

**ENVIRONMENTAL SYSTEMS  
STANDARD LEVEL  
PAPER 1**

Thursday 9 May 2002 (afternoon)

45 minutes

---

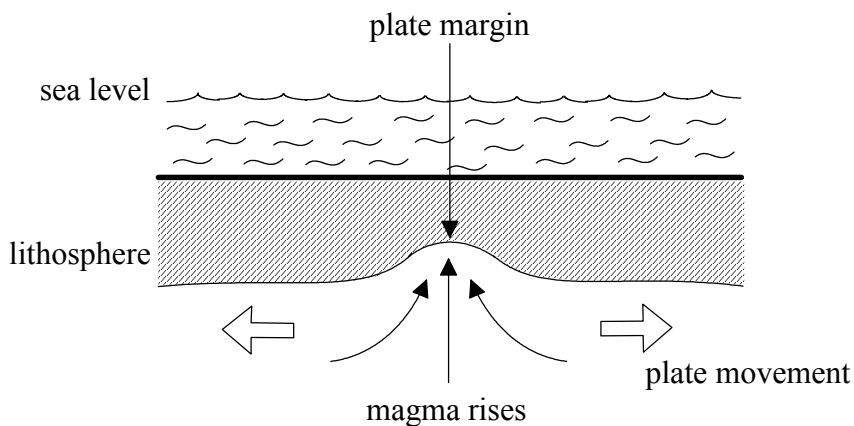
**INSTRUCTIONS TO CANDIDATES**

- 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. Inputs to a closed system may be
  - A. matter only.
  - B. energy only.
  - C. matter and energy.
  - D. heat only.
  
2. The flow of water from ocean to atmospheric storages over land masses involves
  - A. both transfer and transformation processes.
  - B. transfer processes only.
  - C. transformation processes only.
  - D. no transfer or transformation processes.
  
3. Two herbivorous animals are part of the same community. One of them is prey to many predators and the other has no natural predator. They are
  - A. primary consumers and occupy the same ecological niche.
  - B. primary producers and occupy the same ecological niche.
  - C. primary consumers and occupy different ecological niches.
  - D. primary producers and occupy different ecological niches.
  
4. A mineral resource, such as aluminium ore, can
  - A. be exploited sustainably with efficient recycling programmes.
  - B. be exploited sustainably using more efficient mining technology.
  - C. be exploited sustainably if rates of mining are limited.
  - D. never be exploited sustainably.

5. The percentage of the earth's surface covered by oceans is about
- A. 90 %.
  - B. 70 %.
  - C. 50 %.
  - D. 45 %.
6. The main factors that determine the type of biome found are
- I. temperature.
  - II. precipitation.
  - III. soil type.
  - IV. wind direction.
- A. I and II only
  - B. I and III only
  - C. I, II and IV only
  - D. I, II, III and IV

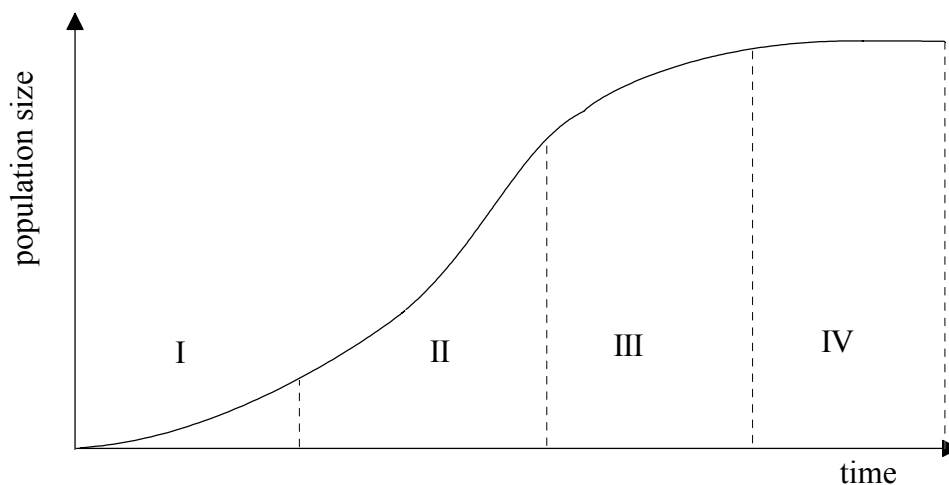
Question 7 refers to the diagram below



7. The type of plate boundary shown in the diagram
- A. is a constructive margin.
  - B. is a destructive margin.
  - C. involves the process of subduction.
  - D. leads to loss of crustal material.
8. The table below shows processes carried out by three different organisms. Which statement is correct?

