



**ENVIRONMENTAL SYSTEMS  
STANDARD LEVEL  
PAPER 2**

Candidate number

--	--	--	--	--	--	--	--

Friday 14 November 2003 (afternoon)

1 hour 15 minutes

---

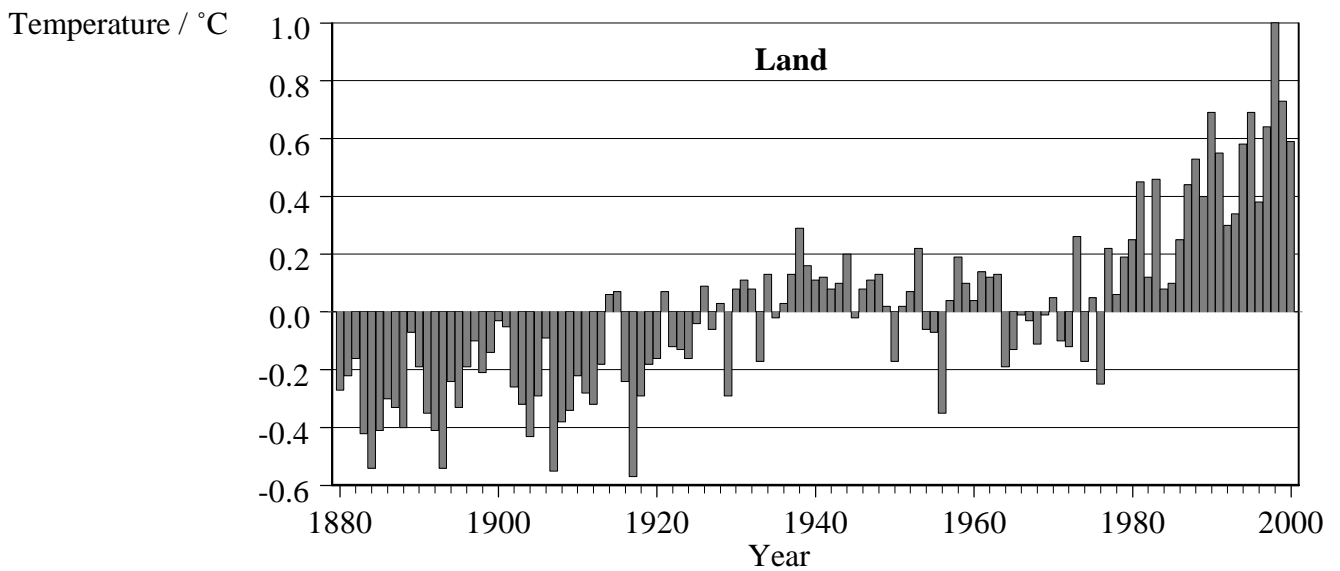
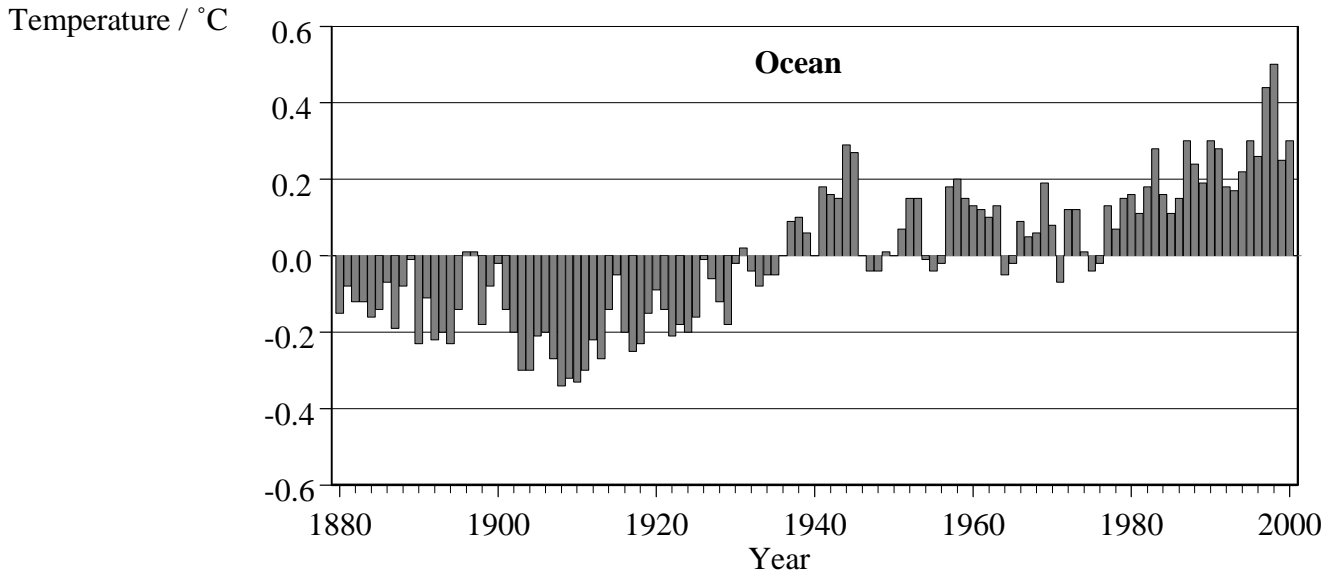
**INSTRUCTIONS TO CANDIDATES**

