



**ENVIRONMENTAL SYSTEMS
STANDARD LEVEL
PAPER 1**

Wednesday 10 November 2004 (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 row shows how energy and materials move through each type of system?

	Isolated System	Closed System	Open System
A.	energy flows through system	materials flow through system	energy flows through system
B.	energy does not enter system	materials flow through system	energy does not leave system
C.	energy does not leave system	energy flows through system	materials flow through system
D.	materials do not leave system	energy flows through system	materials do not leave system

2. In the water (hydrological) cycle, energy and materials are both transferred and transformed. Which process in the water cycle involves only a transfer?

- A. Melting of the ice caps
- B. Movement of water from oceans to the atmosphere
- C. Run-off from land to rivers
- D. Formation of water droplets in clouds

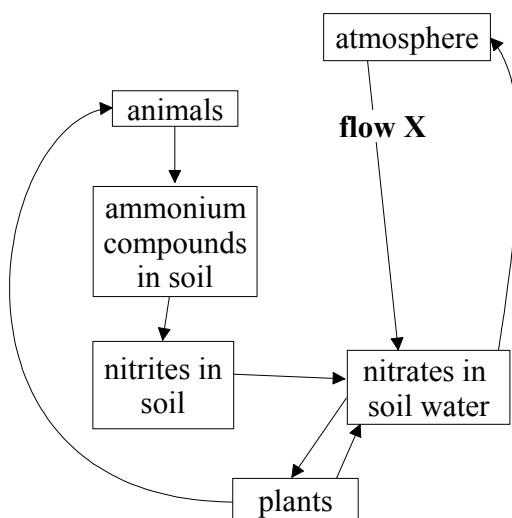
3. Which statement about energy transformations is correct?

- A. Energy is not always conserved, because during respiration it is released as heat.
- B. Some energy transformations create energy.
- C. When an organism grows its entropy usually decreases.
- D. The decay of a dead bird decreases its entropy.

4. Which productivity equation is correct?

- A. (net productivity) = (gross productivity) + (respiration loss)
- B. (gross secondary productivity) = (food consumed) – (energy in feces)
- C. (gross primary productivity) = (energy fixed by photosynthesis) – (respiration loss)
- D. (net secondary productivity) = (gross secondary productivity) – (respiration loss) – (energy in feces)

Questions 5, 6 and 7 are based on the simplified diagram of the nitrogen cycle below.



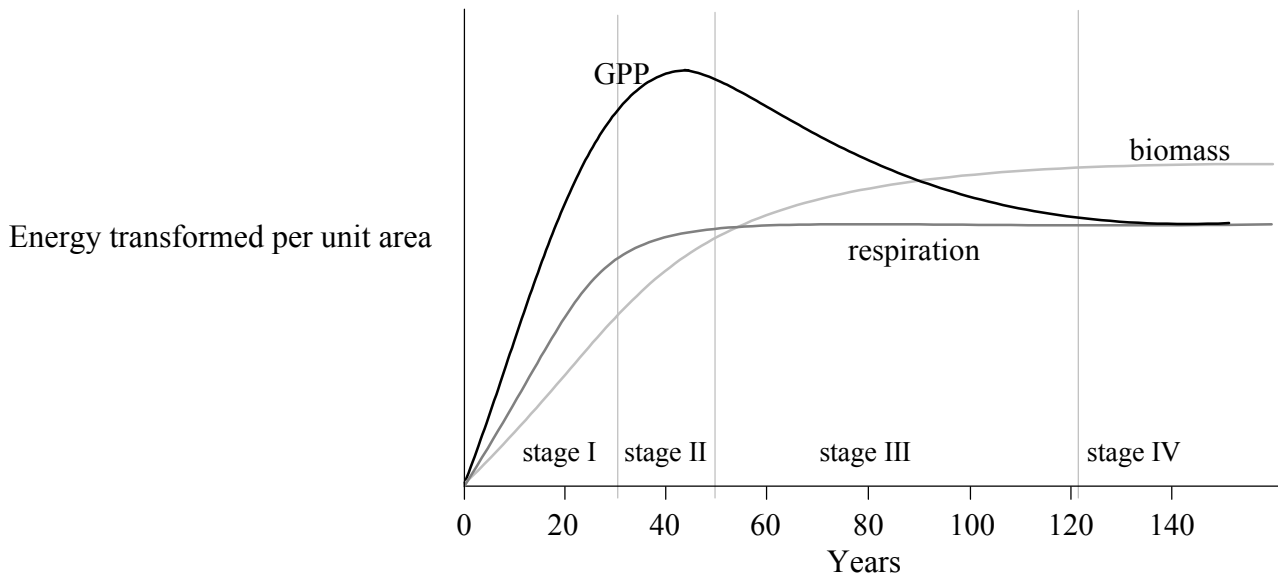
5. Which process transfers nitrogen from the soil to the atmosphere?
 - A. Bacterial decomposition of nitrates
 - B. Acidification of rain
 - C. Feeding
 - D. Respiration

