



**ENVIRONMENTAL SYSTEMS
STANDARD LEVEL
PAPER 1**

Thursday 10 November 2005 (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 system represents a herd of elephants living on the African grassland?
 - A. An open system
 - B. A closed system
 - C. An isolated system
 - D. An autotrophic system

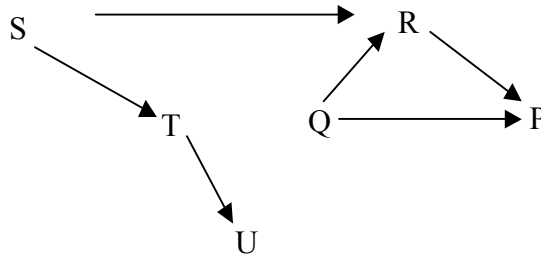
2. Which of the following best describes the result of positive feedback in a system?
 - A. The system changing further in the same direction
 - B. The system remaining stable
 - C. The system changing in the opposite direction
 - D. The system remaining unchanged

3. Which statement describes the result of the first law of thermodynamics?
 - A. In any isolated system entropy tends to increase spontaneously.
 - B. Heat energy always flows spontaneously from hot to cold.
 - C. Energy always transfers from a more useful form to a less useful form.
 - D. Energy input always equals energy output.

4. Which list includes three **abiotic** factors that affect aquatic plants?
 - A. number of decomposers, pH of water, day length
 - B. water temperature, oxygen concentration, light intensity
 - C. carbon dioxide concentration, number of primary consumers, wavelength of light
 - D. water temperature, number of secondary consumers, carbon dioxide concentration

5. Which statement about a food chain is correct?
- A. The top carnivore is the species most vulnerable to extinction.
 - B. The system is very efficient with low energy loss.
 - C. Approximately 10 % of energy is lost in every transfer.
 - D. The tertiary consumers will always have the largest number of individuals.

Questions 6 and 7 are based on the following diagram of a food web. The letters represent different species of organism. *S* is a photosynthesizing organism.



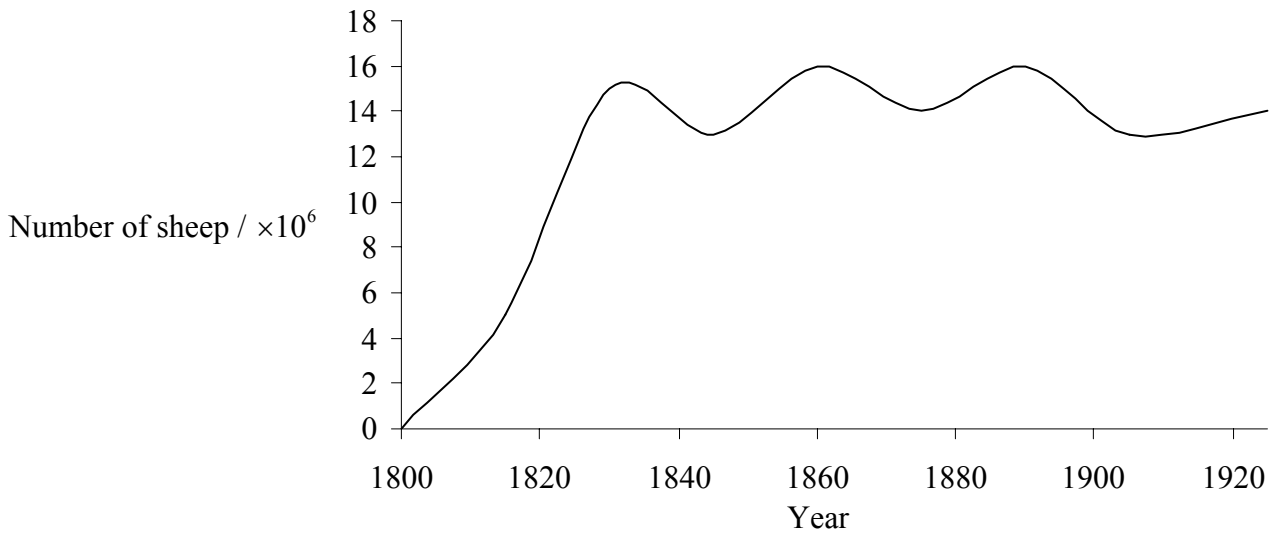
6. Which organism is **only** a primary consumer (herbivore)?
- A. P
 - B. T
 - C. U
 - D. S
7. What is organism U?
- A. A producer
 - B. A primary consumer
 - C. A secondary consumer (carnivore)
 - D. An autotroph

8. Which of the following are both produced by aerobic respiration?
- A. Carbon dioxide and oxygen
 - B. Water and oxygen
 - C. Carbon dioxide and methane
 - D. Water and carbon dioxide
9. Which of the following are important storages of phosphorus?
- I. Atmosphere
 - II. Soils
 - III. Oceans
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III
10. The energy available to the tertiary consumers (top carnivores) in a particular ecosystem is $10 \text{ kJ m}^{-2} \text{ y}^{-1}$. How much energy (in $\text{kJ m}^{-2} \text{ y}^{-1}$) is likely to be passed on by the producers to the primary consumers?
- A. 1
 - B. 10
 - C. 100
 - D. 1000

11. How is the net productivity of the producers in an ecosystem defined?

- A. Energy fixed by biomass per unit time plus respiratory losses
- B. Energy fixed by biomass per unit time minus respiratory losses
- C. Biomass gained by heterotrophic organisms per unit time
- D. Gain in biomass per unit time minus fecal losses

12. The graph below shows the changes in the sheep population of the island of Tasmania since their introduction in about 1800.



