



22086410



International Baccalaureate®  
Baccalauréat International  
Bachillerato Internacional

**ENVIRONMENTAL SYSTEMS  
STANDARD LEVEL  
PAPER 1**

Wednesday 14 May 2008 (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 contains correct statements about exchanges between open and closed systems and their surroundings?

	Open system	Closed system
A.	Exchanges matter but not energy	Exchanges neither matter nor energy
B.	Exchanges matter but not energy	Exchanges energy but not matter
C.	Exchanges energy but not matter	Exchanges neither matter nor energy
D.	Exchanges matter and energy	Exchanges energy but not matter

2. “The change in a system’s internal energy is equal to the energy absorbed by the system minus the energy released into its surroundings.”

This statement best illustrates

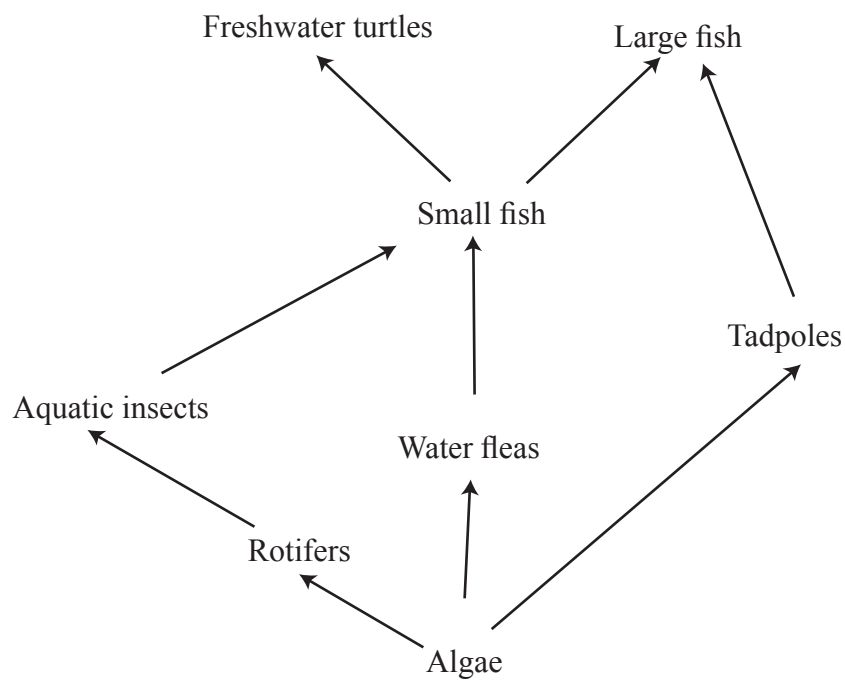
- A. the law of conservation of mass.
- B. the first law of thermodynamics.
- C. the second law of thermodynamics.
- D. the third law of thermodynamics.
3. Which is an example of **negative feedback**?
- A. An increase in air temperature increases the rate of melting of the Earth’s ice caps, thus decreasing the reflection of solar radiation.
- B. An increase in a herbivore population, leading to overgrazing and thus to a decline in the herbivore population.
- C. An increase in human birth rate compared with death rate leading to exponential increase in the human population.
- D. A loss of vegetation leads to soil erosion and thus further loss of vegetation occurs.

4. Which of the following is a transfer process / are transfer processes?

- I. Deposition of sand by waves on beaches
- II. Organic matter entering the ocean
- III. Decomposition of organic matter at the bottom of a lake
- IV. Run-off of water from land to rivers

