



**ENVIRONMENTAL SYSTEMS
STANDARD LEVEL
PAPER 1**

Wednesday 11 May 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.



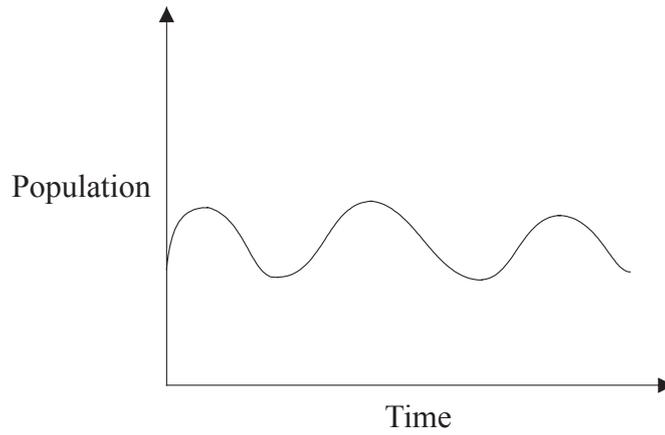
1. Which statement is correct?
 - A. A lake is an example of an isolated system.
 - B. An open system exchanges energy but not matter with its surroundings.
 - C. The most common systems found on Earth are closed systems.
 - D. A closed system exchanges energy but not matter with its surroundings.

2. Which statement expresses the second law of thermodynamics?
 - A. The amount of energy available to do useful work in a system decreases over time.
 - B. Energy can neither be created nor destroyed.
 - C. Entropy will always decrease spontaneously in a system over time.
 - D. Energy inputs equal energy outputs.

3. Which of the following contains only transfer processes?
 - A. Melting of ice caps; evaporation of sea water
 - B. Run-off of water from land to rivers; dead organic matter entering a lake
 - C. Formation of water droplets in clouds; volcanic eruptions
 - D. Leaching of soil nutrients; freezing of lake water



4. The graph below shows how a population changed over a period of time.

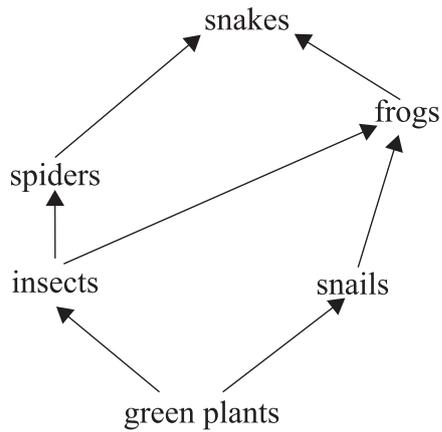


Which of the following best describes the regulation process in this system?

- A. Positive feedback
- B. Static equilibrium
- C. Negative feedback
- D. Transformation



Questions 5, 6, and 7 refer to the diagram of part of a food web below.



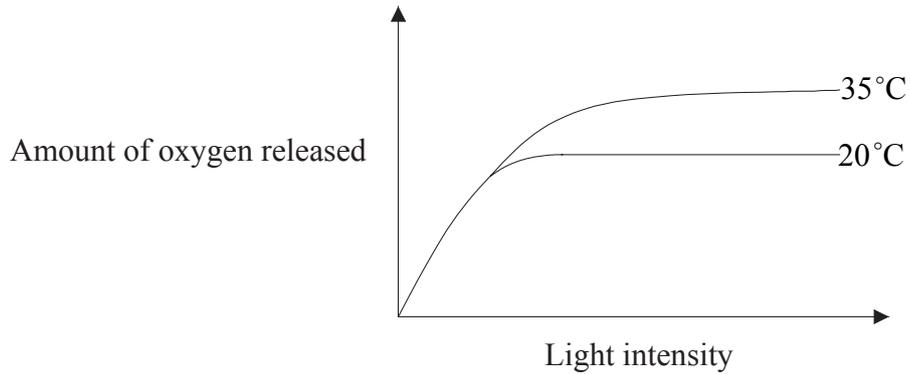
5. How many trophic levels are represented in this food web?
- A. 2
 - B. 3
 - C. 4
 - D. 5
6. What is the role of the spiders in this food web?
- A. Producers
 - B. Primary consumers
 - C. Tertiary consumers
 - D. Secondary consumers
7. Which of the following is an abiotic factor that might affect this food web?
- A. Presence of parasites
 - B. Spread of diseases in frogs
 - C. Increase in temperature
 - D. Introduction of new plant species



