E. Concept five: Scientific knowledge and values
1. Culture and environmental awareness
2. Why is solving environmental problems so difficult?
3. Precautionary principle
4. Science and values

Some Questions to Think About

1. An answer to this question should reflect the interaction between Earth systems and the human influences on those systems. Possible solutions depend strongly on the cultural, political, and economic situation of a nation or region.
2. An answer to this question should focus on the costs, in terms of environmental impacts, of producing food for that many people, and whether that level of food production and the collective impacts of that many people are sustainable.
3. A response to this task must focus on the perceived necessity of sustainability, and on the varying levels of economic vitality that are acceptable to the people and cultures involved in a sustainable approach.
4. This assignment must focus on the various linked systems that might be affected by the development, and what actions or reactions the development might set off in those interacting systems.
5. An answer to this question should focus on possible genetic and cultural linkages over thousands of years. The answer should address the degree to which behaviors and attitudes reflect characteristics passed on between generations.
6. This question refers to the nature of science. An answer should reflect knowledge of the scientific method and the nature of scientific inquiry, and should focus on the testability of linkages between Earth systems central to the Gaia hypothesis.
7. A response to this question should focus on perceived influences of humans on Earth resources and systems and the viability of sustainable development. There are many value judgments involved in this question.
8. This question requires a discussion of the philosophy behind the precautionary principle and of the seriousness of the problem of human population growth.

Exam Questions

Multiple Choice

1. Why is human population growth often considered the foremost environmental problem?

a. the Earth will run out of open land space within the next 50 years
b. increasing population strains resources and creates additional wastes
c. there is no way to provide food for additional people
d. there is insufficient oxygen production on Earth for more than 10 billion people

Answer: b
Difficulty Level: 1
Section Number: 1.2
Bloom's taxonomy level: Understanding

2. What is exponential growth?

a. growth that occurs at a constant rate
b. growth that is logarithmic in nature

c. growth that occurs as a constant percentage of the existing amount
d. growth that doubles the existing number

Answer: c
Difficulty Level: 2
Section Number: 1.2
Bloom's taxonomy level: Remembering

3. What is uniformitarianism?

a. a uniform method by which science is conducted
b. a concept that states that present processes operated in the past, at similar rates
c. a concept stating that environmental conditions in the past were the same as those of today
d. a method by which the uniformity of population growth is assessed

Answer: b
Difficulty Level: 2
Section Number: 1.2
Bloom's taxonomy level: Remembering

4. How are the impacts of natural hazards linked to population growth?

a. population growth concentrates people and resources, such that the impacts of an individual natural hazard can be greater
b. population growth changes the rates of geologic processes, in turn changing the frequency of hazardous events
c. population growth weakens societal defenses against natural hazards
d. natural hazards strongly influence population growth

Answer: a
Difficulty Level: 3
Section Number: 1.2
Bloom's taxonomy level: Understanding

5. What is sustainability?

a. development that can be sustained for at least 10 years
b. the ability of a population to sustain its growth
c. the ability of a population to sustain its economy
d. development that ensures that future generations will have equal access to the resources that our planet offers

Answer: d
Difficulty Level: 1
Section Number: 1.2
Bloom's taxonomy level: Understanding

6. What does the concept of environmental unity state?

a. one action leads to subsequent actions in linked systems
b. all humans live on Gaia, and therefore we are subject to the same environment
c. all people on Earth agree on the nature of and solutions to environmental problems
d. all systems are related to one another

Answer: a
Difficulty Level: 2
Section Number: 1.2
Bloom's taxonomy level: Understanding

7. What is a theory?

a. a possible explanation for a set of observations
b. a hypothesis that has withstood extensive testing
c. a set of ideas that unifies a field of inquiry
d. an idea that is based only on logical thought

Answer: b
Difficulty Level: 2
Section Number: 1.2
Bloom's taxonomy level: Understanding

8. How does an open system contrast with a closed system?

a. an open system is open to scientific scrutiny, while a closed system is not
b. an open system is able to convert energy from one form to another, while a closed system is not able to do so
c. an open system is prone to collapse, while a closed system is typically more sustainable in the long term
d. an open system exchanges energy and/or materials with its surroundings, while a closed system does not

Answer: d
Difficulty Level: 2
Section Number: 1.2
Bloom's taxonomy level: Understanding

9. What is average residence time?

a. the average time required for the total stock of a material to be cycled through a system
b. the average time that a human population can stay in an area before environmental conditions force them to move
c. the average time required for an open system to convert to a closed system
d. the average time for a system to run out of energy

Answer: a
Difficulty Level: 2
Section Number: 1.2

Bloom's taxonomy level: Understanding

10. What is the Gaia hypothesis?

a. a hypothesis that states the Earth is alive
b. the concept of environmental unity
c. the hypothesis lying at the root of uniformitarianism
d. a set of hypotheses that likens the Earth to a superorganism with interrelated, mutually adjusting systems

Answer: d
Difficulty Level: 1
Section Number: 1.2
Page Reference: 22
Bloom's taxonomy level: Remembering

Fill-in-the-Blank

1. The society of _____ Island was destroyed by environmental degradation.
Answer: Easter
Difficulty Level: 1
Section Number: 1.0
Bloom's taxonomy level: Remembering

2. The law of _____ states that rocks with similar fossils are most likely of a similar geologic age.
Answer: faunal assemblages
Difficulty Level: 2
Section Number: 1.2
Bloom's taxonomy level: Understanding

3. _____ growth implies that a constant percentage of humans are added each year.
Answer: Exponential
Difficulty Level: 1
Section Number: 1.2
Bloom's taxonomy level: Remembering

4. The maximum number of people Earth can hold without causing prohibitive environmental degradation is called _____.
Answer: carrying capacity
Difficulty Level: 2
Section Number: 1.2
Bloom's taxonomy level: Remembering

5. Large-scale _____ of Earth materials will be required to meet future resource demands.