

ENVIRONMENTAL SYSTEMS

Standard Level

Tuesday 11 May 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.

Calculators are NOT permitted for this examination paper.

EXAMINATION MATERIALS

Required:

Optically Mark Read (OMR) answer sheet

Allowed:

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

1. A fungus which gets food from the living tissue of a tree on which it grows is an example of
 - A. competition.
 - B. mutualism.
 - C. parasitism.
 - D. herbivory.

2. The human population is now growing at a rate of about
 - A. 1.7 % per month.
 - B. 17 % per year.
 - C. 0.17 % per year.
 - D. 1.7 % per year.

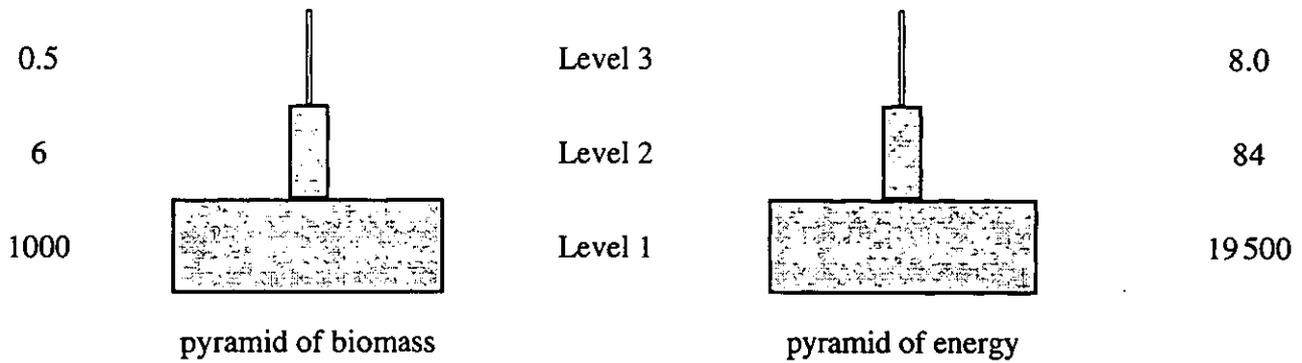
3. Rossby waves found in the Northern hemisphere transport
 - A. warm air to north and cold air to south.
 - B. warm air to north and south.
 - C. cold air to north and south.
 - D. cold air to north and warm air to south.

4. The tundra contains many shallow lakes and bogs because
 - A. there is heavy snowfall in winter.
 - B. weathering of rocks occurs unevenly.
 - C. there is a lot of water from melting glaciers.
 - D. the ground is mostly impermeable.

5. In some ecosystems, the plants that gain advantage by regular burning are also the most combustible. This is an example of
- A. negative feedback.
 - B. positive feedback.
 - C. ecological succession.
 - D. a climax community.
6. The human population can continue to grow exponentially because
- A. women are younger when they have children.
 - B. there has been an increase in multiple births.
 - C. birth rate is greater than death rate.
 - D. it is below its carrying capacity.

Questions 7-9 refer to the diagram below.

The following pyramids were estimated for a single food chain in a terrestrial ecosystem.



7. In what units might figures for each pyramid be expressed?

	Pyramid of biomass	Pyramid of energy
A.	kg	kJ
B.	g m^{-2}	kJ m^{-2}
C.	g	kJ m^{-2}
D.	$\text{g m}^{-2} \text{ yr}^{-1}$	$\text{kJ m}^{-2} \text{ yr}^{-1}$

8. The organism at Level 3 in this food chain is most likely to be

- A. an autotroph.
- B. a herbivore.
- C. a carnivore.
- D. a producer.

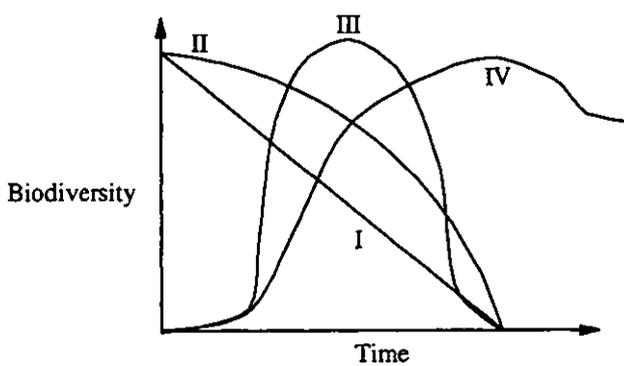
9. The organism at Level 3 receives only about 10 % of the energy which enters Level 2 because

- A. most energy is lost as waste and respiratory heat.
- B. the biomass at Level 3 is about 10 % of that at Level 2.
- C. the organism at Level 3 is a predator.
- D. the organism at Level 2 stores most of its energy.

