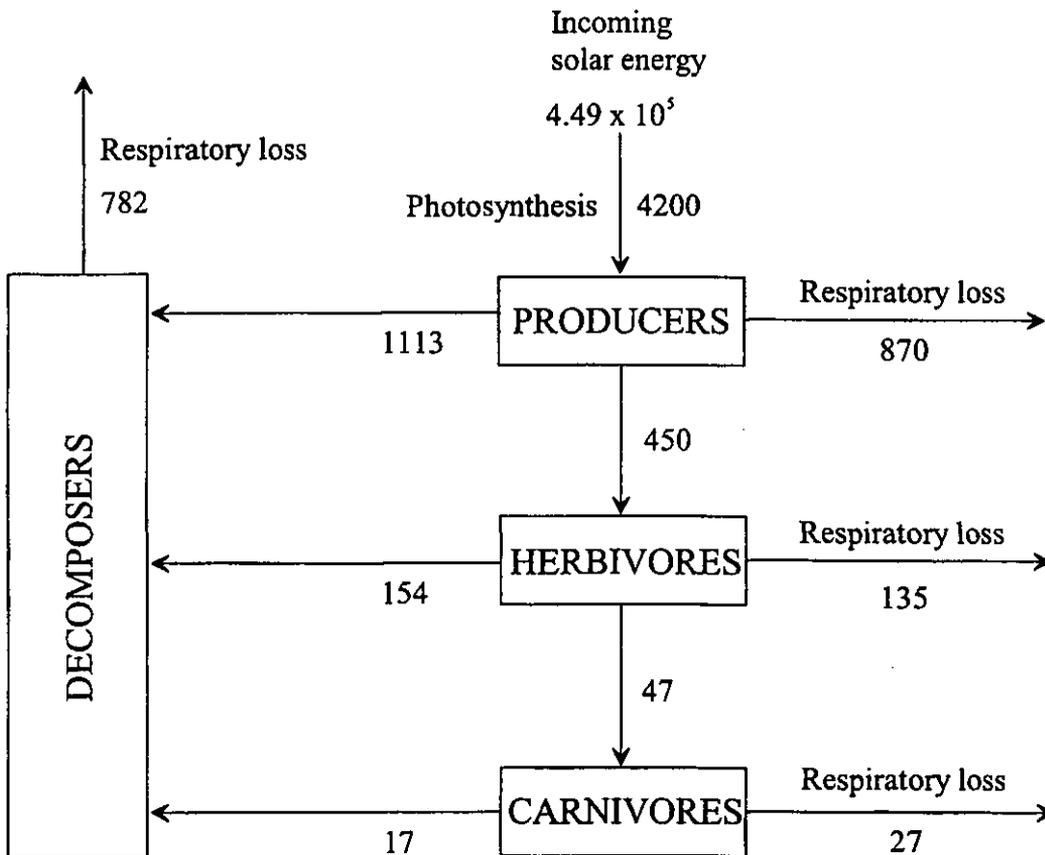
4. Which of the following is most likely to be the explanation for the biomass of species X temporarily being greater than species Y?
- A. Biomass accumulates along the food chain.
 - B. Species Y has a greater number of individuals than species X.
 - C. Species X has consumed a large part of the biomass of species Y.
 - D. Species X has fewer predators than species Y.
5. A group of conservationists wish to introduce a threatened top carnivore (species V) that would feed on species W. The success of such a project would be most likely if
- A. only one pair of individuals of species V were introduced.
 - B. more individuals of species W were introduced at the same time.
 - C. an alternative prey species for species V was introduced alongside species W.
 - D. the boundaries of the nature reserve were extended to increase the amount of primary production.
6. Which of the following facts about ecosystems best illustrates the Second Law of Thermodynamics?
- A. Light energy is converted to chemical energy in photosynthesis.
 - B. Total energy inputs to the biosphere are equal to total energy outputs.
 - C. Much energy is lost as heat from ecosystems as it passes along food chains.
 - D. Less than 50% of the incoming solar radiation reaches the earth's surface.

7. Consider the following statements about a typical S-shaped population curve.
- I. The early growth of the population is an example of positive feedback.
 - II. The growth rate reaches its maximum before the numbers reach their maximum.
 - III. The growth rate is greatest when there are most individuals.
 - IV. The growth rate is only exponential until the growth rate reaches its maximum.

Which of the above statements are true for the typical S-shaped population curve?

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

Questions 8 - 11 refer to the diagram below which shows some of the energy flows through an ecosystem. All units are $\text{kJ m}^{-2} \text{ day}^{-1}$.