[Source: modified from G Tyler Miller (2001), *Environmental Science*, Brooks/Cole, page 171]

Which statement is correct?

- A. The graph represents a survivorship curve.
- B. In 1840 a population boom occurred.
- C. By 1830 the population had reached its carrying capacity.
- D. The sheep is a good example of an *r*-strategist species.

13. [– I –] species reproduce and disperse rapidly and unfavourable environmental conditions can cause such populations to [– II –].

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

	I	II
A.	<i>r</i> -strategist	increase
B.	<i>K</i> -strategist	crash
C.	<i>K</i> -strategist	increase
D.	<i>r</i> -strategist	crash

14. Which statement best describes a climax community?

- A. The end-point of ecological succession.
- B. A group of organisms in a community at the same trophic level in a food chain.
- C. The minimum number of a species that can be supported by a given environment.
- D. A community at an early stage of ecological succession.

15. Which statement about the Earth’s energy budget is correct?

- A. Heat is transferred away from the tropics by ocean currents.
- B. About 90 % of the incoming solar radiation reaches the Earth’s surface directly.
- C. There is a net gain of radiation at polar latitudes, where albedo is low.
- D. The proportion of insolation reflected from the Earth’s surface is constant at all latitudes.

16. Which statements correctly describes circulation in a Hadley cell?
- I. Warm air rises in convection currents
 - II. Upper layers of air cool as they move away from the equator
 - III. Cool air sinks creating an area of high pressure
 - IV. Warm air from the tropics mixes with cold air from polar areas
- A. I and IV only
 - B. I, II and III only
 - C. II, III and IV only
 - D. I, II, III and IV
17. Twice as much energy is required to raise the temperature of an aquatic environment than a forest. To what is this mainly due?
- A. The difference in the angle of incidence of the sun
 - B. Water has a greater specific heat capacity
 - C. A large amount of heat is lost by evaporation in forests
 - D. Winds are very strong above the water surface due to reduced friction
18. Which statement is correct?
- A. Ozone is destroyed by carbon dioxide released by burning of fossil fuels.
 - B. During recent decades the ozone hole over the Antarctic has become larger, producing global warming.
 - C. Ultraviolet radiation is involved in the production of stratospheric ozone.
 - D. Ozone is essential for human respiration.

19. Which of the following are possible effects of acid deposition?

- I. Death of fish due to increasing levels of aluminium in lakes
- II. Reduction of forest productivity due to depletion of soil nutrients
- III. Death of trees due to decreasing levels of aluminium in soils

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

20. Which pair of statements about the greenhouse effect is correct?

A.	It is caused by carbon dioxide and methane	It increases acid rain
B.	It occurs in the troposphere	It may cause a rise in sea levels
C.	It accelerates ozone depletion	It is caused by CFCs
D.	It blocks UV light	It occurs in the asthenosphere

21. Which of the following are stages of soil formation?

- I. Chemical weathering
- II. Action of living organisms
- III. Formation of organic compounds
- IV. Mechanical weathering

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

22. Which statement about photochemical smog is correct?
- A. Photochemical smog is independent of local topography and climate.
 - B. Photochemical smog is a mixture of snow and rain formed when the upper air temperature is below freezing.
 - C. Photochemical smog results from the meeting of two air streams in areas of low pressure.
 - D. Photochemical smog is a mixture of pollutants formed under the influence of sunlight.
23. Which of the following contains the greatest proportion of the world's freshwater?
- A. Ice caps and glaciers
 - B. Rivers
 - C. Lakes
 - D. Groundwater
24. Which statement about plate tectonics is **not** correct?
- A. The plates are still moving.
 - B. The plates are composed of magma from the Earth's core.
 - C. Plate tectonics explains some of the patterns of distribution of plants and animals.
 - D. The formation of ocean ridges is due to plate movement.
25. Which process reduces storages of soil nutrients?
- A. Addition of well-composted organic matter
 - B. Addition of lime
 - C. Application of inorganic fertilizers
 - D. Heavy rainfall

26. What is the definition of crude birth rate?
- A. The total number of births per year.
 - B. The number of births per thousand individuals per year.
 - C. The percentage of births per year in a population.
 - D. The predicted birth rate of a country.
27. Which atmospheric gas filters out harmful ultraviolet radiation?
- A. Oxygen
 - B. Ozone
 - C. Carbon dioxide
 - D. CFCs
28. Which is an example of replenishable natural capital?
- A. A forest
 - B. A hydroelectric power station
 - C. Groundwater
 - D. A herd of cattle

29. Which statement is correct?

- A. It is almost impossible to make reliable estimates of carrying capacities for human populations.
- B. A country's carrying capacity for humans is likely to be very low because humans are top consumers in the food chain.
- C. The increase in recycling activities has decreased the human carrying capacity of developed countries.
- D. Denmark has exceeded its carrying capacity because of its low birth rate.

30. Which statement is correct?

- A. Recycling is always economically beneficial.
 - B. Recycling is a better environmental option than reuse because it provides energy.
 - C. It is impossible to recycle dirty water.
 - D. Aluminum, glass containers and cardboard can be recycled.
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