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

5. The diagram below shows part of an aquatic food web for a lake ecosystem.

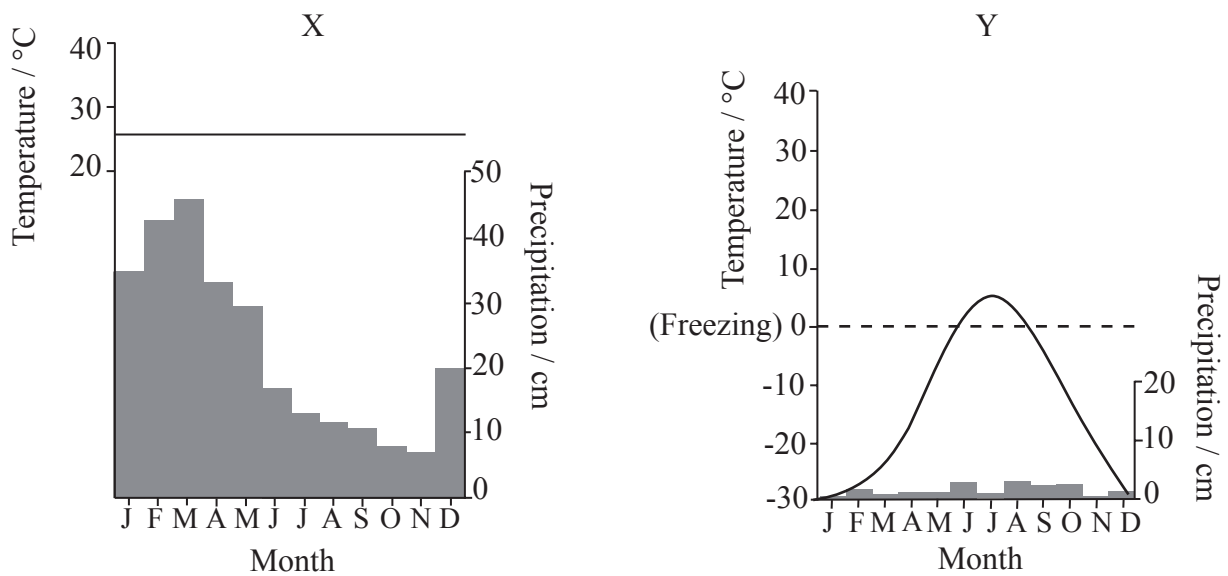


What is the maximum number of trophic levels represented in this food web?

- A. Three
- B. Four
- C. Five
- D. Six

6. Which of the following statements is correct?
- A. A community is a collection of ecosystems sharing similar climatic conditions.
  - B. A species is a group of organisms of the same population living in the same area at the same time.
  - C. Two species of a community may share the same habitat but not the same niche.
  - D. A population may include two different species living in the same community.

7. The graphs below represent the average monthly precipitation and temperature in two biomes.



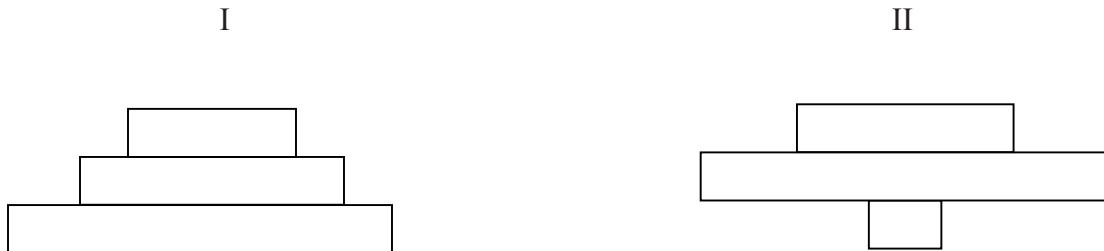
Which of the following correctly identifies biomes X and Y?

	X	Y
A.	Temperate forest	Tundra
B.	Tropical rainforest	Tundra
C.	Tropical rainforest	Desert
D.	Temperate forest	Desert

8. Which of the following is an example of mutualism?
- A. A tapeworm living inside a pig's small intestine
  - B. Vultures feeding on a dead lion
  - C. Bats capturing mosquitoes using sonar to detect them
  - D. Nitrogen-fixing bacteria living on the roots of a bean plant

9. The following pyramids represent the terrestrial food chain:

trees → small insects → birds



Which of the following corresponds to pyramids I and II?