10. In which of the following ecosystems is a pyramid of biomass sometimes inverted?
- A. tundra
 - B. ocean
 - C. tropical rainforest
 - D. desert
11. On a small island, 250 mice were trapped, marked and released. The following week, a further sample of 250 were trapped, of which 50 were found to have been previously marked. Approximately how large was the total mouse population of the island?
- A. 50
 - B. 250
 - C. 1250
 - D. 62 500
12. The main storage of nitrogen in the ecosphere is in the
- A. lithosphere.
 - B. biosphere.
 - C. atmosphere.
 - D. hydrosphere.

13. In the diagram below, which curve most closely represents the change in the biodiversity in a community during succession?

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



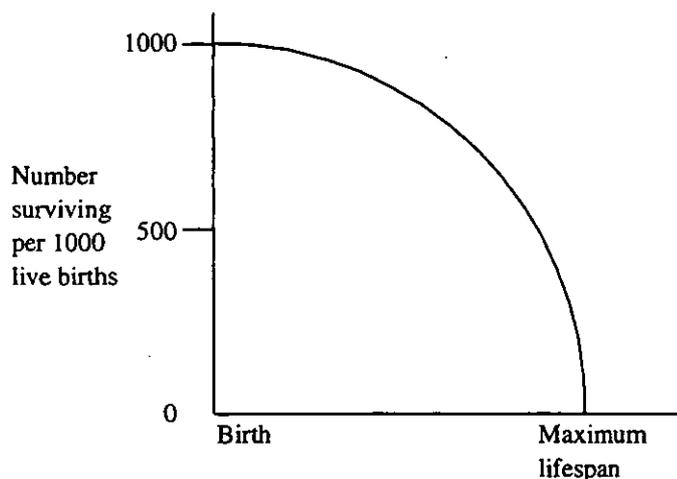
14. A plant which germinates quickly, has a slow growth rate and long lifespan, and produces a large number of seeds irregularly is an example of

- A. an r-selected organism.
- B. a pioneer organism.
- C. an organism that has both r and K characteristics.
- D. an organism typical of climax communities.

15. An open system is a system that exchanges with its environment

- A. matter and energy.
- B. neither matter nor energy.
- C. matter but not energy.
- D. energy but not matter.

16. The survivorship curve below shows



- A. most deaths in mid-life, with high survival at either end of the age-range.
- B. a low mortality amongst the young, increasing with age.
- C. an equal proportion of the population dying throughout the age-range.
- D. a high mortality amongst the young, decreasing with age.

Use the data in the table below to answer questions 17 and 18.

The demographic characteristics of a certain country are summarised below.

Demographic Characteristics	Statistics
Population size (millions)	3.45
Birth rate (per 1000)	38
Death rate (per 1000)	7
Total fertility rate (average number of births per woman)	6
Population under 15 years of age (%)	47

17. The natural rate of increase of this population per year is

- A. 6 %.
- B. 3.1 %.
- C. 1 %.
- D. 0.31 %.

18. The data most likely represents a
- A. developing country because the population size is small.
 - B. developed country because the death rate is low.
 - C. country undergoing demographic transition.
 - D. developing country because the total fertility rate is high.

