

Climate Change Science Essentials

Climate Science · Answer Key · 25 Questions

1. Which gas is responsible for the largest portion of the enhanced greenhouse effect caused by human activities?

- A) Methane
- B) Carbon dioxide**
- C) Nitrous oxide
- D) Ozone

2. What is the primary process by which oceans mitigate atmospheric warming?

- A) Absorbing excess heat and carbon dioxide**
- B) Reflecting sunlight into space
- C) Releasing oxygen into the atmosphere
- D) Neutralizing nitrogen levels

3. Which term describes the long-term trend of increasing average global temperatures?

- A) Climate variability
- B) Global warming**
- C) Weather oscillation
- D) Thermal inversion

4. What is the relationship between the burning of fossil fuels and the carbon cycle?

- A) It creates new carbon atoms
- B) It releases sequestered carbon into the atmosphere**
- C) It reduces the amount of carbon in the crust
- D) It accelerates the natural carbon sequestration process

5. Which scientific instrument is primarily used to measure current atmospheric CO₂ concentrations at the Mauna Loa Observatory?

- A) Spectrometer
- B) Keeling Curve sensor**
- C) Barometer
- D) Anemometer

6. What phenomenon occurs when warming leads to the loss of reflective ice, causing even more heat absorption?

- A) The Greenhouse Effect
- B) The Albedo Effect**
- C) The Coriolis Effect
- D) The Greenhouse Feedback

7. What is the primary driver of current sea-level rise?

- A) Increased underwater volcanic activity
- B) Thermal expansion of seawater and glacial melt**
- C) Changes in oceanic currents
- D) Increased evaporation from lakes

8. Which atmospheric layer is where the majority of human-induced greenhouse gas trapping occurs?

- A) Stratosphere
- B) Mesosphere
- C) Troposphere**
- D) Thermosphere

9. What is the main chemical byproduct of methane oxidation in the atmosphere?

- A) Sulfur dioxide
- B) Carbon dioxide**
- C) Nitrogen
- D) Argon

10. How do volcanic eruptions influence short-term global climate?

- A) They increase global temperatures significantly
- B) They release sulfate aerosols that reflect sunlight**
- C) They permanently deplete the ozone layer
- D) They have no impact on climate

11. What is the main source of human-produced nitrous oxide emissions?

- A) Transportation
- B) Agricultural soil management**
- C) Cement production
- D) Refrigeration

12. What is the approximate percentage of solar radiation that is reflected back into space by clouds and Earth's surface?

- A) 5%
- B) 30%**
- C) 50%
- D) 75%

13. Which isotope analysis is often used to differentiate between fossil fuel CO₂ and natural CO₂?

A) Carbon-14

B) Carbon-13

C) Oxygen-18

D) Deuterium

14. What does the term 'ocean acidification' refer to?

A) The rise in ocean temperature

B) The decrease in oceanic pH due to CO₂ absorption

C) The increase in plastic pollution

D) The loss of salt concentration in seawater

15. Which human activity is the largest source of global methane emissions?

A) Waste management

B) Livestock enteric fermentation

C) Residential heating

D) Forest fires

16. What is a 'proxy' in the context of paleoclimatology?

A) A computer model

B) Physical evidence like ice cores or tree rings

C) A satellite observation

D) A historical weather report

17. What is the role of permafrost in the context of the global carbon cycle?

A) It acts as a permanent carbon sink

B) It stores large amounts of organic carbon that can be released as methane when thawed

C) It increases the rate of forest growth

D) It has no significant role in carbon storage

18. Which international agreement was designed to phase out substances that deplete the ozone layer, indirectly benefiting climate?

A) Kyoto Protocol

B) Paris Agreement

C) Montreal Protocol

D) Copenhagen Accord

19. How does deforestation contribute to climate change beyond the loss of carbon sequestration?

- A) It increases the concentration of ozone
- B) It reduces the Earth's surface albedo
- C) It releases stored carbon from biomass and soil**
- D) It creates excess sulfur dioxide

20. What does the 'Global Warming Potential' (GWP) of a gas measure?

- A) The total amount of the gas in the atmosphere
- B) Its ability to trap heat relative to CO₂ over a specific time**
- C) Its chemical toxicity
- D) The speed at which it degrades in the stratosphere

21. Which of these is a confirmed impact of ocean warming on marine ecosystems?

- A) Increased frequency of coral bleaching**
- B) Enhanced growth of all fish species
- C) Increased salinity in deep-sea trenches
- D) Faster ice shelf formation

22. What is the 'Greenhouse Effect' a natural requirement for?

- A) Maintaining temperatures suitable for life on Earth**
- B) Preventing the formation of clouds
- C) Filtering ultraviolet radiation
- D) Increasing atmospheric oxygen levels

23. What are Milankovitch cycles known to influence?

- A) The intensity of current human-driven warming
- B) Long-term natural cycles in Earth's climate**
- C) The rate of photosynthesis
- D) The concentration of methane in the troposphere

24. Which sector is the largest contributor to global greenhouse gas emissions?

- A) Transportation
- B) Energy production**
- C) Waste
- D) Agriculture

25. What is the primary component of 'black carbon' aerosols?

- A) Soot from incomplete combustion**
- B) Sulfur particles
- C) Water vapor
- D) Nitrogen oxides