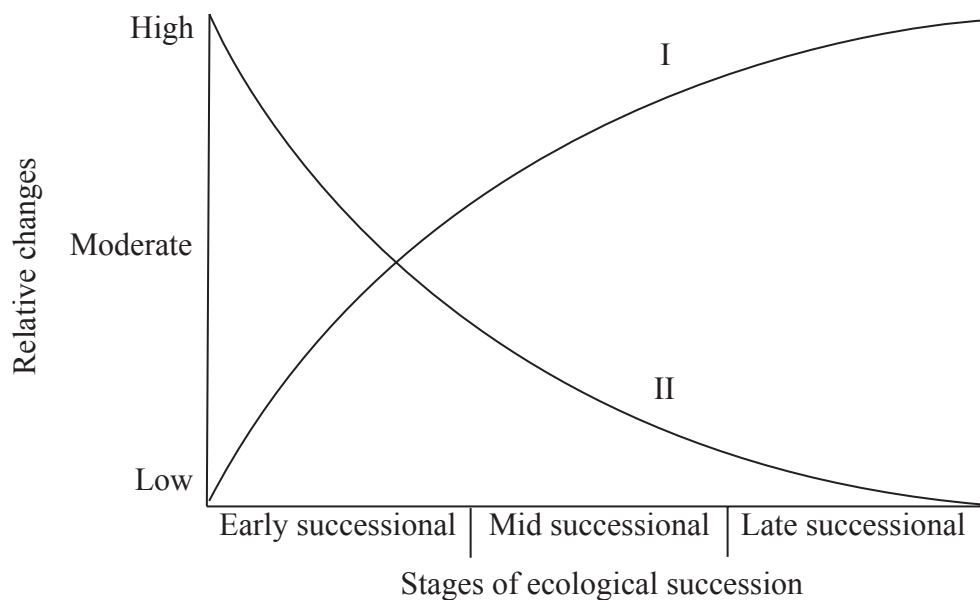
	Pyramid I	Pyramid II
A.	Energy	Biomass
B.	Biomass	Number
C.	Number	Energy
D.	Number	Biomass

10. A farmer gives 60 kg of food per day to his chickens. If their combined gross productivity is  $40 \text{ kg day}^{-1}$ , their net productivity is  $10 \text{ kg day}^{-1}$ , and they lose  $20 \text{ kg day}^{-1}$  in feces, what is their daily loss by respiration (in  $\text{kg day}^{-1}$ )?
- A. 10
  - B. 20
  - C. 30
  - D. 50
11. Which of the following applies to both “S” and “J” population growth curves?
- A. An initial period of slow growth is followed by a period of exponential increase.
  - B. The population crashes back to very low levels after exceeding the carrying capacity.
  - C. Due to environmental resistance the growth tends to level off once the carrying capacity is reached.
  - D. Positive feedback corrects any excessive birth rate.
12. Which is most likely to be a density-dependent factor that regulates the size of a population of birds?
- A. An increase in urbanization which destroys nesting sites
  - B. Unfavorable weather causing high mortality during non-breeding season
  - C. An increase in predation of eggs and young birds
  - D. An increased size of breeding territories when *per capita* food supplies are abundant

13. Oysters release millions of eggs each time they breed, but most of their offspring die before reaching adulthood.

This is an example of

- A. an *r*-strategist organism.
  - B. an organism threatened by extinction.
  - C. a *K*-strategist organism.
  - D. an organism typical of a climax community.
14. The graph below shows generalized changes taking place during ecological succession.



[Source: Modified from G. Tyler Miller, *Environmental Science* 7th ed., 1999, Wadsworth Publishing Company, page 151]

Which of the following correctly identifies curves I and II?

	I	II
A.	Species diversity	Gross primary productivity
B.	Gross primary productivity	Species diversity
C.	Net primary productivity	Gross primary productivity
D.	Species diversity	Net primary productivity

