

MULTIPLE CHOICE

1. Which of the following is NOT a major Earth component?
- atmosphere
 - biosphere
 - hydrosphere
 - lithosphere
 - stratosphere

ANS: E PTS: 1 DIF: Knowledge/Comprehension

2. Which of the following is a product of the conflicting processes driven by Earth's internal and external heat sources?
- wind
 - soil
 - earthquakes
 - sleet
 - gravity

ANS: B PTS: 1 DIF: Knowledge/Comprehension

3. A situation where a system acquires a new stable set of conditions significantly different from the original ones is an example of which type of feedback?
- positive
 - negative
 - run-away
 - formative
 - cumulative

ANS: C PTS: 1 DIF: Knowledge/Comprehension

4. Clouds ____ the temperature of Earth's atmosphere due to reflection of solar radiation and ____ it due to greenhouse re-radiation.
- raise; raise
 - raise; lower
 - lower; raise
 - lower; lower
 - Clouds have no impact on the temperature of Earth's atmosphere.

ANS: C PTS: 1 DIF: Knowledge/Comprehension

5. Judge the following sentence according to the criteria given below: Winds on Earth tend to blow more north-south than east-west BECAUSE the Coriolis effect causes all winds to bend to the right.
- The assertion and the reason are both correct, and the reason is valid.
 - The assertion and the reason are both correct, but the reason is invalid.
 - The assertion is correct, but the reason is incorrect.
 - The assertion is incorrect, but the reason is correct.
 - Both the assertion and the reason are incorrect.

ANS: E PTS: 1 DIF: Evaluation

6. Whirlpool-like storms are called all of the following EXCEPT?

- a. cyclones
- b. hurricanes
- c. monsoons
- d. typhoons
- e. willy-willies

ANS: C

PTS: 1

DIF: Knowledge/Comprehension

7. What drives surface ocean currents?

- a. the rotation of the Earth
- b. the Earth's magnetic field
- c. wind
- d. waves
- e. storm activity

ANS: C

PTS: 1

DIF: Knowledge/Comprehension

8. What drives deep ocean currents?

- a. the rotation of the Earth
- b. the Earth's magnetic field
- c. wind
- d. waves
- e. density

ANS: E

PTS: 1

DIF: Knowledge/Comprehension

9. Which of the following is NOT a factor cited to explain periodic long-term variations in the climate of the Earth?

- a. tilt of the Earth's axis
- b. shape of the Earth's orbit
- c. speed of rotation of the Earth on its axis
- d. wobble of the Earth's axis
- e. All are factors.

ANS: C

PTS: 1

DIF: Knowledge/Comprehension

10. What is obliquity?

- a. tilt of the Earth's axis
- b. shape of the Earth's orbit
- c. speed of rotation of the Earth on its axis
- d. wobble of the Earth's axis
- e. planetary alignment

ANS: A

PTS: 1

DIF: Knowledge/Comprehension

11. Which isotope ratio is especially important in studying Earth's climate over the past 500,000 years?

- a. oxygen-18 to oxygen-16
- b. carbon-14 to carbon-12
- c. sulfur-34 to sulfur-32
- d. nitrogen-15 to nitrogen-14
- e. argon-40 to argon-39

ANS: A

PTS: 1

DIF: Knowledge/Comprehension

12. Judge the following sentence according to the criteria given below: Land conversion from forests to cropland results in an increase in biological carbon storage capacity BECAUSE the annual planting and harvesting of crops involves far more biomass than mature forests.
- a. The assertion and reason are both correct, and the reason is valid.
 - b. The assertion and reason are both correct, and the reason is invalid.
 - c. The assertion is correct and the reason is incorrect.
 - d. The assertion is incorrect and the reason is correct.
 - e. Both the assertion and the reason are incorrect.