|    |  | <b>Green plants</b> | <b>Decomposer organisms</b> | <b>Fish</b> |
|----|--|---------------------|-----------------------------|-------------|
| A. | produce carbohydrates by photosynthesis    | Yes                 | Yes                         | No          |
| B. | release carbon dioxide from respiration    | Yes                 | Yes                         | No          |
| C. | obtain organic matter from other organisms | No                  | Yes                         | Yes         |
| D. | release oxygen as a waste product          | Yes                 | Yes                         | No          |

9. In which sections of this S-shaped population growth curve does environmental resistance significantly affect population growth?

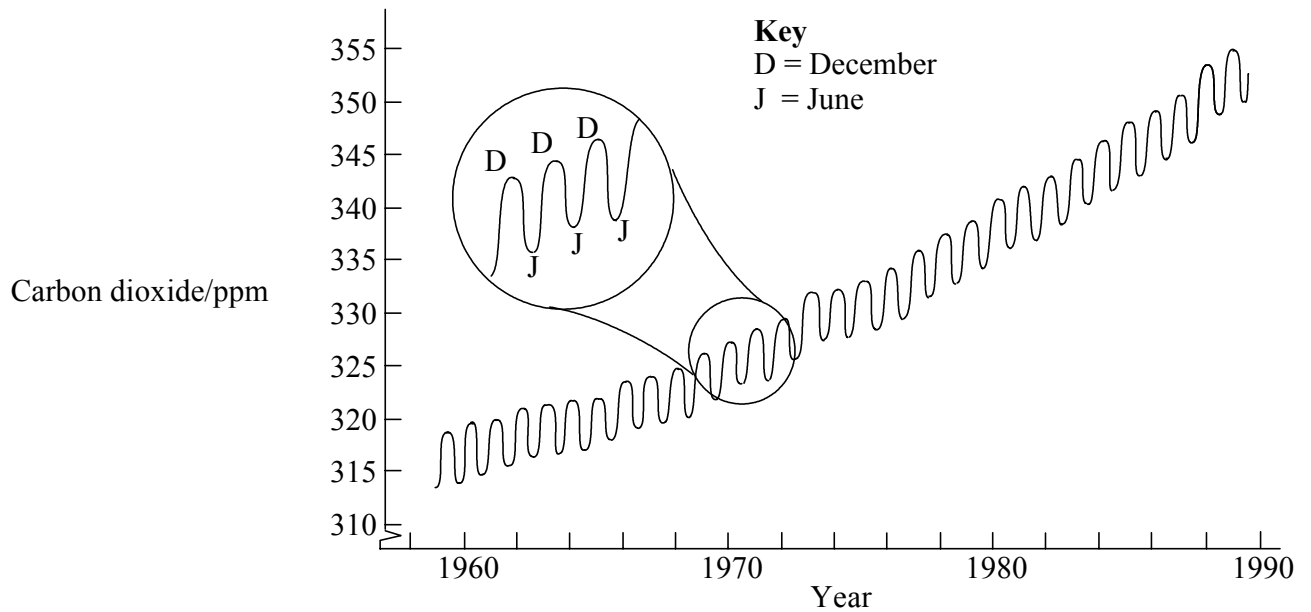


- A. I and II  
 B. II and III  
 C. I and IV  
 D. III and IV
10. Which column in the table correctly shows the effects of the pollutant gas?

|                                 | A.                    | B.                       | C.             | D.                    |
|---------------------------------|-----------------------|--------------------------|----------------|-----------------------|
|                                 | <b>Sulfur dioxide</b> | <b>Halogenated gases</b> | <b>Methane</b> | <b>Carbon dioxide</b> |
| increases the greenhouse effect | Yes                   | No                       | Yes            | Yes                   |
| depletes stratospheric ozone    | Yes                   | Yes                      | No             | Yes                   |
| increases acidity of rain       | Yes                   | No                       | No             | Yes                   |

11. Nitrogen is returned to the atmosphere by
- A. lightning discharges.
  - B. denitrifying bacteria.
  - C. nitrifying bacteria.
  - D. leguminous plants.
12. The ozone layer can be protected by
- I. using substitutes for ozone-depleting chemicals.
  - II. reducing cattle production.
  - III. recycling old refrigerators.
- A. I and II only
  - B. I and III only
  - C. II and III only
  - D. I, II and III
13. In which group are there examples of each of a non-renewable, renewable and replenishable resource?
- A. Coal, wheat, nuclear power
  - B. Natural gas, fish, stratospheric ozone
  - C. Cattle, rice, groundwater
  - D. Tin, biomass, wood
14. Which statement about latent heat is correct?
- A. It is transferred from the oceans to the atmosphere by evaporation.
  - B. It is stored in the tropical oceans when they are warmed by solar radiation.
  - C. It is released by the temperate oceans as they cool during the winter months.
  - D. It is all the energy transferred by the movement of warm air from the tropical regions towards the poles.

