



**ENVIRONMENTAL SYSTEMS
STANDARD LEVEL
PAPER 1**

Tuesday 10 November 2009 (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. energy only.
 - B. matter only.
 - C. energy and matter.
 - D. neither energy nor matter.

2. As the Japanese population ages, its fertility decreases and the total population declines. What is this type of change called?
 - A. Negative feedback
 - B. Positive feedback
 - C. Steady state equilibrium
 - D. Exponential growth

3. Decomposition of dead algae in the bottom of a lake is primarily an example of which of these processes?
 - A. Transfer
 - B. Transformation
 - C. Acidification
 - D. Hydration

4. A community is composed of
 - A. the abiotic factors in a habitat.
 - B. several populations.
 - C. several habitats.
 - D. organisms of the same species.

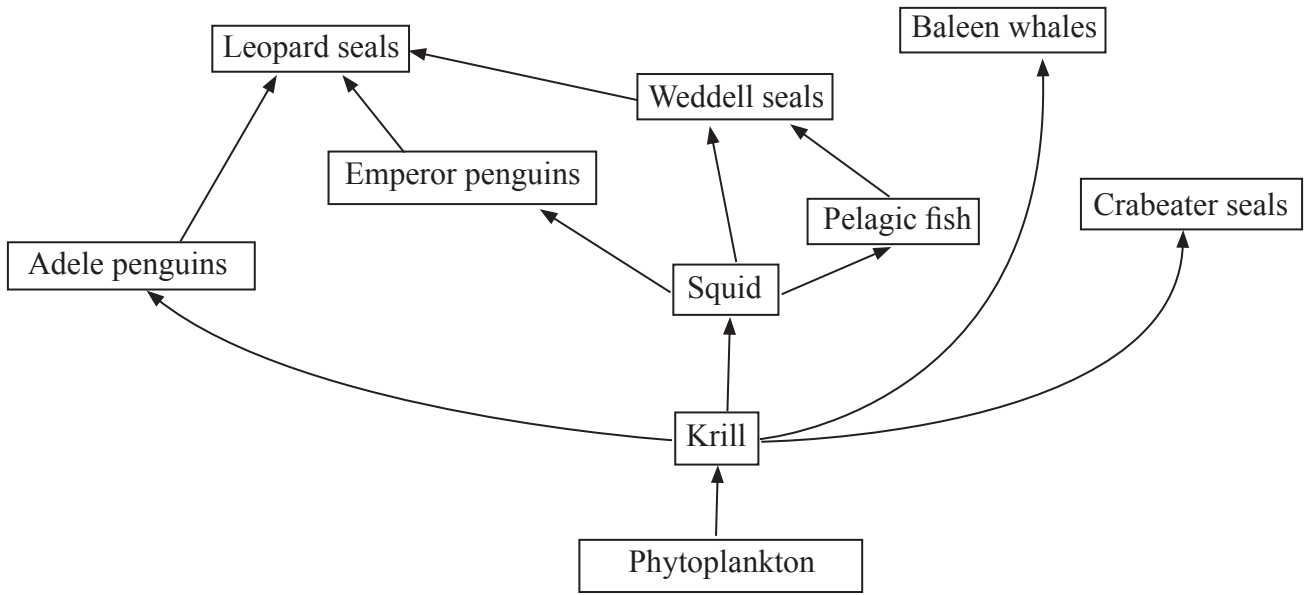
5. Which of the following statements about trophic levels is correct?
- A. The same organism could be in two different trophic levels in a single food chain.
 - B. Food chains cannot have more than four trophic levels.
 - C. The same organism could be in two different trophic levels in a food web.
 - D. Trophic level is the maximum number of individuals that can sustainably be supported by an ecosystem.
6. Which of the following is/are needed to calculate gross primary productivity?
- I. Energy fixed by photosynthesis
 - II. Energy lost by respiration
 - III. The biomass gained by heterotrophic organisms
- A. I only
 - B. II only
 - C. III only
 - D. I and III only
7. Which substances are needed to produce organic matter by photosynthesis?
- A. Oxygen and water
 - B. Oxygen and carbon dioxide
 - C. Carbon dioxide and water
 - D. Sugars and carbon dioxide

8. A bird disease spread in a pigeon population, resulting in the deaths of 95 % of the pigeons in one year. The following year, a survey of the same area showed that only 10 % of the remaining population had the disease.

Why did the disease affect fewer birds in the second year?

