

**ENVIRONMENTAL SYSTEMS
STANDARD LEVEL
PAPER 1**

Wednesday 7 May 2003 (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.

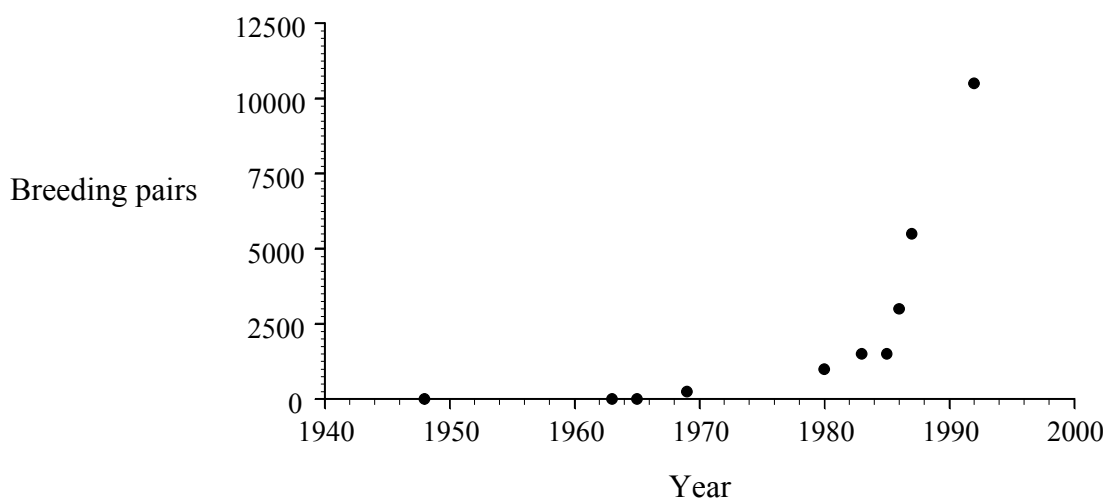
1. Which statement is correct?
- A. Convictional cells in the asthenosphere are important for the net transfer of energy from the tropics to the poles.
 - B. The atmosphere and the hydrosphere are important for the net transfer of energy from the poles to the tropics.
 - C. The atmosphere and the hydrosphere are important for the net transfer of energy from the tropics to the poles.
 - D. Convictional cells in the atmosphere are important for the net transfer of energy from the poles to the tropics.
2. The accelerating decline in the population of a country in which the average age was increasing, provides an example of which of the following?
- A. Negative feedback
 - B. Positive feedback
 - C. Steady-state equilibrium
 - D. A demographic transition model
3. Four examples of natural capital are listed below.
- (i) a nickel ore deposit in the Australian outback
 - (ii) a population of deer in a forest reserve
 - (iii) ozone in the upper atmosphere
 - (iv) the forest cover of an uninhabited Pacific island

In which of the three classes of natural capital does each belong?

	(i)	(ii)	(iii)	(iv)
A.	non-renewable	renewable	renewable	replenishable
B.	replenishable	replenishable	renewable	non-renewable
C.	renewable	renewable	non-renewable	renewable
D.	non-renewable	renewable	replenishable	renewable

4. Which statement most correctly describes *K*-strategist organisms?
- A. They reach adulthood quickly and have many young.
 - B. They reach adulthood slowly and have many young.
 - C. They reach adulthood quickly and have few young.
 - D. They reach adulthood slowly and have few young.

Questions 5 and 6 relate to the graph below which shows the number of pairs of penguins breeding on an island in the Southern Ocean.



[Source: data from Australian Antarctic Division]

5. The graph could be used to
- A. estimate the growth rate of the population.
 - B. estimate the survivorship of the species
 - C. estimate the breeding success of the population.
 - D. estimate the life expectancy of a pair of penguins.
6. Penguins are a part of a complex oceanic ecosystem that also includes organisms above them in the food-chain (carnivores such as leopard seals) and below them (fish). What changes would you expect as the result of the changes in penguin numbers shown in the graph?
- A. Leopard seals and fish to increase in number.
 - B. Leopard seals and fish to decrease in number.
 - C. Leopard seals to increase, but fish to decrease in number.
 - D. Leopard seals to decrease, but fish to increase in number.

7. Temperate forests are generally found closer to the
- A. poles than both tundra and deserts.
 - B. equator than both tropical forests and deserts.
 - C. poles than deserts, but closer to the equator than tundra.
 - D. poles than tropical forests, but closer to the equator than deserts.
8. Which list contains **only** abiotic components of an ecosystem?
- A. air, water, rock
 - B. air, producers, climate
 - C. soil, consumers, water
 - D. carnivores, herbivores, decomposers
9. The plants and animals of Australia had a unique evolution because the tectonic plate on which the continent is situated
- A. is the oldest.
 - B. is the youngest.
 - C. was never attached to any other plate.
 - D. has been isolated for a long period.
10. Which of the following contains the greatest proportion of the world's fresh water?
- A. Organisms
 - B. The atmosphere
 - C. Ice-caps and glaciers
 - D. Streams, rivers and lakes

11. For a particular year, for the fishing grounds of an island nation, assume:

- R = the biomass of young fish reaching harvestable size
- G = the growth in biomass of fish already of harvestable size
- M = the loss of fish through death and emigration
- B = the biomass of the total fish population at the start of the year.

The sustainable yield of the fishing grounds could be calculated using which of the following?

