

Chapter 1

HUMANS, GEOLOGY, AND THE ENVIRONMENT

MULTIPLE-CHOICE

1. Which item listed below has helped to increase the carrying capacity of the Earth?
- A. the development of nitrogen-based fertilizers
 - B. the development and application of chemical pesticides
 - C. the development and application of chemical herbicides
 - D. genetic modification of grains and other crops
 - E. all of the choices

ANSWER: E

2. What is the population of the world likely to be by the year 2050?
- A. 5 billion
 - B. 7 billion
 - C. 9 billion
 - D. 11 billion
 - E. 13 billion

ANSWER: C

3. Which of the following statements is true regarding the world population growth rate since 1965?
- A. It has been increasing at an alarming rate.
 - B. It has been decreasing at an alarming rate.
 - C. It has been decreasing slowly.
 - D. It has been increasing slowly.
 - E. It has stayed the same.

ANSWER: C

4. The IPAT equation is about which of the following?
- A. earthquake prediction
 - B. global warming trends
 - C. inflation
 - D. environmental impact
 - E. slope stability

ANSWER: D

5. Which of the following is true of environmental geology?
- A. It is concerned with how natural geological processes affect man.
 - B. It is concerned largely with surface geologic processes.
 - C. It applies the science of geology to problems arising from the complex interactions of water, soil, air, solid earth, and life.
 - D. It seeks ways for the Earth's inhabitants to interact safely with their geological surroundings.
 - E. all of the choices

ANSWER: E

6. The number of people or animals that can be supported by a given area of land is called _____.
_____.
- A. carrying capacity
 - B. growth rate
 - C. doubling time
 - D. population dynamics
 - E. critical mass

ANSWER: A

7. Which of the following is true of world population in the 20th century?
- A. It doubled.
 - B. It tripled.
 - C. It quadrupled.
 - D. It quintupled.
 - E. It remained the same because of wars.

ANSWER: C

8. Which of the following is NOT a variable in the IPAT equation?
- A. impact
 - B. technology
 - C. natural resources
 - D. affluence
 - E. population

ANSWER: C

9. A population exceeding its carrying capacity is referred to as _____.
_____.
- A. population dynamics
 - B. ecological overshoot
 - C. involutional melancholia
 - D. diminishing returns
 - E. negative feedback

ANSWER: B

10. _____ are far more readily modified and overturned than _____.
- A. Hypotheses; laws
 - B. Laws; hypotheses
 - C. Theories; hypotheses
 - D. Hypotheses; theories
 - E. Laws; theories

ANSWER: D

11. Which of the following would be the first step in applying the scientific method to an environmental geological problem?
- A. formulate a hypothesis
 - B. create a map
 - C. pose a question
 - D. draw a conclusion
 - E. analyze data

ANSWER: C

12. Which of the following is NOT something that is included on derivative maps?
- A. landslide hazards zones
 - B. depth to underground water
 - C. areas susceptible to flooding
 - D. seismic hazard zones
 - E. All are included.

ANSWER: E

13. What is the computer system that assembles, stores, manipulates, and displays geographic data according to location?
- A. GPS
 - B. GOP
 - C. GSA
 - D. GIS
 - E. GPA

ANSWER: D

14. What are lines of equal elevation called on topographic maps?
- A. isotherms
 - B. contours
 - C. geological contacts
 - D. lineations
 - E. grid lines

ANSWER: B

15. How much greater are population growth rates in poorer countries than in richer countries?
- A. two times
 - B. four times
 - C. six times
 - D. eight times
 - E. ten times

ANSWER: C

16. An environmental geologist could be expected to apply the scientific method to all of the following questions EXCEPT:
- A. Which public policy can best lower population growth rate?
 - B. Which regions in the United States have the lowest seismic risk?
 - C. How did the water supply to a community get contaminated?
 - D. Are the soils in a sub-development safe to build on?
 - E. What is the landslide potential of building a shopping mall outside a city?

ANSWER: A

17. Which of the following sustainable factors helped to save America's forests from destruction during the 20th century?
- A. conservation of forests by creation of the National Forest Service
 - B. technology driven mass production of construction materials from plastics
 - C. economic policies that allowed the importation of wood from tropical rainforests
 - D. conservation efforts that resulted in a reduction in the demand for wood products
 - E. overall decline in the United States population

ANSWER: A

18. In poorer countries, which part of the IPAT equation has the greatest impact?
- A. population
 - B. affluence
 - C. technology
 - D. pollution
 - E. energy

ANSWER: A

19. Read carefully through the following sentence and decide which of the options is correct: In industrialized countries, personal perspectives of environmental issues are realistic because environmental problems develop close to home as resources are collected and used locally.
- A. The word “realistic” should be replaced by “warped.”
 - B. The word “ industrialized “ should be replaced by “developing.”
 - C. The word “resources” should be replaced by “wastes.”
 - D. The word “environmental” should be replaced by “geological.”
 - E. The word “home” should be replaced by “rivers.”