8. What is a biome?
- A. A collection of ecosystems sharing similar climatic conditions.
 - B. A biotic factor that may influence an organism or ecosystem.
 - C. A group of populations living and interacting with each other in a common habitat.
 - D. A group of organisms that interbreed and produce fertile offspring.
9. Which of the following are examples of mutualism?
- I. Bacteria fixing nitrogen in the roots of plants
 - II. The pollination relationship between flowering plants and insects
 - III. Lions hunting zebras
 - IV. Mosquitos spreading malaria
- A. I and II only
 - B. III and IV only
 - C. I, II and III only
 - D. I, II, III and IV
10. Which series represents the correct distribution, with increasing latitude, of the following biomes?
- I. Temperate deciduous forest
 - II. Arctic tundra
 - III. Tropical forest
 - IV. Northern coniferous forest
- A. I, III, II, IV
 - B. I, IV, III, II
 - C. III, I, IV, II
 - D. III, IV, II, I



11. An experiment on photosynthesis at two different temperatures using one species of plant, produced the following results.



Which statement is correct?

- A. At 35°C photosynthesis is slower than at 20°C.
 - B. The rate of photosynthesis is always greater at 35°C.
 - C. At 20°C the rate of photosynthesis is independent of light intensity.
 - D. At low light intensity temperature does not affect the rate of photosynthesis.
12. Which of the following correctly lists two of the **requirements** of photosynthesis and respiration?

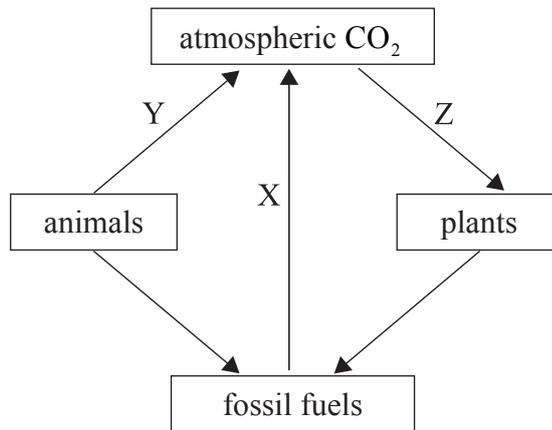
	Photosynthesis	Respiration
A.	Organic matter and oxygen	Carbon dioxide and water
B.	Oxygen and water	Carbon dioxide and organic matter
C.	Organic matter and carbon dioxide	Oxygen and water
D.	Carbon dioxide and water	Organic matter and oxygen



13. Which statement describes secondary productivity?
- A. The quantity of solar energy fixed by photosynthesis by green plants
 - B. The biomass gained by heterotrophic organisms through feeding and absorption
 - C. The process of capturing sunlight to make sugars and other organic compounds
 - D. The quantity of biomass potentially available to consumers in an ecosystem
14. If the producer biomass in an ecosystem is 300 kg ha^{-1} , what is the approximate secondary consumer biomass (kg ha^{-1}) likely to be in the same ecosystem?
- A. 3000
 - B. 300
 - C. 30
 - D. 3



15. The figure below shows a simplified model of the carbon cycle. Each arrow represents a process which involves a transfer of carbon.