6. Which of the following is likely to increase primary productivity the most?
 - A. An increase in levels of nitrogen compounds stored in animals
 - B. An increase in levels of nitrogen gas in the atmosphere
 - C. A decrease in levels of nitrogen compounds stored in plants
 - D. An increase in levels of nitrogen compounds dissolved in soil water

7. Which process could flow X represent?
 - A. Photosynthesis
 - B. Respiration
 - C. Lightning fixation
 - D. Decomposition of organic material

8. In which biomes – tundra, desert, temperate forest – is productivity limited by both low insolation and low precipitation?
- A. Deserts and temperate forests
 - B. Tundra and temperate forests
 - C. Tundra only
 - D. Temperate forest only

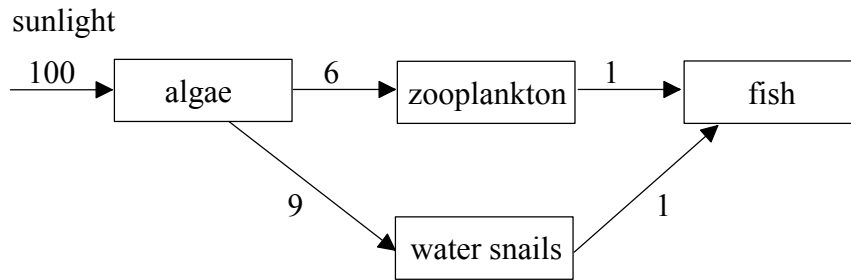
Questions 9 and 10 refer to the graph below, which shows changes in the biomass, productivity and respiration of a community during the process of forest succession.



9. Which type of organism is likely to be most common in stage I?
- A. *r*-selected pioneer species
 - B. *K*-selected pioneer species
 - C. *r*-selected climax species
 - D. *K*-selected climax species
10. During which stage is mean net productivity lowest?
- A. Stage I
 - B. Stage II
 - C. Stage III
 - D. Stage IV

11. Which of the following is an internal, density dependent factor that could control the size of a rabbit population?
- A. Competition for food between rabbits
 - B. Destruction of the rabbit's habitat
 - C. Summer drought
 - D. Demand for rabbit meat
12. When a population exceeds the carrying capacity of the environment that supports it, which process often restores the equilibrium?
- A. Succession
 - B. Negative feedback
 - C. Exponential growth
 - D. Positive feedback
13. Which organisms have a net output of oxygen?
- A. Decomposers
 - B. Producers
 - C. Primary consumers
 - D. Secondary consumers

14. The diagram below shows the relative size of some energy flows between four types of organisms in a small pond, over one year.



What is the gross productivity of the primary consumers?

- A. 2
 - B. 13
 - C. 15
 - D. 85
15. Which row correctly describes a sandy soil?

	Nutrient Levels	Drainage	Productivity
A.	Low	Good	High
B.	High	Poor	Low
C.	High	Poor	High
D.	Low	Good	Low

16. What is the possible result of depletion of stratospheric ozone?
- A. Increased acidification of rain
 - B. Reduced amounts of energy fixed by phytoplankton
 - C. Increased levels of greenhouse gases
 - D. Reduced levels of ultraviolet light reaching the Earth's surface

17. Which of these human activities both increases global warming and depletes the ozone layer?
- A. Emission of carbon dioxide from vehicle exhausts
 - B. Emission of sulfur dioxide from power stations
 - C. Leakage of methane from gas pipelines
 - D. Release of CFCs from old refrigerators
18. Which method would be most effective in reducing the acidity of rain downwind of a coal-fired power station?
- A. Burning high sulfur coal
 - B. Increasing the temperature at which fuel is burned
 - C. Fitting wet scrubbers (filters) to chimneys
 - D. Converting the power station to burn high sulfur oil
19. Which of the following is associated with an El Niño southern oscillation event?
- A. Warm water close to the South American coast moves westwards
 - B. Additional cold water upwells off the coast of South America
 - C. Easterly trade winds in the Atlantic Ocean are disrupted
 - D. Easterly trade winds in the Pacific Ocean are disrupted
20. What is the main direction ocean currents generally transfer heat energy?
- A. From east to west
 - B. From deep water to shallower water
 - C. From the equator to the poles
 - D. From less saline water to more saline water