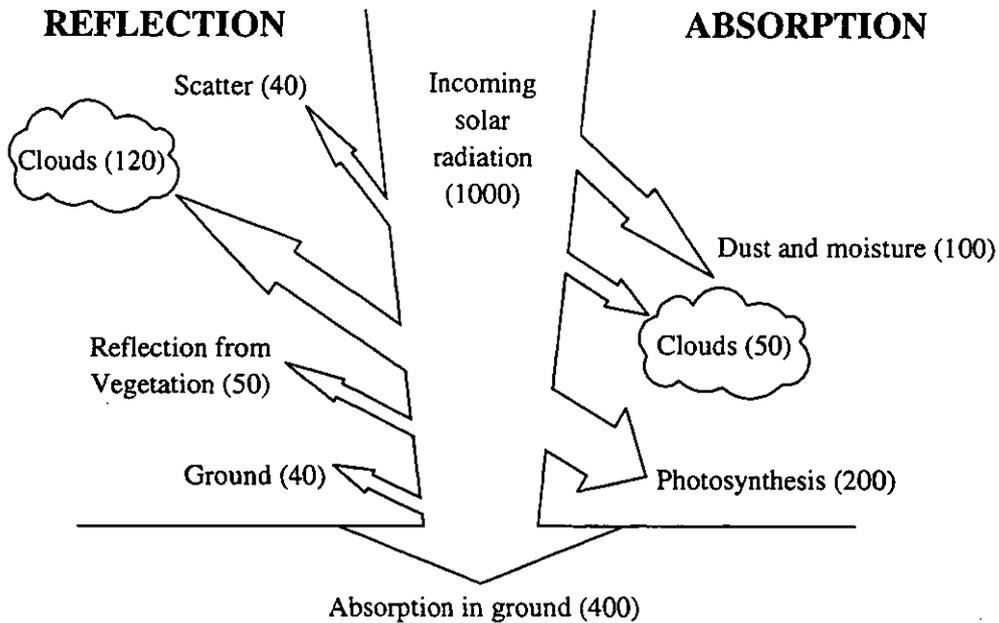
19. For most desert areas, which of the following is correct?

	Gross Primary Productivity	Net Primary Productivity	Biomass
A.	low	low	low
B.	high	high	high
C.	low	low	high
D.	high	high	low

20. Which list shows the atmospheric gases in descending order of their relative contribution to global warming?
- A. chlorofluorocarbons, methane, carbon dioxide
 - B. carbon dioxide, chlorofluorocarbons, methane
 - C. water vapour, carbon dioxide, methane
 - D. carbon dioxide, methane, water vapour
21. If a population grows exponentially,
- A. the population grows by the same percentage per unit of time.
 - B. the same number of new individuals are added per unit of time.
 - C. the number of new individuals added in a unit of time varies with death rate.
 - D. rate of population growth depends on the size of the population.

Questions 22 and 23 refer to the diagram below.

The diagram shows the energy budget of an ecosystem.



22. In this diagram, the energy absorbed by the atmosphere and the ground is ...**(i)**... and this energy will be ...**(ii)**....
- | | | |
|----|------|-------------------------------|
| | (i) | (ii) |
| A. | 750 | radiated back out to space |
| B. | 550 | radiated back out to space |
| C. | 550 | absorbed by the Earth's crust |
| D. | 1000 | absorbed by the Earth's crust |
23. The percentage of incoming solar radiation that is converted to chemical energy by plants is ...**(i)**... and this is termed the ...**(ii)**....
- | | | |
|----|------|--------------------------|
| | (i) | (ii) |
| A. | 25 % | Gross Primary Production |
| B. | 25 % | Net Primary Production |
| C. | 20 % | Net Primary Production |
| D. | 20 % | Gross Primary Production |

24. All of the following are true of acid deposition EXCEPT
- A. it causes mucus to build up in the gills of fish.
 - B. it causes erosion of limestone buildings.
 - C. it decreases species diversity.
 - D. it decreases the solubility of aluminium ions.
25. The greenhouse effect is caused mainly by the absorption of
- A. short wavelength radiation in the stratosphere.
 - B. cosmic rays in the stratosphere.
 - C. long wavelength radiation in the troposphere.
 - D. ultra-violet radiation in the troposphere.
26. Which of the following normally emit gases which cause acid deposition?
- I. nuclear power stations
 - II. oil-fired power stations
 - III. vehicle exhausts
- A. I, II and III
 - B. I and II only
 - C. II and III only
 - D. II only

27. Identify the processes below:

- I. Conversion of solar radiation to chemical energy by photosynthesis.
- II. Denitrification by bacteria.
- III. Formation of glaciers from snow.
- IV. Loss of heat energy from organisms in respiration.

Transfer Process

Transformation Process

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

28. Which of the gases below does **not** act as a greenhouse gas?

- A. chlorofluorocarbons
- B. methane
- C. carbon dioxide
- D. nitrogen

29. The best definition of carrying capacity is

- A. a population size at any given time.
- B. the size of a population per unit area.
- C. the size of a sustainable population.
- D. the rate of increase of a population.

30. Stratospheric ozone is

- A. replenishable because it naturally renews itself at a certain rate.
 - B. non-renewable because it took millions of years to form.
 - C. replenishable because it is possible for humans to synthesise and release ozone.
 - D. non-renewable because once destroyed it is gone forever.
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