- A. Density-independent factors cause negative feedback
 - B. Density-dependent factors cause negative feedback
 - C. Density-independent factors cause positive feedback
 - D. Density-dependent factors cause positive feedback
9. In a single system, which series of ecological units is in the correct order of decreasing biomass?
- A. ecosystem – population – community – individual
 - B. biosphere – ecosystem – population – community
 - C. community – biosphere – population – individual
 - D. biosphere – ecosystem – population – individual

The figure below shows part of a food web from the Antarctic Ocean. Use this diagram to answer questions 10 and 11.

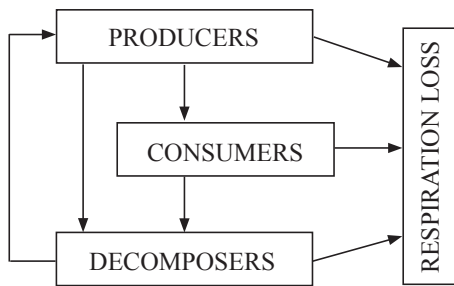


- 10. Which trophic level do pelagic fish belong to?
 - A. Quaternary consumers
 - B. Tertiary consumers
 - C. Secondary consumers
 - D. Primary consumers

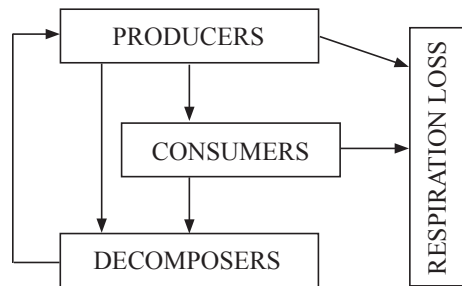
- 11. Which human activity will have the greatest impact on this food web?
 - A. Overfishing the krill
 - B. A ban on hunting whales
 - C. Destroying the nesting habitats of emperor penguins
 - D. Setting limits for hunting seals for their skins

12. Which diagram most accurately represents all the **energy flows** between producers, consumers and decomposers in a forest ecosystem?

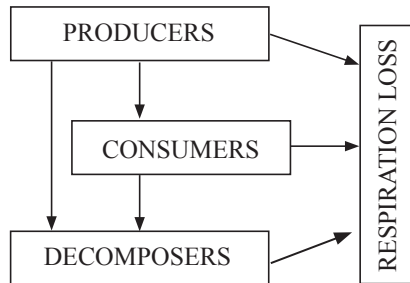
A.



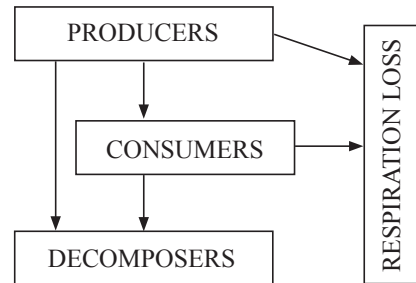
B.



C.



D.



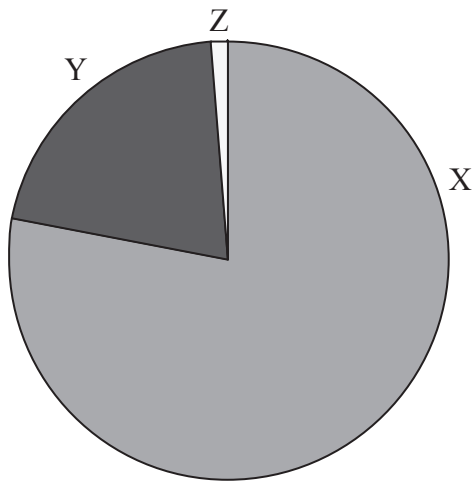
13. The process of ecological succession generally involves

- I. an increase in the ratio of organic to inorganic storages.
- II. a continuous decrease in the rate of plant growth.
- III. an increase in species diversity.

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

14. Which of these abiotic factors must be present to produce a forest climax community?
- A. High mean annual temperatures
 - B. Acid soils
 - C. Steep slopes
 - D. Moderate to high mean annual rainfall

15. The figure below shows the approximate proportions of gases in the atmosphere.



Which row correctly identifies X,Y and Z in the figure above?