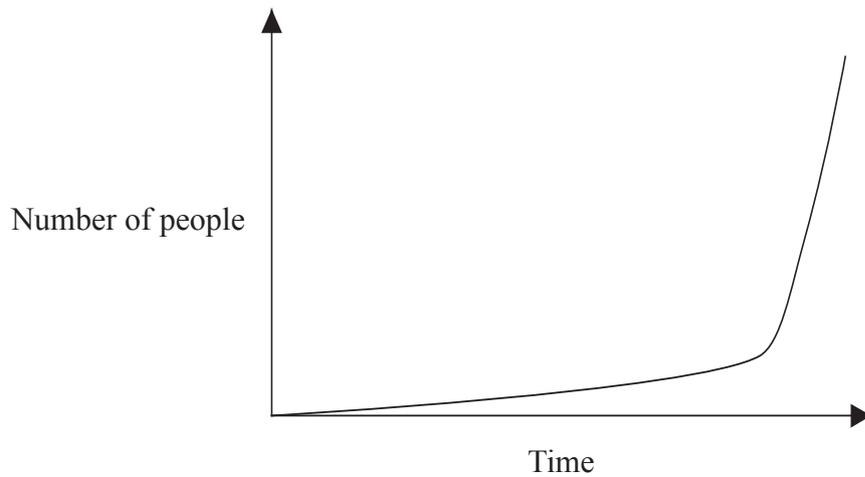
What are processes X, Y and Z?

	X	Y	Z
A.	Combustion	Respiration	Photosynthesis
B.	Fossilisation	Combustion	Respiration
C.	Fossilisation	Respiration	Combustion
D.	Combustion	Assimilation	Photosynthesis

16. What might be a consequence of a significant decrease in the amount of the CO₂ in the atmosphere?
- A. The Earth becoming warmer
 - B. A decrease in CFC levels in the atmosphere
 - C. A rise in sea levels
 - D. The Earth becoming cooler



17. The figure below represents the world population growth.

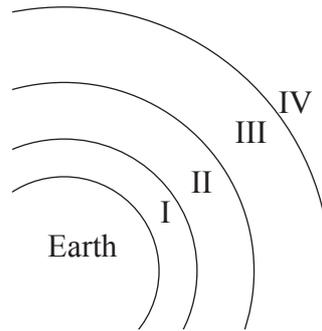


Which statement is correct?

- A. The graph represents a J-shaped population curve.
 - B. This graph represents a S-shaped population curve.
 - C. The graph shows that the world population has reached its carrying capacity.
 - D. This graph shows that human population will grow exponentially indefinitely.
18. Which statement is correct?
- A. Elephants are *K*-strategists because they have a low population growth rate.
 - B. *r*-strategists tend to reproduce late and have few offspring.
 - C. The population size of a species is only genetically controlled.
 - D. All plants are *K*-strategists because they have limited ability to compete.



19. The figure below represents the different layers of the atmosphere



Which layers correspond to the troposphere and the stratosphere?

	Troposphere	Stratosphere
A.	I	II
B.	I	III
C.	II	III
D.	II	IV

20. Which statement best describes a role of the United Nations Environmental Programme (UNEP)?
- A. To impose fines on countries that exceed the limits on the use of ozone-depleting substances
 - B. To monitor the effectiveness of international agreements on the use of ozone-depleting substances
 - C. To set the maximum levels of atmospheric emissions for all countries
 - D. To control the regional use of ozone-depleting substances
21. Which statement about thermal inversion is correct?
- A. It is a mixture of primary and secondary pollutants formed under the influence of sunlight.
 - B. It is a layer of gases in the troposphere formed during the destruction of UV rays.
 - C. It traps smog in valleys so pollutants can reach harmful levels.
 - D. It is a dry air circulation mechanism occurring at the Equator.