- A. $R + G - M$
 - B. $B - M$
 - C. $B + R + G - M$
 - D. $R + G$
12. Species associated with pioneer and early seral communities tend to have ... **(i)** ... young, which mature ... **(ii)** ... and are often given ... **(iii)** ... parental care. Such organisms often have a ... **(iv)** ... life span.

Which of the following provides the correct set of words to be inserted in the above sentence?

- | | (i) | (ii) | (iii) | (iv) |
|----|------------|-------------|--------------|-------------|
| A. | many | slowly | little | long |
| B. | many | quickly | little | short |
| C. | few | slowly | much | short |
| D. | few | quickly | little | long |

13. Which of the following is **not** associated with the process of subduction?

- A. Formation of new crustal material
- B. Formation of islands and mountains
- C. Melting of crustal material
- D. Volcanic activity

14. In a country in which most energy is obtained from burning fossil fuels, which of the following will tend to reduce the amount of acid deposition?
- A. Switching from conventional to nuclear power stations
 - B. Reducing tax on fossil fuels
 - C. Using lead-free petrol (gasoline) in cars
 - D. Banning the use of substances that harm the ozone layer, such as CFCs
15. If the producer biomass in an ecosystem is 150 kg per hectare (kg ha^{-1}), what is the approximate primary consumer (herbivore) biomass (in kg ha^{-1}) that might be expected in the same ecosystem?
- A. 15000
 - B. 1500
 - C. 15
 - D. 1.5
16. Which statement about the storage of nitrogen in ecosystems is correct?
- A. The atmosphere contains more carbon than nitrogen.
 - B. Nitrogen is not stored in organic matter in the soil.
 - C. The plant biomass of an ecosystem contains much more nitrogen than carbon.
 - D. Nitrogen is stored in the animal biomass of an ecosystem mainly in the form of protein.
17. What is the lapse rate?
- A. The rate at which temperature declines with increasing altitude in the troposphere
 - B. The rate at which temperature increases approaching the equator
 - C. The rate at which an organism's population grows when numbers are uncontrolled
 - D. The rate at which ozone is produced by ultraviolet radiation

18. Why is it difficult to calculate carrying capacities for human populations?
- A. Human populations have increased greatly over the last 50 years.
 - B. Resources can be imported and exported and the level of technology can influence carrying capacity.
 - C. Human populations can move more rapidly than the populations of other organisms.
 - D. Pollution has damaged certain environments and reduced the carrying capacity.
19. If toxic materials were to be released into a coral reef ecosystem, in which part of the ecosystem would you expect them to accumulate to the greatest extent?
- A. In the algae living amongst the corals
 - B. In the open water
 - C. In the tissues of small fish
 - D. In the tissues of large carnivorous fish such as sharks
20. In a normal terrestrial ecosystem, most nutrients
- A. come from the sun.
 - B. move through the ecosystem in a single direction only.
 - C. tend to be stored in the biomass of the top carnivore.
 - D. tend to be recycled.
21. Which statement is correct?
- A. A food chain can never have more than four members.
 - B. Ecosystems that have a high productivity often also show high biodiversity.
 - C. One ecosystem can never contain another within it.
 - D. Pioneer communities usually contain more plant species than climax communities.

22. If the crude birth rate of a country in a particular year is 16 per 1 000, and the crude death rate is 8 per 1 000, what is the annual population growth by natural increase?
- A. 0.8 %
 - B. 8.0 %
 - C. 2.0 %
 - D. 0.2 %
23. What is a biome?
- A. A collection of ecosystems sharing similar climatic conditions
 - B. A group of populations living and interacting with each other in a common habitat
 - C. A community of independent organisms and the physical environment they inhabit
 - D. A group of organisms that interbreed and produce fertile offspring
24. During the process of soil formation
- A. environmental temperature has no effect.
 - B. the first stage involves the weathering of parent rock.
 - C. plants have no material input.
 - D. chemical weathering slows the process.
25. Photochemical smog is formed when primary pollutants interact with which of the following?
- A. Water vapour
 - B. Heat
 - C. Oxygen
 - D. Sunlight

26. What is a group of organisms of the same species living in the same area at the same time known as?
- A. A community
 - B. A population
 - C. An ecosystem
 - D. An ecological niche
27. Why is lime sometimes added to acid lakes?
- A. To lower the pH of the water
 - B. To raise the pH of the water
 - C. To kill poisonous fish
 - D. To prevent eutrophication
28. The downward leaching of nutrients within the soil profile is primarily an example of which of the following?
- A. Transformation of energy
 - B. Transfer of energy
 - C. Transfer of materials
 - D. Transformation of materials
29. Which statement about the ozone layer is correct?
- A. Fluorine released from chlorofluorocarbons combines with carbon dioxide molecules in the upper atmosphere to form ozone.
 - B. Acid rain is caused by an increase in the amount of ultraviolet radiation that penetrates the ozone layer.
 - C. The burning of fossil fuels causes the formation of ozone, which gradually diffuses to the stratosphere.
 - D. Ultraviolet radiation is absorbed during the process of stratospheric ozone formation.

30. Which statement about soils is correct?

- A. Clay soils are capable of retaining more moisture than sandy soils.
 - B. Soils form rapidly in some climates and thus soil is often regarded as a renewable resource.
 - C. Irrigation of soils prevents salinization.
 - D. Loam soils are generally less productive than either clay or sandy soils.
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