



**ENVIRONMENTAL SYSTEMS
STANDARD LEVEL
PAPER 1**

Thursday 4 May 2006 (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 desert with very low precipitation and little vegetation is an example of which type of system?
 - A. Open
 - B. Closed
 - C. Isolated
 - D. Closed and isolated

2. What does the first law of thermodynamics tell us?
 - A. Doing work always creates heat.
 - B. Entropy tends to increase.
 - C. Energy can not be recycled.
 - D. All energy comes from other energy.

3. Which of the following is an example of negative feedback?
 - A. Loss of vegetation, leading to soil erosion, leading to further loss of vegetation
 - B. Animals failing to reproduce when food is abundant
 - C. More carbon dioxide favouring plant growth, so plants absorb more carbon dioxide
 - D. A population of small mammals in a forest decreasing due to a fire

4. How are the flows and storages of matter and energy generally represented in flow diagrams?

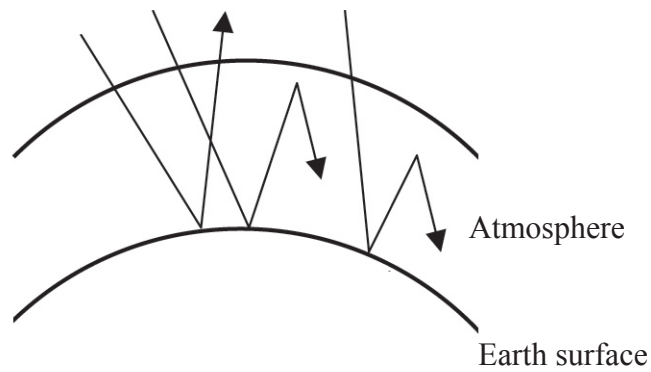
	Storages	Flows
A.	arrows	boxes
B.	circles	boxes
C.	boxes	arrows
D.	boxes	circles

5. Which statement about trophic levels is correct?
- A. The biomass per unit area usually increases with each trophic level.
 - B. A trophic level defines the feeding rate of an organism in a food chain.
 - C. No organism can occupy more than one trophic level in a food web.
 - D. Naturally occurring terrestrial food chains rarely have more than five trophic levels.
6. Which of the following are found at the second trophic level in a food chain?
- A. Carnivores
 - B. Herbivores
 - C. Secondary consumers
 - D. Primary producers
7. Which of the following is the best definition of a population?
- A. The number of individuals of a given species
 - B. The number of individuals of the same species in a given area
 - C. The number of species in a given area
 - D. The number of individuals in a given area
8. Which unit is the most appropriate to express the gross primary productivity of an ecosystem?
- A. kg
 - B. kg y^{-1}
 - C. kg m^{-2}
 - D. $\text{kg m}^{-2} \text{ y}^{-1}$

9. An *r*-strategist generally
- A. gives considerable parental care to its offspring.
 - B. is small and short-lived.
 - C. lives in a stable environment.
 - D. produces small numbers of offspring.
10. The frequency of bush fires increases as the abundance of an inflammable plant species increases. At the same time, the increased frequency of fires leads to a decrease in the population of certain animals. In what way(s) is the fire acting in this example?
- A. As a density-dependent factor for plants and a density-independent factor for animals
 - B. As a density-dependent factor for both plants and animals
 - C. As a density-independent factor for both plants and animals
 - D. As a density-dependent factor for animals and a density-independent factor for plants
11. Which of the following might show primary succession?
- A. A rock surface exposed by a retreating glacier
 - B. An abandoned farm
 - C. A forest that has been clear-cut
 - D. A newly restored ecosystem

12. Which of the following are normally associated with the formation of photochemical smog?
- I. Nitrogen oxides
 - II. Sunlight
 - III. Volatile organic compounds
 - IV. Clouds
- A. I and III only
- B. III and IV only
- C. I, II and III only
- D. I, II, III and IV
13. Which list contains only greenhouse gases?
- A. Carbon dioxide, water and methane
 - B. Methane, CFCs and sulfur dioxide
 - C. Carbon dioxide, lead and methane
 - D. Nitrogen, water and CFCs

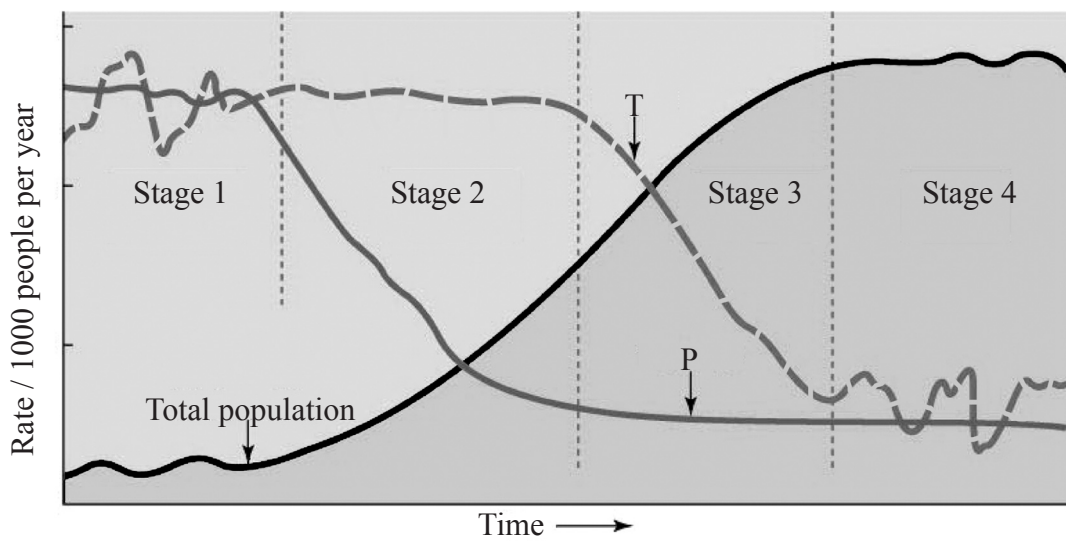
14. Which of the following does the figure below represent?