15. “A community of organisms that is more or less stable, and that is in equilibrium with natural environmental conditions” best defines
- A. a pioneer community.
  - B. a seral community.
  - C. a biotic community.
  - D. a climax community.
16. The term *lapse rate* defines:
- A. The decrease in temperature with altitude in the troposphere.
  - B. The decrease in temperature with altitude in the stratosphere.
  - C. The decrease in temperature with latitude at the Earth’s surface.
  - D. The increase in temperature with latitude at the Earth’s surface.
17. Which is the most abundant gas in the troposphere?
- A. Oxygen
  - B. Nitrogen
  - C. Carbon dioxide
  - D. Ozone
18. Which of the following statements is correct?
- A. The atmosphere allows solar radiation to pass through it more easily than radiation re-radiated by the Earth.
  - B. The absorption of incoming solar radiation by atmospheric gases is the main cause of the greenhouse effect.
  - C. The land has a higher heat capacity than the ocean, therefore the land can store more heat than the ocean.
  - D. Along the equator, descending dry and warm air masses cause a dry and cloudless atmosphere.



19. Which is most likely to occur as a result of an **increase** in stratospheric ozone?

- A. Increased damage to plant life
- B. Reduced concentration of CFCs in stratosphere
- C. Increased formation of photochemical smog
- D. Reduction in ultraviolet radiation reaching the Earth's surface

20. Photochemical smog is part of a cyclic process which requires \_\_\_ I \_\_\_ and produces \_\_\_ II \_\_\_.

Select the words that should be inserted from the table below.

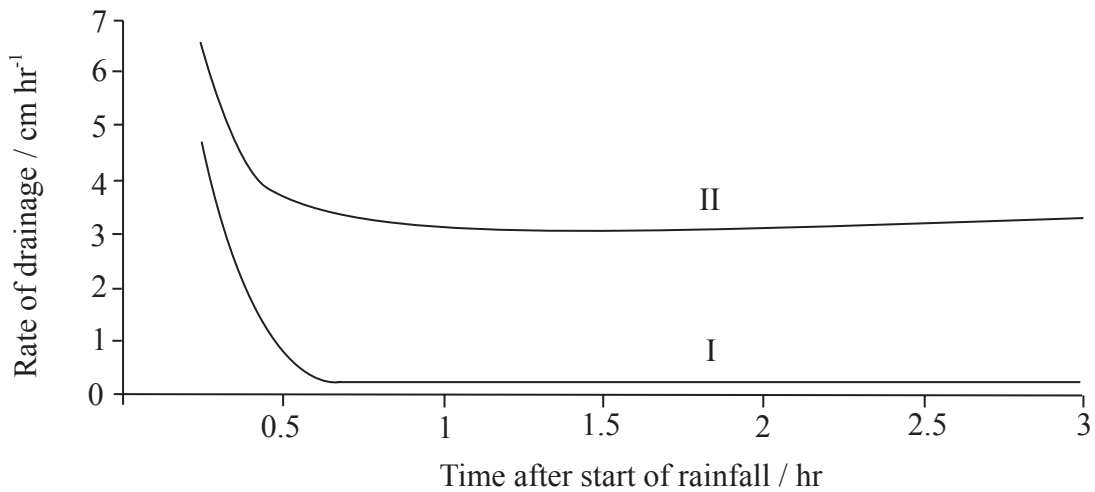
	I	II
A.	ultraviolet radiation	CFCs
B.	sun light and nitrogen oxides	oxygen atoms
C.	sun light and water vapour	ultraviolet radiation
D.	ultraviolet radiation and carbon dioxide	carbon monoxide

21. Which statement about the greenhouse effect is correct?

- A. The greenhouse effect is a normal and necessary condition for life on Earth.
- B. The greenhouse effect is a recent environmental phenomenon caused by carbon dioxide and other emissions.
- C. Nitrogen, carbon dioxide and CFCs are the main greenhouse gases.
- D. The greenhouse effect is the natural trapping of heat in the stratosphere by water vapour and carbon dioxide gases.