8. The net productivity of the decomposers in $\text{kJ m}^{-2} \text{day}^{-1}$ is
- A. 502
 - B. 782
 - C. 1284
 - D. 2066
9. The net primary productivity of the producers in $\text{kJ m}^{-2} \text{day}^{-1}$ is
- A. 1720
 - B. 1767
 - C. 2217
 - D. 3330
10. The percentage of incoming solar radiation fixed by the producers is approximately
- A. 0.01
 - B. 0.1
 - C. 1
 - D. 10
11. From the evidence available in the given data, this ecosystem is most likely to be
- A. a fully developed climax community.
 - B. a pioneer community.
 - C. an intermediate stage of seral succession.
 - D. an old and declining community.

12. The human carrying capacity of a country depends most heavily upon

- A. population policies restricting number of offspring.
- B. the level of the country's technological development.
- C. the quality of housing.
- D. available medical facilities.

13. The lowest layer of the atmosphere is the . . . (i) . . . , in which temperatures. . . (ii) . . . , with increasing altitude.

	(i)	(ii)
A.	stratosphere	increase
B.	stratosphere	decrease
C.	troposphere	increase
D.	troposphere	decrease

14. The following are three examples of relationships between species.

- I. Flea living in a sheep's fur.
- II. Two herbivorous insect species feeding on the same food source.
- III. Bacteria living in a cow's stomach breaking down cellulose.

Identify the types of relationship above.

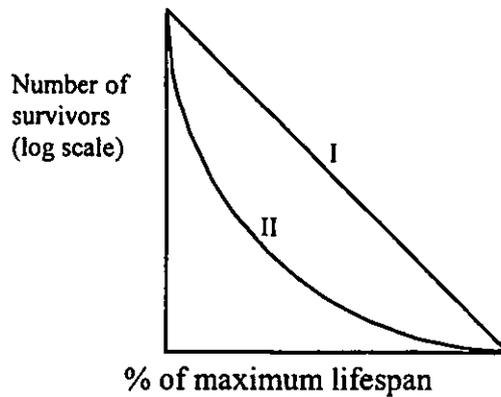
	I	II	III
A.	parasitism	mutualism	mutualism
B.	predation	competition	parasitism
C.	parasitism	competition	mutualism
D.	predation	mutualism	parasitism

15. Burning coal containing high levels of . . . (i) . . . , releases . . . (ii) . . . , into the atmosphere which might eventually lead to the release of toxic aluminium ions into lakes.

	(i)	(ii)
A.	oxygen	ozone
B.	carbon	carbon dioxide
C.	sulphur	sulphur oxides
D.	chlorides	chlorofluorocarbons

16. The greatest importance of decomposers to the productivity of an ecosystem is their ability to
- A. increase the accumulation of dead organic matter.
 - B. increase the inorganic storages available to producers.
 - C. return oxygen to the atmosphere.
 - D. carry out denitrification.
17. An example of positive feedback is
- A. the increase in parasitic populations as the density of their host population increases.
 - B. the trapping of organic matter by plants growing on bare rock which leads to a greater depth of soil.
 - C. animals failing to reproduce when food is in short supply.
 - D. taller trees being blown over by wind before producing their seeds.
18. Which one of the following statements about the earth's water storages is correct?
- A. The oceans store more than 95% of the earth's water.
 - B. The atmosphere contains more water than rivers and lakes together.
 - C. Nearly one quarter of the earth's water is frozen in the glaciers and ice-caps.
 - D. More water is stored in the rivers and lakes than in the groundwater.

19. The figure below shows survivorship curves for populations of carnivorous birds, I, that prey on herbivorous insects, II.



Which of the following statements can be concluded from the evidence in this graph?