15. The graph below shows changes in the concentration of carbon dioxide in the atmosphere.



The fluctuations in the graph are due to

- A. biomass variations in phytoplankton.
  - B. increased use of fossil fuels in winter.
  - C. daily changes in the amount of photosynthesis occurring.
  - D. seasonal changes in the amount of photosynthesis occurring.
16. Food chains seldom have more than four members because
- A. in most ecosystems competition for food is great.
  - B. the total biodiversity of any area is limited.
  - C. energy is lost as it moves along a food chain and little remains at the top carnivore level.
  - D. in many parts of the world, species have become extinct and complex ecosystems are rare.
17. For a population with a Natural Increase Rate of 2 %, the doubling time in years is
- A. 70.
  - B. 35.
  - C. 3.5.
  - D. 0.7.

18. Which of the following populations are **most** likely to be sustainable?

|    | <b>Population Density</b> | <b>Mean Individual Consumption</b> | <b>High dependence on</b> |
|----|---------------------------|------------------------------------|---------------------------|
| A. | high                      | low                                | renewable resources       |
| B. | high                      | high                               | renewable resources       |
| C. | high                      | high                               | non-renewable resources   |
| D. | low                       | low                                | non-renewable resources   |

19. Which of the following does **not** influence human carrying capacity?

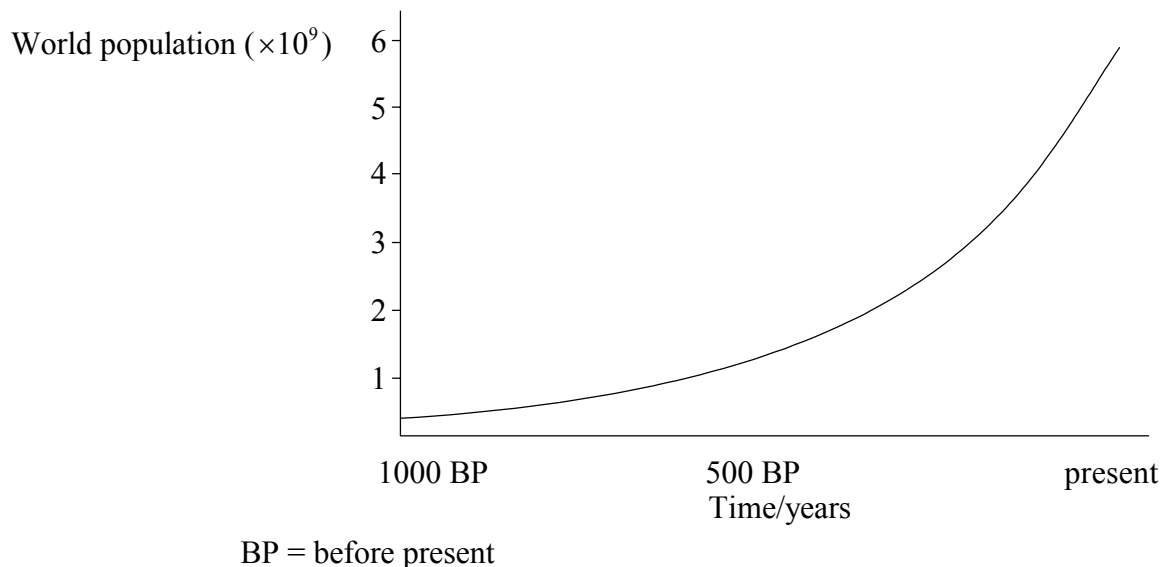
- A. Birth rate
- B. Resource consumption rate
- C. Resource exploitation rate
- D. Level of medical technology

20. Which statement best illustrates the second law of thermodynamics?

- A. Potential energy increases as energy moves through a system.
- B. The amount of energy is unchanged as matter moves through a system.
- C. Potential energy decreases as energy and matter move through a system.
- D. Energy cannot leave a system.