- 22.** An accidental discharge of a very acidic waste occurred near a small lake. Which of the following is most likely to happen?
- A. Eutrophication of the lake
  - B. An increase in the turbidity of the water
  - C. Gill damage in fish
  - D. An algal bloom
- 23.** Which of the following statements is correct?
- A. Less than 0.1 % (by volume) of the Earth's water is freshwater.
  - B. The hydrological cycle is independent of solar energy.
  - C. The main reservoir of the Earth's freshwater is in ice caps and glaciers.
  - D. Only abiotic storages are involved in the hydrological cycle.
- 24.** Which of the following statements regarding global transfer of energy are correct?
- I. Solar energy input has major influence on weather and climate processes.
  - II. The global movement of water plays an important role in the transfer of energy.
  - III. Uneven global heat distribution causes atmospheric convection currents.
  - IV. Oceans tend to moderate local climates because of the rate at which they absorb and release heat.
- A. I and II only
  - B. III and IV only
  - C. I, III, and IV only
  - D. I, II, III, and IV

25. This graph shows the drainage properties of two different soils.



Using the information from the graph above, which statement is most likely to be correct?

- A. Soil II has larger air spaces than soil I.
- B. Soil II has smaller particles than soil I.
- C. Soil II holds more soluble nutrients than soil I.
- D. Soil II has a higher water-holding capacity than soil I.

26.

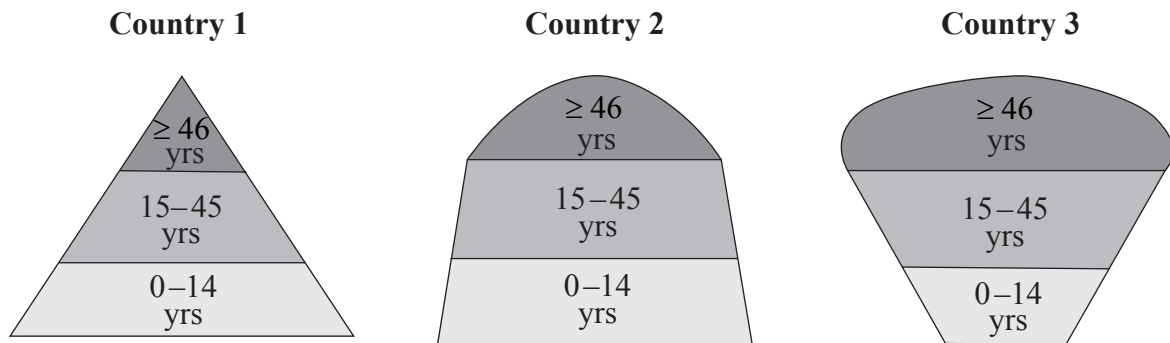
Country	Crude birth rate / thousand	Crude death rate / thousand	Natural increase rate
Angola	46	24	<b>X</b>
Portugal	11	<b>Z</b>	0.1

Which row in the table below correctly gives the values of X and Z?

	<b>X</b>	<b>Z</b>
A.	22	10.9
B.	2.2	10
C.	70	-10.9
D.	-22	11.1

27. Resources that have a sustainable yield equal to their natural productivity are
- A. natural income.
  - B. renewable natural capital.
  - C. replenishable natural capital.
  - D. non-renewable natural capital.
28. A forest has a volume of 800 000 million  $\text{m}^3$  of timber. In one year, 150 000  $\text{m}^3$  of timber are harvested and 100 000  $\text{m}^3$  of timber are added by normal tree growth.
- Which of the following statements is correct with regard to this year?
- A. The maximum sustainable yield was 800 000 million  $\text{m}^3$  of timber.
  - B. Harvesting exceeded the natural income by 100 000  $\text{m}^3$  of timber.
  - C. The natural capital remaining was 750 000  $\text{m}^3$  of timber.
  - D. The natural income was 100 000  $\text{m}^3$  of timber.
29. One factor that makes it difficult to calculate the Earth's carrying capacity for the human population is
- A. human ability to substitute one resource for another through technological development.
  - B. the rapid development of health care technology and its influence on death rates.
  - C. differences in cultural attitudes to family planning and birth rates.
  - D. human ability to import resources from other populations.

30. These three pyramids represent the population of three different countries:



Which of the following correctly describe the populations of the three countries?

	Country 1	Country 2	Country 3
A.	Declining	Stable	Rapidly expanding
B.	Stable	Declining	Rapidly expanding
C.	Rapidly expanding	Declining	Stable
D.	Rapidly expanding	Stable	Declining