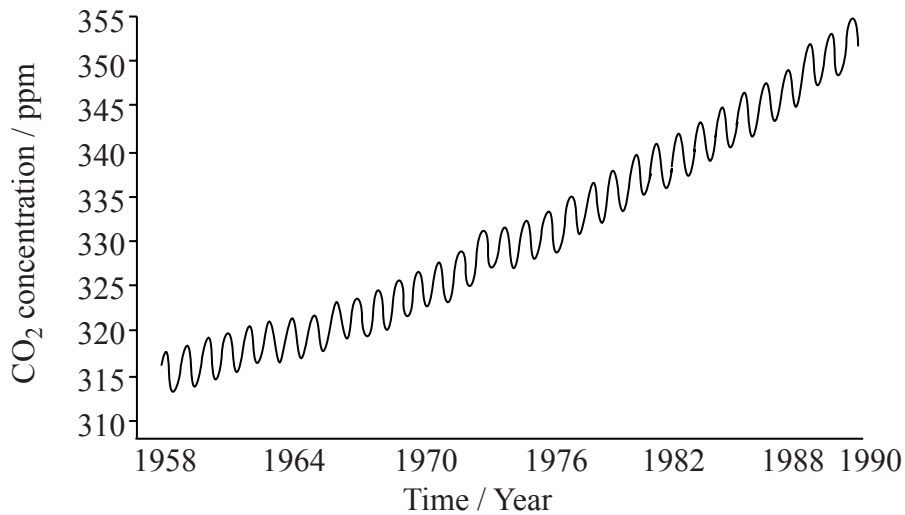
	X	Y	Z
A.	Nitrogen	Oxygen	Other gases
B.	Oxygen	Nitrogen	Other gases
C.	Nitrogen	Other gases	Oxygen
D.	Other gases	Nitrogen	Oxygen

16. Which of the following correctly describe/describes tropospheric ozone?

- I. It is formed by the action of sunlight on nitrogen dioxide.
- II. It blocks harmful UV rays from reaching the Earth’s surface.
- III. It has recently become depleted at high latitudes.

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

17. The graph below shows the changes in the concentration of carbon dioxide in the atmosphere (*at a specific location*).



[Source: Reproduced with the permission of Nelson Thornes Ltd. from *Environmental Science* by Kevin Byrne ISBN 978-0-17-448305-2 first published in 1997]

Which statement can be concluded from the graph?

- A. CO₂ concentration is affected by seasonal factors.
- B. CO₂ is the main greenhouse gas.
- C. The concentration of CO₂ has a positive feedback effect, increasing global temperature.
- D. The annual mean atmospheric concentration of CO₂ follows an S-shaped curve.

18. Which of the following processes are involved in the formation of acidified precipitation?

- I. Sulfur dioxide and nitrogen dioxide are emitted.
- II. These gases combine with water to form sulfuric and nitric acid.
- III. These acids absorb sunlight and become more concentrated.
- IV. These acids are deposited as wet or dry deposition.

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

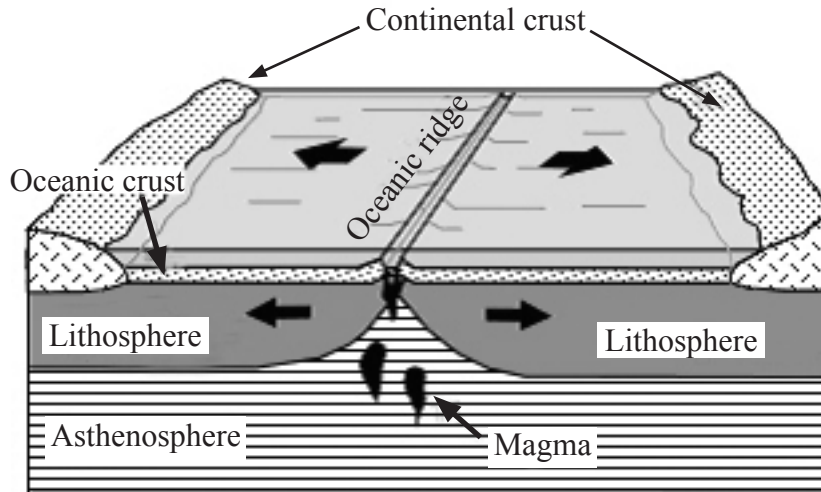
19. Which statement about liming is correct?

- A. Liming is a method of permanently neutralizing acidified lakes and streams.
- B. Liming adds aluminium that is beneficial to aquatic life.
- C. Liming is a method used to reduce eutrophication caused by excessive use of fertilizers.
- D. Liming of streams is only effective downstream from the point of introduction.

20. Oceans make climates less extreme because

- A. water currents are slower than air currents.
- B. they release and absorb heat more slowly than land.
- C. ocean currents transport energy from the poles towards the equator.
- D. photosynthesis is more efficient in water than on land.