ANS: E PTS: 1 DIF: Evaluation

13. Snow-albedo is an example of which type of feedback?
- a. positive
 - b. negative
 - c. run-away
 - d. formative
 - e. cumulative

ANS: A PTS: 1 DIF: Knowledge/Comprehension

14. Which of the following factors, responsible for large-scale temperature changes presently being experienced, has changed decisively due to human activity?
- a. stratospheric volcanic sulfate aerosols
 - b. climate variability
 - c. solar radiation
 - d. greenhouse gases
 - e. snow-albedo effect

ANS: D PTS: 1 DIF: Knowledge/Comprehension

15. Which of the following is NOT a major source of human greenhouse gas emissions?
- a. agriculture
 - b. deforestation
 - c. cement production
 - d. burning of coal
 - e. livestock

ANS: B PTS: 1 DIF: Knowledge/Comprehension

16. Judge the following sentence according to the criteria given below: Earth's climate for the next several hundred thousand years depends strongly on the carbon emissions we put into the air over the coming century BECAUSE as much as 25% of the carbon-dioxide in an emissions spike can persist for tens of millennia.
- a. The assertion and reason are both correct, and the reason is valid.
 - b. The assertion and reason are both correct, and the reason is invalid.
 - c. The assertion is correct and the reason is incorrect.
 - d. The assertion is incorrect and the reason is correct.
 - e. Both the assertion and the reason are incorrect.

ANS: A PTS: 1 DIF: Evaluation

17. Who invented the first thermometer?

- a. William Rankine
- b. Daniel Fahrenheit
- c. Anders Celsius
- d. William Thomson (Lord Kelvin)
- e. Galileo Galilei

ANS: E

PTS: 1

DIF: Knowledge/Comprehension

18. Which of the following best reflects the change in sea surface temperature of the past half-century?

- a. A net warming of 1°C-2°C has occurred.
- b. A net warming of 0.1°C-0.2°C has occurred.
- c. There has been no change in sea surface temperature.
- d. A net cooling of 0.1°C-0.2°C has occurred.
- e. A net cooling of 1°C-2°C has occurred.

ANS: B

PTS: 1

DIF: Knowledge/Comprehension

19. Judge the following sentence according to the criteria given below: The net warming of the oceans over the past fifty years is not significant BECAUSE the oceans are enormous in size.

- 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.

ANS: D

PTS: 1

DIF: Evaluation

20. Which of the following has the greatest albedo?

- a. fresh concrete
- b. grasslands
- c. ocean water
- d. sandy deserts
- e. snow and ice

ANS: E

PTS: 1

DIF: Application

TRUE/FALSE

1. Not all systems require energy to operate.

ANS: F

PTS: 1

DIF: Knowledge/Comprehension

2. Radiogenic decay is a primary source of heat within the Earth.

ANS: T

PTS: 1

DIF: Knowledge/Comprehension

3. If Earth were to stop receiving energy from the Sun, it would not become a frozen iceball because of radiogenic heat slowly escaping from the interior of the planet.

ANS: F

PTS: 1

DIF: Knowledge/Comprehension

4. The most abundant component of Earth's atmosphere is oxygen.

ANS: F PTS: 1 DIF: Knowledge/Comprehension

5. Without greenhouse gasses, Earth's average air temperature would be well below zero degrees Fahrenheit.

ANS: T PTS: 1 DIF: Knowledge/Comprehension

6. Worldwide seasonal effects in carbon dioxide in the northern and southern hemispheres cancel each other out.

ANS: F PTS: 1 DIF: Knowledge/Comprehension

7. Warm air is less dense than cold air.

ANS: T PTS: 1 DIF: Knowledge/Comprehension

8. In the distant geologic past, the temperature of Earth's atmosphere was the same worldwide.

ANS: F PTS: 1 DIF: Analysis

9. Biologically important marine upwellings form when shallow marine currents move away from the shoreline.

ANS: T PTS: 1 DIF: Knowledge/Comprehension

10. Carbon dioxide dissolves more readily in cold water than in warm water.

ANS: T PTS: 1 DIF: Knowledge/Comprehension

11. Scandinavia has much less ice cover than Greenland because it is at a lower latitude.

ANS: F PTS: 1 DIF: Knowledge/Comprehension

12. Earth's northern hemisphere has always had winter between the December solstice and the March Equinox and always will.