- Write your candidate number in the box above.
- Do not open this examination paper until instructed to do so.
- Section A: answer all of Section A in the spaces provided.
- Section B: answer one question from Section B. Write your answers on answer sheets. Write your candidate number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.
- At the end of the examination, indicate the numbers of the questions answered in the candidate box on your cover sheet and indicate the number of sheets used in the appropriate box on your cover sheet.

### SECTION A

Answer *all* the questions in the spaces provided.

1. The graphs below show how global temperatures have varied above and below the mean between the years 1880 and 2000, both on land and in the ocean.



Variation in global temperatures from the mean between the years 1880 and 2000.

[Source: Adapted from February Global Surface Mean Temperature Anomalies, National Climatic Data Center / NESDIS / NOAA]

*(This question continues on the following page)*

*(Question 1 continued)*

- (a) (i) Describe the changes in **land** temperatures between 1880 and 2000 shown on the graph opposite. [3]

.....  
.....  
.....  
.....  
.....  
.....  
.....

- (ii) Explain **one** way in which human activities could have caused these changes. [1]

.....  
.....

(b) From the graphs, calculate

- (i) the **total** range of ocean temperatures. [1]

.....  
.....

- (ii) the **total** range of land temperatures. [1]

.....  
.....

(c) Explain why the range of temperatures in the ocean differs from the range of temperatures on land. [2]

.....  
.....  
.....  
.....  
.....

2. (a) In 1991, Mount Pinatubo (a volcano in the Philippines) erupted, throwing large amounts of volcanic ash into the atmosphere. Explain the likely effect of this type of eruption on global temperatures. [2]

.....  
.....  
.....  
.....  
.....

(b) Mount Pinatubo is situated close to a subduction zone.

- (i) State whether subduction zones occur at constructive **or** destructive plate margins. Explain your answer. [1]

.....  
.....  
.....

- (ii) Draw a labelled diagram showing how crustal plates interact in a subduction zone. [3]

- (iii) Explain why earthquakes and volcanoes often occur close to subduction zones. [2]

.....  
.....  
.....  
.....  
.....

*(This question continues on the following page)*

(Question 2 continued)

(c) When volcanoes erupt, they emit many gases, some of which contribute to acid rain.

(i) State any **two** gases which contribute to acid rain. [2]

.....

(ii) List **two** human activities which increase atmospheric concentrations of the gases stated in (i). [2]

.....

.....

(iii) Outline **two** methods of reducing emissions of the gases stated in (i) and evaluate their effectiveness in reducing atmospheric pollution. [4]

.....

.....

.....

.....

.....

.....

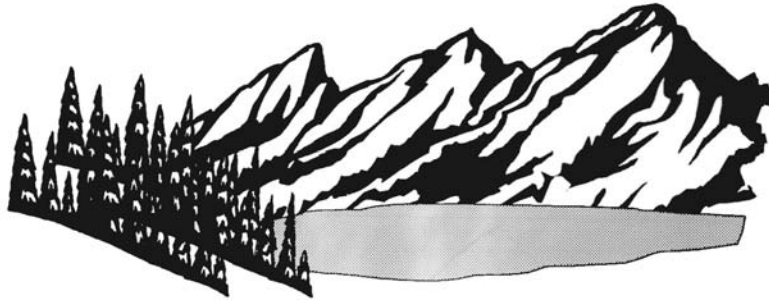
.....

.....

.....

.....

3. Rocks from the mountains in the diagram below are quarried to provide stone for road building. The lake is used to supply fresh water to a nearby town and the trees are harvested to make paper.



- (a) Define *natural capital*. [1]

.....  
.....