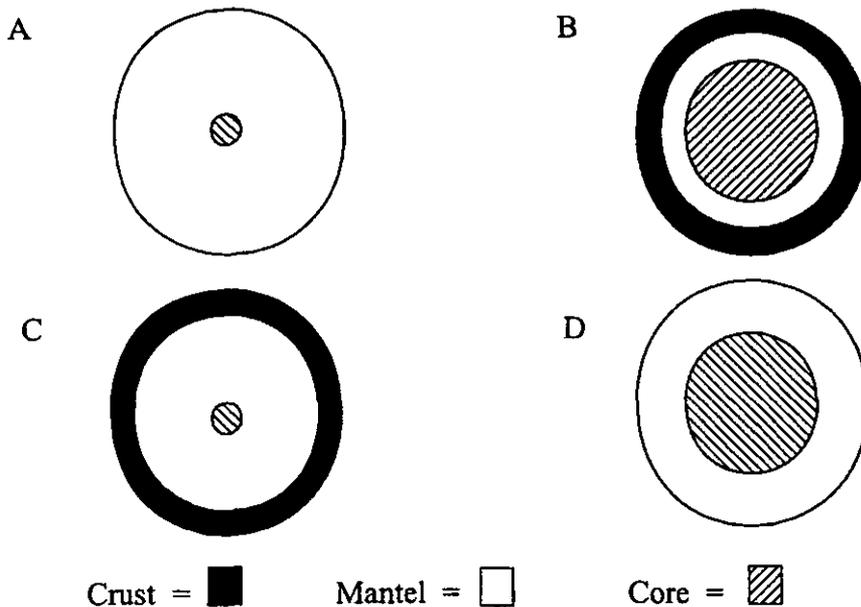
- A. Most insects die young.
 - B. The birds have a shorter lifespan than the insects.
 - C. Insects produce a greater number of offspring than the birds.
 - D. The mortality rate of insects increases throughout their lifespan.
20. The following is a list of changes that might occur in an ecosystem.
- I. Increase in the ratio of consumers to producers
 - II. Decrease in the proportion of r-selected species
 - III. Decrease in available minerals
 - IV. Increase in decomposer activity

Which of these changes is likely to result from the process of succession?

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

21. Subduction zones are associated with
- A. destructive plate margins.
 - B. mid-oceanic ridges.
 - C. conservative plate margins.
 - D. the earth's core.
22. The maximum sustainable yield for a resource may be described as equal to
- A. the natural income.
 - B. the natural capital.
 - C. the difference between the natural capital and natural income.
 - D. the addition of the natural capital and natural income.

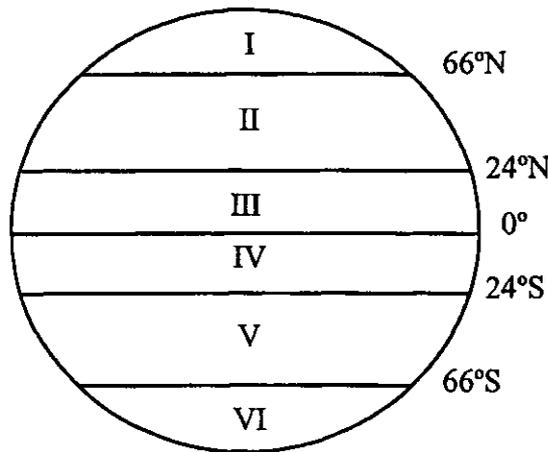
23. The diagrams below represent the internal structure of the earth. Which diagram most closely represents the zones in the correct proportion to one another?



24. Which one of the following statements about the ozone layer is correct?

- A. The process of forming ozone from oxygen absorbs ultra-violet radiation.
- B. Most ozone is formed in the troposphere and diffuses into the stratosphere.
- C. Each chlorine atom released from chlorofluorocarbons combines irreversibly with a single ozone molecule.
- D. The increase in ultra violet radiation penetrating the ozone layer causes acid rain.

25. The following diagram represents different latitudinal zones on the earth's surface.



Which of the following gives the correct zones of latitude for Hadley cells and Westerly winds?

	Hadley Cells	Westerly Winds
A.	III and IV	II and V
B.	II and V	I, III, IV and VI
C.	II only	II, IV and VI
D.	III and IV	I, III, IV and VI

26. The farming of rice contributes to global warming because it releases

- A. methane which absorbs long-wavelength radiation.
- B. methane which absorbs short-wavelength radiation.
- C. carbon dioxide which absorbs long-wavelength radiation.
- D. carbon dioxide which absorbs short-wavelength radiation.

27. Crude birth rate is best defined as

- A. the total number of births per year.
- B. the number of births per 1000 individuals per year.
- C. the annual percentage increase in the population due to births alone.
- D. the number of births per 1000 women of child bearing age per year.

28. A river flows through a forest on a hillside. Which of the following most correctly identifies examples of natural capital and natural income associated with this system?

	Natural capital	Natural income
A.	The trees of the forest	The timber to be gained from complete deforestation
B.	The water flowing in the river	The total fish population of the river
C.	The trees of the forest	The ability of the trees to reduce erosion
D.	The total fish population of the river	The organic waste produced by the fish

29. An improvement in the educational opportunities for women in a developing country would be expected to lead to

- A. an increase in infant mortality.
- B. a long-term decrease in crude birth rate.
- C. an increase in the number of children per family.
- D. a rapid increase in emigration rates.

30. The groundwater in a limestone aquifer used by a local human population would usually be considered

- A. a non-renewable resource
- B. an unsustainable resource.
- C. a renewable resource.
- D. a replenishable resource.