IB DIPLOMA PROGRAMME
PROGRAMME DU DIPLÔME DU BI
PROGRAMA DEL DIPLOMA DEL BI

ENVIRONMENTAL SYSTEMS
STANDARD LEVEL
PAPER 1

Wednesday 7 May 2003 (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. Convectional cells in the asthenosphere are important for the net transfer of energy from the tropics to the poles.

B. The atmosphere and the hydrosphere are important for the net transfer of energy from the poles to the tropics.

C. The atmosphere and the hydrosphere are important for the net transfer of energy from the tropics to the poles.

D. Convectional cells in the atmosphere are important for the net transfer of energy from the poles to the tropics.

2. The accelerating decline in the population of a country in which the average age was increasing, provides an example of which of the following?

A. Negative feedback

B. Positive feedback

C. Steady-state equilibrium

D. A demographic transition model

3. Four examples of natural capital are listed below.

(i) a nickel ore deposit in the Australian outback
(ii) a population of deer in a forest reserve
(iii) ozone in the upper atmosphere
(iv) the forest cover of an uninhabited Pacific island

In which of the three classes of natural capital does each belong?

	(i)	**(ii)**	**(iii)**	**(iv)**
A.	non-renewable	renewable	renewable	replenishable
B.	replenishable	replenishable	renewable	non-renewable
C.	renewable	renewable	non-renewable	renewable
D.	non-renewable	renewable	replenishable	renewable

4. Which statement most correctly describes *K*-strategist organisms?

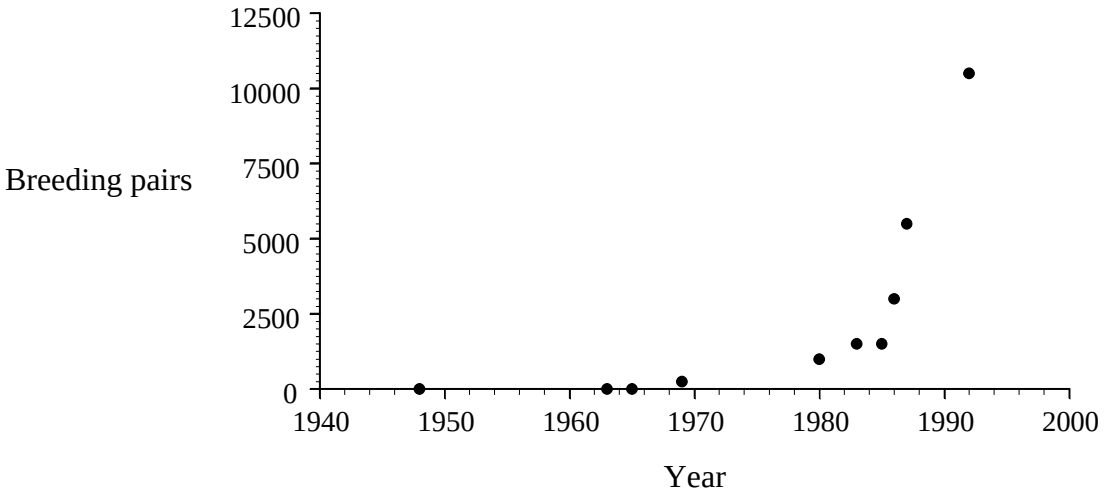
A. They reach adulthood quickly and have many young.

B. They reach adulthood slowly and have many young.

C. They reach adulthood quickly and have few young.

D. They reach adulthood slowly and have few young.

Questions 5 and 6 relate to the graph below which shows the number of pairs of penguins breeding on an island in the Southern Ocean.



[Source: data from Australian Antarctic Division]

5. The graph could be used to

A. estimate the growth rate of the population.

B. estimate the survivorship of the species

C. estimate the breeding success of the population.

D. estimate the life expectancy of a pair of penguins.

6. Penguins are a part of a complex oceanic ecosystem that also includes organisms above them in the food-chain (carnivores such as leopard seals) and below them (fish). What changes would you expect as the result of the changes in penguin numbers shown in the graph?

A. Leopard seals and fish to increase in number.

B. Leopard seals and fish to decrease in number.

C. Leopard seals to increase, but fish to decrease in number.

D. Leopard seals to decrease, but fish to increase in number.

7. Temperate forests are generally found closer to the

A. poles than both tundra and deserts.

B. equator than both tropical forests and deserts.

C. poles than deserts, but closer to the equator than tundra.

D. poles than tropical forests, but closer to the equator than deserts.

8. Which list contains **only** abiotic components of an ecosystem?

A. air, water, rock

B. air, producers, climate

C. soil, consumers, water

D. carnivores, herbivores, decomposers

9. The plants and animals of Australia had a unique evolution because the tectonic plate on which the continent is situated

A. is the oldest.

B. is the youngest.

C. was never attached to any other plate.

D. has been isolated for a long period.

10. Which of the following contains the greatest proportion of the world's fresh water?

A. Organisms

B. The atmosphere

C. Ice-caps and glaciers

D. Streams, rivers and lakes

11. For a particular year, for the fishing grounds of an island nation, assume:

R = the biomass of young fish reaching harvestable size
G = the growth in biomass of fish already of harvestable size
M = the loss of fish through death and emigration
B = the biomass of the total fish population at the start of the year.