21. Which statement about the *El Niño* phenomenon is true?
- A. It is a consequence of the greenhouse effect, causing redistribution of rains with flooding and droughts.
 - B. It is caused by the oscillation in the surface atmospheric pressure between the south-eastern tropical Pacific and the Australian-Indonesian regions.
 - C. It occurs every year when strong westward-blowing trade winds subside, and warm water slowly moves back eastward across the Pacific.
 - D. It is a local environmental problem of the tropical Atlantic region that has important consequences for the weather globally.
22. The diagram below shows plate activity at a mid-oceanic ridge.



What type of plate boundary is shown in the diagram above?

- A. It involves the process of subduction.
- B. It involves the loss of crustal material.
- C. It is a destructive margin.
- D. It is a constructive margin.

23. The process of soil formation
- A. is slowed down by chemical weathering.
 - B. involves only abiotic factors such as water.
 - C. does **not** happen in desert areas because the temperature is too high.
 - D. starts with the weathering of parental rock.
24. The birth rate for Mexico in 2006 was 11/1000 and the death rate 10/1000. What was the percentage rate of natural increase?
- A. 0.1
 - B. 1
 - C. 10
 - D. 0.1/1000
25. Which of the following factors may cause a rise in the rate of natural increase of the population of a country?
- A. Parents delaying birth of first child
 - B. Improved access to medical care
 - C. Improved status of women
 - D. Increased use of birth control measures

26. Which of the following correctly classifies the resources named in the table?

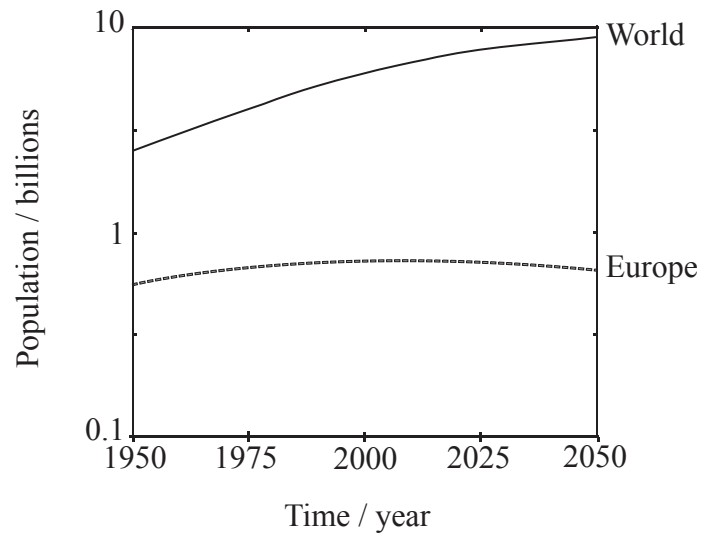
	Renewable	Replenishable	Non-renewable
A.	A school of fish	Minerals	Ozone layer
B.	Timber	Fossil fuels	Groundwater
C.	Groundwater	Timber	Fossil fuels
D.	A forest	Ozone layer	Minerals

27. It is calculated that an area of 0.5 hectares of cropland *per capita* is required to provide the diverse diet available to residents of the USA and Europe. An Asian country has 0.08 hectares of cropland for each person, compared to the global average of 0.27 hectares of cropland *per capita*.

Using this information, select which of the following statements is most likely to be correct.

- A. The Asian country is a net exporter of food.
- B. The USA and Europe have a lower carrying capacity than the Asian country.
- C. The population of the Asian country exceeds what can be sustained by its surface area.
- D. The USA and Europe have reached their carrying capacity.

28. The graph below shows the estimated growth of the human population from 1950 to 2050.



Which of the following can be measured from this type of graph?

- I. Change in total population over time
 - II. Natural increase rate
 - III. Rate of population growth at different times
- A. I only
- B. I and II only
- C. I and III only
- D. I, II and III

29. Which of the following cycles does **not** have an atmospheric storage?
- A. Carbon cycle
 - B. Nitrogen cycle
 - C. Phosphorus cycle
 - D. Water cycle
30. Which equation for the sustainable yield (SY) of a fishery is correct?
- A. $SY = (\text{energy fixed by producers}) - (\text{respiration loss} + \text{emigration})$
 - B. $SY = (\text{gross secondary productivity}) - (\text{respiration loss}) - (\text{energy in feces})$
 - C. $SY = (\text{annual growth} + \text{immigration}) - (\text{annual mortality} + \text{emigration})$
 - D. $SY = (\text{food consumed}) - (\text{energy loss})$
-