ANS: F PTS: 1 DIF: Knowledge/Comprehension

13. Methane is a more potent greenhouse gas than carbon dioxide.

ANS: T PTS: 1 DIF: Knowledge/Comprehension

14. A significant source of methane, an important greenhouse gas, is livestock flatulence.

ANS: T PTS: 1 DIF: Knowledge/Comprehension

15. Ice cores from Antarctica span hundreds of thousands of years of time.

ANS: T PTS: 1 DIF: Knowledge/Comprehension

16. Most greenhouse warming in the atmosphere is from human activity.

ANS: T PTS: 1 DIF: Knowledge/Comprehension

17. Phoenix, Arizona does not need to learn from the Hohokam because technology has improved greatly since the 16th century.

ANS: F PTS: 1 DIF: Knowledge/Comprehension

18. On average, about 30% of solar energy that reaches the surface of the Earth gets reflected back.

ANS: T PTS: 1 DIF: Knowledge/Comprehension

19. Fossil fuel consumption is the only way humans are impacting climate.

ANS: F PTS: 1 DIF: Knowledge/Comprehension

20. There is a correlation between fossil fuel consumption and Earth's temperature.

ANS: T PTS: 1 DIF: Knowledge/Comprehension

SHORT ANSWER

1. What is the ultimate energy source that drives surface ocean currents?

ANS:

The Sun is the ultimate energy source. Unequal heating of the atmosphere causes wind, and it is wind that drives surface currents.

PTS: 1 DIF: Comprehension

2. Human-induced global warming using today's technology can be thought of as a geologically temporary phenomenon. Why is this?

ANS:

Today's technology is based on the use of fossil fuels, a nonrenewable resource. Once it is gone, the human component of global warming will also be gone. Ultimately, in the absence of this influence, the Earth will return to its natural climatic pattern.

PTS: 1 DIF: Evaluation

3. Explain how Earth's internal and external energy sources work together to shape the surface of the Earth.

ANS:

Earth's surface environment is a balance of forces, some imposed externally (sunlight and related winds, rainfall), some imposed internally (tectonic forces). Life modifies the interaction of these forces, helping create soils and the landscapes to which we are accustomed.

PTS: 1 DIF: Synthesis

4. Provide a natural example of a system without an energy source.

ANS:

There is no natural example. All natural systems require an ultimate energy source.

PTS: 1 DIF: Comprehension

5. What are the major greenhouse gases? Which one contributes the most to the greenhouse effect?

ANS:

The major greenhouse gases are water vapor (60-70%), carbon dioxide (15%-20%), halocarbons (7%-10%), methane (5%-7%), and nitrous oxide (1%-3%). Water vapor contributes the most (60-70%) to the greenhouse effect.

PTS: 1 DIF: Knowledge/Comprehension

6. Is the presence of greenhouse gases a bad or good thing for humans?

ANS:

Without any greenhouse gases, the Earth's average temperature would be between -22°C and -36°C. These temperatures are too cold for liquid water to exist on the surface, and life would not be as abundant as it is today.

PTS: 1 DIF: Analysis

7. Is there any relationship between the chemistry of Earth's atmosphere and life on the planet?

ANS:

Evidence from the fossil record strongly suggests that the atmosphere co-evolved with life, gaining oxygen and losing carbon dioxide in response to biological activity.

PTS: 1 DIF: Analysis

8. Which has the greater chance of sending the Earth's climate past a tipping point: the cloud-albedo effect or the snow-albedo effect?

ANS:

The snow-albedo effect has a greater chance of sending the Earth's climate past a tipping point because it is a positive feedback. The cloud-albedo effect is a negative feedback.

PTS: 1 DIF: Application

9. Explain how the observed increases in carbon dioxide in the atmosphere could be a result of increased temperature and not the other way around?

ANS:

Warming of the atmosphere at the end of the last ice age resulted in warming of the oceans, which resulted in a decrease in the amount of carbon dioxide dissolved in seawater. This carbon dioxide left the oceans and went into the atmosphere.

PTS: 1 DIF: Analysis

10. Why is it that the urban heat island effect contributes very little to overall atmospheric warming?

ANS:

Cities occupy a very small percentage of the overall volume of the planet that contributes to Earth's climate. The volume of the atmosphere, hydrosphere, and uppermost part of the lithosphere are enormous compared to the small volume of cities.

PTS: 1

DIF: Comprehension