ANSWER: B

20. Judge the following sentence according to the criteria given below: The IPAT equation of human environmental impact is a quantitative expression BECAUSE no one can put exact numbers to P, A, and T.
- A. The assertion and the reason are both correct, and the reason is valid.
 - B. The assertion and the reason are both correct, but the reason is invalid.
 - C. The assertion is correct, but the reason is incorrect.
 - D. The assertion is incorrect, but the reason is correct.
 - E. Both the assertion and the reason are incorrect.

ANSWER: D

TRUE–FALSE

1. The large agricultural yields obtained today are fundamentally dependant upon fossil fuels.

ANSWER: T

2. An average American citizen consumes 35 times the resources of an average Indian citizen over the course of his or her lifetime.

ANSWER: T

3. Nearly half of the population of the world is living in cities.

ANSWER: T

4. The main purpose of geological maps is to show the shape of the Earth’s surface.

ANSWER: F

5. Once the Earth’s carrying capacity is exceeded, population reduction will occur whether we want it to or not.

ANSWER: T

6. GIS is a new navigational system that will soon replace GPS.

ANSWER: F

7. Derivative maps are made from computer data sets that are analyzed and plotted for special applications.

ANSWER: T

8. Malthus postulated in 1812 that population growth would soon cause global famine and collapse of society.

ANSWER: T

9. An annual population growth rate of +1% corresponds to a situation where there are 100 more deaths per thousand individuals than live births in a given year.

ANSWER: F

10. With a population growth rate of 0.7%, it would take 100 years for the population to double.

ANSWER: T

11. The highest soil degradation rates occur in Africa.

ANSWER: F

12. Nations that tend to have the greatest environmental impacts are those with the lowest population growth rates.

ANSWER: T

13. The size of our population is limited by the amount of food we can grow.

ANSWER: T

14. Since 1950, about one-third of all U.S. croplands have been lost due to erosion.

ANSWER: T

15. The population density of the Earth has tripled since World War II.

ANSWER: T

16. Some environmental disasters are avoidable.

ANSWER: T

17. Students do not need to be concerned with environmental geology problems because they are all global in scale.

ANSWER: F

18. The Earth has functioned as a life-supporting self-sustaining system for over 8 billion years.

ANSWER: F

19. The National Forest Service was created to promote timber harvesting.

ANSWER: F

20. One-fourth of the Earth's people suffer malnutrition on a daily basis.

ANSWER: F

SHORT ANSWER AND ESSAY QUESTIONS

1. The population growth rate of the U.S. is currently well below 1%. What are some reasons why we should not feel good about this?

ANSWER: We are not at zero growth; at the current rate, our population will still double in roughly 100 years. We use a disproportionately large percentage of the world's resources per capita. We produce a disproportionately large percentage of the world's waste per capita. Groundwater resources are decreasing and so is the amount of farmable soil.

2. Things that society values commonly increase population growth rates, thus making the population problem worse. What are some examples of these values?

ANSWER: World peace, medical advances, decreased infant mortality, lower speed limits, increased agricultural productivity, law and order, clean air, and clean water.

3. Things that society considers to be bad commonly decrease population growth rates, thus helping to correct the population problem. What are some examples of these things?

ANSWER: War, anarchy, disease, increased infant mortality, starvation, murder, and pollution.

4. Coal reserves in the U.S. have been estimated to be sufficient to last several centuries at current levels of use. Why should we not feel good about this?

ANSWER: "At current levels of use" does not accurately reflect the future. As oil reserves diminish, the demand for coal will increase. Also, population increases are likely to increase the demand for all fossil fuels. Based on historic trends, the level of use of coal will increase, thus shortening the time that our reserves will last.

5. Some computer scenarios show a collapse of industrial production and agricultural production in the wake of the depletion of critical resources, such as fossil fuels. Paradoxically, in these scenarios, birth rates dramatically increase while population simultaneously drops. How can you explain this?

ANSWER: The death rate increases far faster than the birth rate. The high birth rates are the result of the absence of modern medical resources.

6. Bangladesh had a population, in the year 2002, of 133,376,684 and had a population growth rate of 1.59%. How many years, after 2002, will it take for the population to double at this rate?

ANSWER: 44

7. Consider that Bangladesh has a surface area of 143,998 square kilometers. How long would it take, at a growth rate of 1.59%, for there to be one person for every square meter of land surface? What is the implication of this relative to carrying capacity?

ANSWER: A little over 440 years (slightly more than 10 doublings); the carrying capacity will be reached much sooner.

8. What was the discovery made by Fritz Haber, and why was this a mixed blessing?

ANSWER: Haber discovered how to fix nitrogen from the atmosphere into compounds that could be used to make synthetic fertilizer. This greatly boosted the Earth's carrying capacity, but it also caused very serious global water pollution problems.

9. What did Dr. Albert Bartlett mean when he said, "the greatest shortcoming of the human race is our inability to understand the exponential function"?

ANSWER: His point was that exponential population growth is commonly not understood. World population, for example, quadrupled in the 20th century from 1.6 billion, in 1900, to over 6 billion, in

2000, and it took only 12 years for the last billion people to be added to our population. Doubling times will continue to get shorter unless population growth rates decrease. This trend cannot continue indefinitely in a world of finite resources and living space.

10. What is meant by the term “false carrying capacity”?

ANSWER: The condition where the perceived carrying capacity is not ultimately sustainable.