21. What is the main reason that much less insolation is received at higher latitudes than at lower latitudes?
- A. Higher latitudes are further from the sun.
 - B. Land at higher latitudes reflects more energy back to space.
 - C. The atmosphere is thinner at higher latitudes.
 - D. At higher latitudes, energy from the sun is spread over a larger area.
22. Which factor greatly increases the likelihood of photochemical smog forming over a city?
- A. Low altitude
 - B. High rainfall
 - C. High traffic densities
 - D. Short daylight hours
23. Where do the convection currents that cause the movement of crustal plates occur?
- A. In the crust
 - B. In the mantle
 - C. In the outer core
 - D. In the inner core

24. As a result of global warming, there could be increased

- I. snowfall at the poles.
- II. melting of polar ice caps.
- III. photosynthesis.

Which could produce positive feedback in the Earth's climate system?

- A. I, II and III
 - B. I and III only
 - C. II only
 - D. III only
25. A country has a birth rate of 10 per thousand and a death rate of 7 per thousand. Which statement is most likely to be correct?
- A. The population of this developing country is increasing very rapidly.
 - B. The natural increase rate of this developed country is 0.3 %.
 - C. The doubling time for this developed country is about 30 years.
 - D. This developing country has a natural increase rate of 3.0 %.

Questions 26, 27 and 28 are based on the information in the table below, which shows the use of natural capital in four different human communities.

Community	Building Materials	Food	Water	Fuel
I.	wood	fruit and vegetables	river	wood
II.	mud	fish and cereal	underground aquifer	wood
III.	stone	meat, fruit, vegetables and cereals	river	fossil fuel
IV.	concrete	cereals, fruit and vegetables	underground aquifer	fossil fuel

26. Which column in the table contains only replenishable natural capital?

- A. Building materials
- B. Food
- C. Water
- D. Fuel

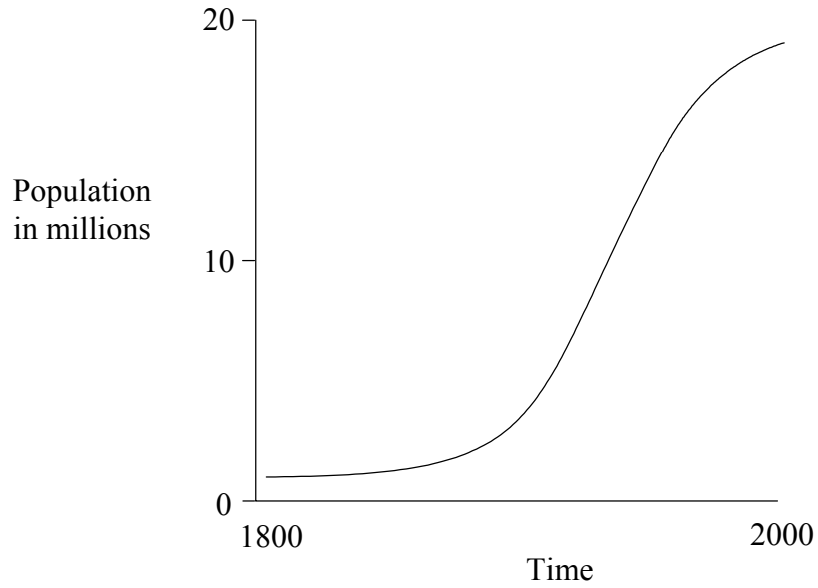
27. Which communities might be living sustainably?

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

28. Which strategy would most increase the sustainability of community IV?

- A. Using methane gas generated from waste for cooking
- B. Replacing concrete buildings with natural stone buildings
- C. Adding meat to their diet
- D. Replacing fossil fuel power stations with nuclear power stations

29. The graph below shows how a country's population has changed over a period of two hundred years. What **cannot** be measured from this type of graph?



- A. Change in total population over time
 - B. Rate of population growth at different times
 - C. Birth rate
 - D. Natural increase rate
30. Which form of natural capital absorbs carbon dioxide?
- A. Producers
 - B. Consumers
 - C. Decomposers
 - D. The ozone layer
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