- (b) Using the information above, identify examples of renewable, non-renewable and replenishable natural capital and outline the differences between them. [3]

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

- (c) Explain how **two** of the examples given in (b) should be managed to provide a sustainable natural income. [2]

.....  
.....  
.....  
.....  
.....

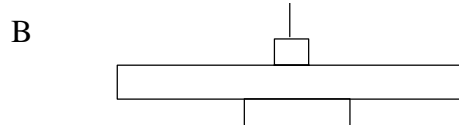
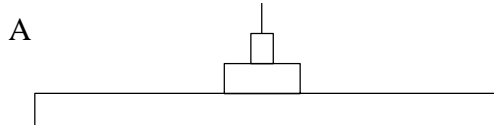
**SECTION B**

Answer **one** question. Write your answers on the answer sheets provided. Write your candidate number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.

Each essay question is marked out of a total of 20 marks of which 3 are allocated to the expression and development of ideas as follows:

- 0 No expression of relevant ideas.
- 1 Expression and development of relevant ideas is limited.
- 2 Ideas are relevant, satisfactorily expressed and reasonably well developed.
- 3 Ideas are relevant, very well expressed and well developed.

4.



- (a) Discuss whether both pyramid diagram A and pyramid diagram B shown above could represent:
- (i) numbers of organisms in an ecosystem;
  - (ii) storage of biomass in an ecosystem;
  - (iii) productivity in an ecosystem.

Use named examples of organisms and ecosystems you have studied to support your answers. [12]

- (b) Describe and explain how a pyramid of productivity for a tundra biome might change if global warming significantly increased both the mean annual temperature and the annual rainfall. [5]

*Expression of ideas* [3]

5. The table shows population data for selected countries in 1999.

Country	Population / millions	Crude birth rate	Crude death rate	Natural increase / % per year	Life expectancy / years	Under 15 years old / %	People per doctor
Germany	82	10	10	-0.1	77	16	370
USA	273	15	9	0.6	77	21	420
Brazil	168	21	6	1.5	67	32	1000
India	987	28	9	1.9	60	36	2439
Nigeria	114	43	13	3.0	54	45	5882

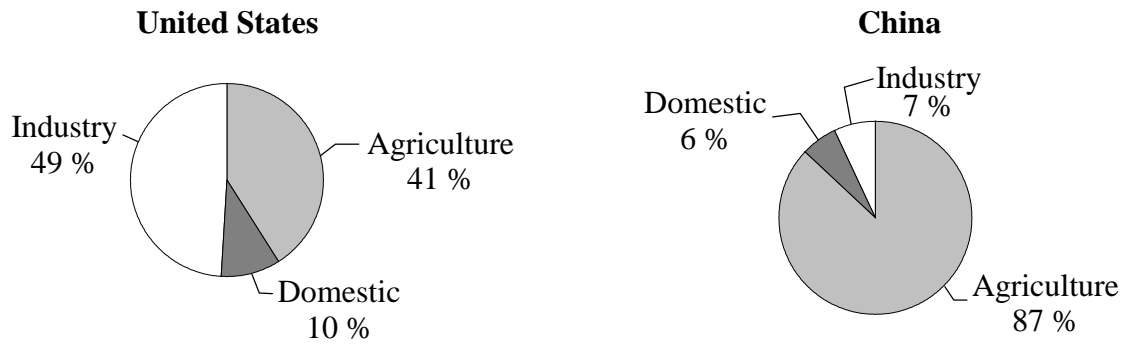
[Source: Adapted from A Bowen and J Pollister, (2000) AS Level Geography, page 150, Heinemann]

- (a) Compare the rates of population growth in the countries shown above and suggest the likely impact of these growth rates on global population figures in the future. [6]
- (b) Discuss the reasons for these differences in growth rate and suggest how international development policies may influence population growth rates. [6]
- (c) Explain what is meant by the global carrying capacity for humans and evaluate ways in which it could be increased to accommodate the anticipated rise in human population. [5]

*Expression of ideas* [3]



6. The pie charts below show the usage of water in the United States and China.



Since 1950 the global rate of water withdrawal from surface and groundwater sources has increased almost fivefold and *per capita* use has tripled.

[Source: Worldwatch Institute and World Resources Institute, 2000]

- (a) Discuss the [7]
  - (i) reasons for differences in water usage between the United States and China.
  - (ii) changes in global rates of water extraction since 1950.
- (b) Describe, with examples, how human population growth affects the world's fresh water resources. [7]
- (c) Water is an essential component of soil systems. Outline **three** processes in soil systems that involve water. [3]

*Expression of ideas* [3]

---