The sustainable yield of the fishing grounds could be calculated using which of the following?

A. R + G – M

B. B – M

C. B + R + G – M

D. R + G

12. Species associated with pioneer and early seral communities tend to have … **(i)** … young, which mature … **(ii)** … and are often given … **(iii)** … parental care. Such organisms often have a … **(iv)** … life span.

Which of the following provides the correct set of words to be inserted in the above sentence?

	(i)	**(ii)**	**(iii)**	**(iv)**
A.	many	slowly	little	long
B.	many	quickly	little	short
C.	few	slowly	much	short
D.	few	quickly	little	long

13. Which of the following is **not** associated with the process of subduction?

A. Formation of new crustal material

B. Formation of islands and mountains

C. Melting of crustal material

D. Volcanic activity

14. In a country in which most energy is obtained from burning fossil fuels, which of the following will tend to reduce the amount of acid deposition?

A. Switching from conventional to nuclear power stations

B. Reducing tax on fossil fuels

C. Using lead-free petrol (gasoline) in cars

D. Banning the use of substances that harm the ozone layer, such as CFCs

15. If the producer biomass in an ecosystem is 150 kg per hectare $\left(\text{kg ha}^{-1}\right)$, what is the approximate primary consumer (herbivore) biomass (in kg ha^{-1}) that might be expected in the same ecosystem?

A. 15 000

B. 1 500

C. 15

D. 1.5

16. Which statement about the storage of nitrogen in ecosystems is correct?

A. The atmosphere contains more carbon than nitrogen.

B. Nitrogen is not stored in organic matter in the soil.

C. The plant biomass of an ecosystem contains much more nitrogen than carbon.

D. Nitrogen is stored in the animal biomass of an ecosystem mainly in the form of protein.

17. What is the lapse rate?

A. The rate at which temperature declines with increasing altitude in the troposphere

B. The rate at which temperature increases approaching the equator

C. The rate at which an organism's population grows when numbers are uncontrolled

D. The rate at which ozone is produced by ultraviolet radiation

18. Why is it difficult to calculate carrying capacities for human populations?

A. Human populations have increased greatly over the last 50 years.

B. Resources can be imported and exported and the level of technology can influence carrying capacity.

C. Human populations can move more rapidly than the populations of other organisms.

D. Pollution has damaged certain environments and reduced the carrying capacity.

19. If toxic materials were to be released into a coral reef ecosystem, in which part of the ecosystem would you expect them to accumulate to the greatest extent?

A. In the algae living amongst the corals

B. In the open water

C. In the tissues of small fish

D. In the tissues of large carnivorous fish such as sharks

20. In a normal terrestrial ecosystem, most nutrients

A. come from the sun.

B. move through the ecosystem in a single direction only.

C. tend to be stored in the biomass of the top carnivore.

D. tend to be recycled.

21. Which statement is correct?

A. A food chain can never have more than four members.

B. Ecosystems that have a high productivity often also show high biodiversity.

C. One ecosystem can never contain another within it.

D. Pioneer communities usually contain more plant species than climax communities.

22. If the crude birth rate of a country in a particular year is 16 per 1 000, and the crude death rate is 8 per 1 000, what is the annual population growth by natural increase?

A. 0.8 %

B. 8.0 %

C. 2.0 %

D. 0.2 %

23. What is a biome?

A. A collection of ecosystems sharing similar climatic conditions

B. A group of populations living and interacting with each other in a common habitat

C. A community of independent organisms and the physical environment they inhabit

D. A group of organisms that interbreed and produce fertile offspring

24. During the process of soil formation

A. environmental temperature has no effect.

B. the first stage involves the weathering of parent rock.

C. plants have no material input.

D. chemical weathering slows the process.

25. Photochemical smog is formed when primary pollutants interact with which of the following?

A. Water vapour

B. Heat

C. Oxygen

D. Sunlight

26. What is a group of organisms of the same species living in the same area at the same time known as?

A. A community

B. A population

C. An ecosystem

D. An ecological niche

27. Why is lime sometimes added to acid lakes?

A. To lower the pH of the water

B. To raise the pH of the water

C To kill poisonous fish

D. To prevent eutrophication

28. The downward leaching of nutrients within the soil profile is primarily an example of which of the following?

A. Transformation of energy

B. Transfer of energy

C. Transfer of materials

D. Transformation of materials

29. Which statement about the ozone layer is correct?

A. Fluorine released from chlorofluorocarbons combines with carbon dioxide molecules in the upper atmosphere to form ozone.

B. Acid rain is caused by an increase in the amount of ultraviolet radiation that penetrates the ozone layer.

C. The burning of fossil fuels causes the formation of ozone, which gradually diffuses to the stratosphere.

D. Ultraviolet radiation is absorbed during the process of stratospheric ozone formation.

30. Which statement about soils is correct?

A. Clay soils are capable of retaining more moisture than sandy soils.

B. Soils form rapidly in some climates and thus soil is often regarded as a renewable resource.

C. Irrigation of soils prevents salinization.

D. Loam soils are generally less productive than either clay or sandy soils.