21. The graph below shows the growth of the human population over the last one thousand years.

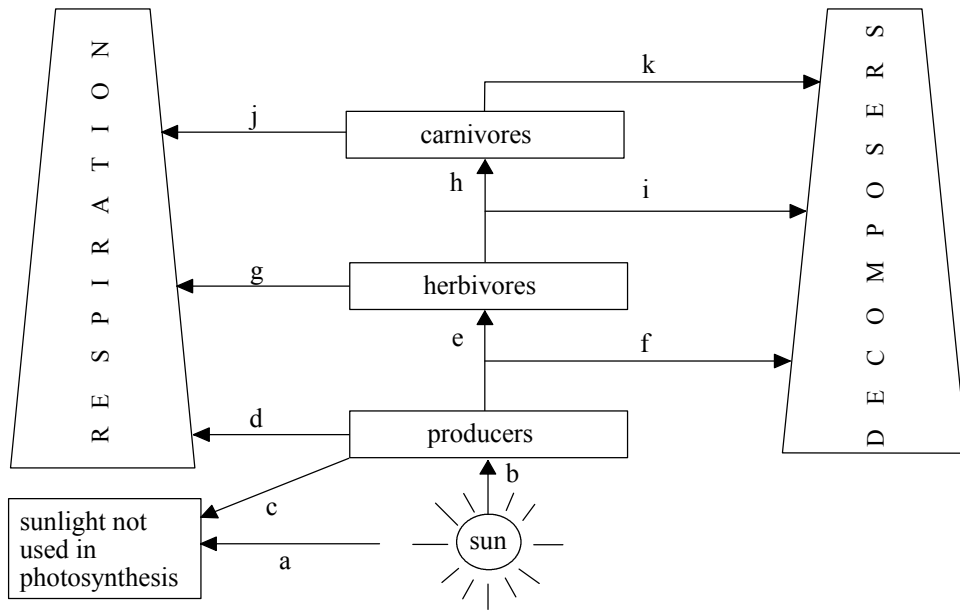


Using this graph alone, it can be concluded that

- A. birth rate is increasing.
  - B. death rate is decreasing.
  - C. population growth rate is increasing.
  - D. fertility rate is increasing.
22. If part of the cost to the environment of fossil fuel use were added to the price of the fuel, the most likely effect would be that
- A. global warming would increase.
  - B. use of renewable energy would decrease.
  - C. more fossil fuels would be produced.
  - D. consumption of fossil fuels would decrease.

23. Ecological succession generally involves
- I. a decrease in the entropy of an ecosystem.
  - II. loss of communities through competition.
  - III. an increase in the ratio of organic to inorganic storages.
- A. III only
  - B. I and II only
  - C. II and III only
  - D. I, II and III
24. If in a human population of 10 000, there are 200 births per year and 100 deaths per year, the Natural Increase Rate would be
- A. 0.01.
  - B. 0.1.
  - C. 1.0.
  - D. 10.
25. The capacity of a system to self-regulate is generally increased by
- A. the presence of positive feedback.
  - B. the presence of negative feedback.
  - C. low energy inputs in the system.
  - D. energy outputs greater than energy inputs in the system.

Questions 26 to 28 are based on the diagram below which shows the flow of energy through a food web.



26. Gross Primary Productivity (GPP) is

- A.  $b - c$ .
- B.  $b - a$ .
- C.  $b$ .
- D.  $b - c - d$ .

27. Net Primary Productivity (NPP) is

- A.  $b - c - d$ .
- B.  $d + e + f$ .
- C.  $e$ .
- D.  $e - d$ .

28. The net productivity for the consumer community is

- A.  $e + h$ .
- B.  $e + h - g - j - k - i$ .
- C.  $e - g - j$ .
- D.  $e - g - j - i - k$ .

29. Which combination of characteristics is most likely to be associated with a stable or falling human population?
- I. Increase in the proportion of women receiving higher education
  - II. Increase in average income
  - III. Decrease in the average age of marriage
  - IV. Increase in birth rate
  - V. Decrease in death rate
  - VI. Increase in the average age of marriage
- A. I, II and III
  - B. I, II and VI
  - C. I, II, III and IV
  - D. III, IV and V
30. Which of the following pairs are both examples of recycling?
- A. Manufacturing new aluminium cans from old ones; biodegradation of plastic bags
  - B. Processing newspapers into toilet paper; breaking down of raw sewage in the oceans
  - C. Converting used car tyres to rubberised road surfaces; producing compost from organic waste
  - D. Producing methane from landfill sites; incinerating plastics
-