- A. The greenhouse effect
 - B. Thermal inversion
 - C. Effects of the ozone layer on UV radiation
 - D. Redistribution of energy by the tricellular model
15. For which environmental impacts has acid deposition been identified as a significant cause?
- I. Leaching of calcium from soil
 - II. Increasing the rate of respiratory problems in humans
 - III. Contamination of fish with toxic aluminium
 - IV. Increasing the productivity of marine phytoplankton
- A. I and II only
 - B. I and IV only
 - C. I, II and III only
 - D. I, II, III and IV

16. Tectonic plates move apart from one another at a
- A. convergent plate boundary.
 - B. transform fault.
 - C. subduction zone.
 - D. mid-oceanic ridge.

17. The graph below represents the demographic transitional model.



[Source: adapted from S A Marston, P L Knox, & D M Liverman, (2002) *World Regions in Global Context: People, Places and Environments*, Prentice Hall, Saddle River, NJ, USA]

Which of the following represents curves T and P?

	T	P
A.	Birth rate	Death rate
B.	Death rate	Birth rate
C.	Birth rate and emigration	Death rate and immigration
D.	Death rate and emigration	Birth rate and immigration

18. The data below relate to the world population at a particular time.

Crude birth rate = 35 per thousand

Crude death rate = 20 per thousand

What was the natural increase rate at the time?

- A. 1.5
 - B. -1.5
 - C. 15
 - D. -15
19. Of which type of natural capital is the ozone layer an example?
- A. Renewable
 - B. Replenishable
 - C. Non-renewable
 - D. Recyclable
20. Which row in the table includes examples of natural capital and natural income of a tropical forest?

	Natural Capital	Natural Income
A.	All harvestable timber	Market value of the timber
B.	All the trees of the forest	The capacity of the trees to reduce soil erosion
C.	A population of organisms in the forest	The total number of offspring the organisms produce in one year
D.	All minerals in the soil	The fertility of the soil for agriculture

21. What is the maximum sustainable yield of a crop equal to?
- A. Natural income
 - B. Natural capital
 - C. Carrying capacity
 - D. Total biomass
22. What does the term *carrying capacity* refer to?
- A. The optimum reproductive rate for sustainability.
 - B. The maximum size any given population reaches.
 - C. The minimum area of land required to support a given population sustainably.
 - D. The maximum population size an environment will sustainably support.
23. Which statement is correct?
- A. Secondary consumers can be abiotic or biotic components of ecosystems.
 - B. Temperature, soil pH and decomposers are abiotic components of soil ecosystems.
 - C. Primary consumers are always biotic components of ecosystems.
 - D. Bacteria, turbidity and plankton are biotic components of marine ecosystems.

24. Oxpeckers (tickbirds) are small birds that feed on ticks which infest large animals like rhinoceros.



[Source: Encounter South Africa, *The Red Billed and Yellow Billed Oxpecker*, <http://www.encounter.co.za/article/133.html>]

What are the relationships between these species?

	Oxpecker – Rhinoceros	Oxpecker – Tick	Tick – Rhinoceros
A.	Competition	Predation	Parasitism
B.	Mutualism	Parasitism	Predation
C.	Competition	Parasitism	Predation
D.	Mutualism	Predation	Parasitism

25. Which row of the table represents inputs and outputs of respiration?

	Inputs	Outputs
A.	Carbon dioxide and water	Organic matter and oxygen
B.	Organic matter and water	Carbon dioxide and oxygen
C.	Organic matter and oxygen	Carbon dioxide and water
D.	Carbon dioxide and oxygen	Organic matter and water

26. What information is necessary to calculate the net primary productivity of an ecosystem?
- I. The biomass produced by photosynthesis per unit area per unit time.
 - II. The biomass lost by the plant by respiration per unit area per unit time.
 - III. The biomass gained by heterotrophic organisms per unit area per unit time.
 - IV. The biomass potentially available to consumers per unit area per unit time.
- A. I only
 - B. I and II only
 - C. I, II and III only
 - D. I, II, III and IV
27. What are tropical cyclones?
- A. Regions of relatively high pressure in middle latitudes in which winds spiral inwards and counterclockwise
 - B. Movements of air from about 30° latitude towards the equator
 - C. Convection cells at the equator caused by rising warm air
 - D. Low pressure areas, often associated with high winds, forming over the oceans in low latitudes

28. Which of the following is most likely to lead to increased mutation rates in phytoplankton?
- A. Increase in stratospheric ozone
 - B. Decrease in stratospheric ozone
 - C. Increase in tropospheric ozone
 - D. Decrease in tropospheric ozone

29. Which statement is correct?
- A. More than 10% (by volume) of the Earth's water is freshwater.
 - B. The Earth's hydrological cycle is considered an open system because it exchanges matter and energy.
 - C. Major cold ocean currents flow from polar regions towards the equator.
 - D. The major reservoir of the Earth's water is in ice caps and glaciers.

30. Which row in the following table correctly represents characteristics of each type of soil?

	Sandy Soil	Clay Soil
A.	Low water-holding capacity	Good water-holding capacity
B.	Good nutrient-holding capacity	Low nutrient-holding capacity
C.	Poor aeration	Good aeration
D.	Low permeability	High permeability