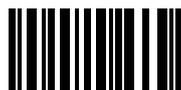
22. Which are the three major greenhouse gases?
- A. water, carbon dioxide and methane
 - B. ozone, water and carbon dioxide
 - C. carbon dioxide, ozone and nitrogen
 - D. water, methane and chlorine
23. Which statement about Hadley cells is correct?
- A. Hadley cells transport energy and matter to higher latitudes.
 - B. Hadley cells are periodic disruptions of tropical winds expanding eastward towards South America.
 - C. Hadley cells are responsible for the even distribution of heat over the Earth's surface.
 - D. Hadley cells are responsible for the movement of the tectonic plates.
24. Which of the combinations in the table below correctly completes the following sentence?

Human activities such as ... **I** ... can cause soil ... **II** ...

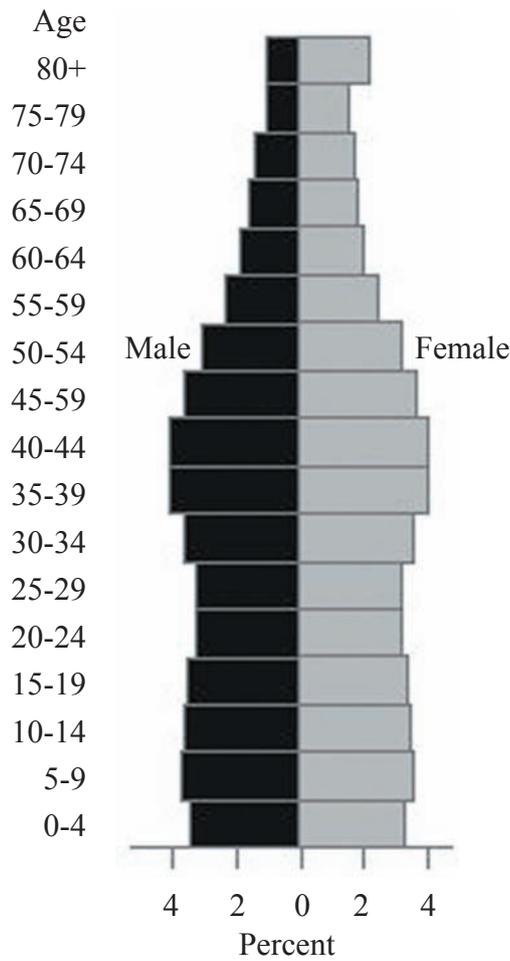
	I	II
A.	Overgrazing	Conservation
B.	Deforestation	Degradation
C.	Urbanisation	Conservation
D.	Addition of organic material	Degradation



25. If the crude birth rate of a country is 27 per thousand per year and the crude death rate is 7 per thousand per year, what would the natural increase rate be?
- A. 35 %
 - B. 20 %
 - C. 2 %
 - D. 0.2 %
26. Which statement is correct?
- A. Non-renewable natural capital is all the goods in an area that have marketable value.
 - B. The ozone layer is an example of non-living non-renewable natural capital.
 - C. Trees are considered renewable natural capital.
 - D. Minerals are replenishable natural capital.
27. Which of the following could increase human carrying capacity?
- I. Technical innovations
 - II. Population growth
 - III. Increase in resource consumption
- A. I only
 - B. III only
 - C. II and III only
 - D. I, II and III
28. What is the maximum sustainable yield for a resource?
- A. The difference between natural capital and natural income
 - B. The rate of decrease in natural capital
 - C. The sustainable rate of harvest of a resource
 - D. The point at which the original stock is depleted



29. Which statement about the age-sex pyramid below is correct?



[Source: United Nations, *World Population Prospects, The 1998 Revision*, <http://www.prb.org/pdf/threepatterns.pdf>]

- A. Birth rates and death rates are both high.
- B. Birth rates are low or declining and death rates are high.
- C. Birth rates are high and death rates are low or declining.
- D. Birth rates and death rates are both low.



30. Which of the following factors contribute to declining birth rates in a human population?
- I. Greater education opportunities for women
 - II. Improved access to family planning
 - III. Improved public health care
- A. I only
 - B. I and II only
 - C. II only
 - D. I, II and III
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