

Space-Based Climatology and Planetary Atmospheres

Climatology · Answer Key · 25 Questions

1. Which planet in our solar system has a runaway greenhouse effect resulting in surface temperatures hot enough to melt lead?

- A) Mars
- B) Venus**
- C) Mercury
- D) Jupiter

2. The Great Red Spot is a persistent high-pressure storm located on which planet?

- A) Saturn
- B) Neptune
- C) Jupiter**
- D) Uranus

3. What is the primary component of the atmosphere on Mars?

- A) Nitrogen
- B) Oxygen
- C) Carbon Dioxide**
- D) Argon

4. Which gas, present in high concentrations in Neptune's atmosphere, gives the planet its distinct blue color?

- A) Methane**
- B) Helium
- C) Hydrogen
- D) Neon

5. Which moon of Saturn is known for having a thick, nitrogen-rich atmosphere and liquid methane lakes?

- A) Enceladus
- B) Titan**
- C) Mimas
- D) Rhea

6. What is the primary cause of the extreme seasonal temperature variations on Uranus compared to other planets?

- A) Its distance from the Sun
- B) Its axial tilt of 98 degrees**
- C) Its rapid orbital velocity
- D) The lack of an atmosphere

7. The 'Solar Wind' consists primarily of which particles flowing out from the Sun?

- A) Protons and electrons**
- B) Neutrons and alpha particles
- C) Gamma rays
- D) X-rays

8. Which planet has an atmosphere composed mainly of molecular hydrogen and helium, similar to the Sun?

- A) Mars
- B) Earth
- C) Jupiter**
- D) Venus

9. The 'Milankovitch cycles' describe the collective effects of changes in the Earth's movements on its climate; which of these is NOT one of those cycles?

- A) Eccentricity
- B) Obliquity
- C) Precession
- D) Supernova irradiance**

10. Which celestial body is known to have 'cryovolcanoes' that eject water, ammonia, or methane instead of molten rock?

- A) Venus
- B) Europa**
- C) Mars
- D) Mercury

11. The exosphere is the outermost layer of Earth's atmosphere, but what is its primary characteristic?

- A) It contains the ozone layer
- B) It is where weather occurs
- C) Particles are so far apart they can travel hundreds of kilometers without colliding**
- D) It has the highest density of oxygen

12. What effect does the solar cycle's 11-year period of solar activity fluctuation have on Earth's upper atmosphere?

- A) It changes the chemical composition of the troposphere
- B) It causes expansion and contraction of the thermosphere**
- C) It shifts the tectonic plates
- D) It reverses the Earth's magnetic field

13. Which planet is characterized by supersonic winds reaching up to 2,100 kilometers per hour?

A) Neptune

B) Mars

C) Saturn

D) Venus

14. What is the term for the boundary where the Sun's solar wind is stopped by the interstellar medium?

A) The Heliosphere

B) The Heliopause

C) The Oort Cloud

D) The Asteroid Belt

15. Which planetary atmosphere is significantly thinned by the lack of a strong global magnetic field to protect it from solar wind stripping?

A) Venus

B) Jupiter

C) Mars

D) Neptune

16. The 'aurora borealis' and 'aurora australis' are caused by the interaction of solar wind with which part of Earth's environment?

A) The magnetosphere

B) The lithosphere

C) The stratosphere

D) The mesosphere

17. On Venus, 'acid rain' occurs, but the droplets are composed of what substance?

A) Hydrochloric acid

B) Sulfuric acid

C) Nitric acid

D) Acetic acid

18. Which planet's atmosphere contains 'diamond rain' believed to form due to high pressure and temperature in its interior?

A) Neptune

B) Mars

C) Mercury

D) Venus

19. What phenomenon occurs when a planet passes directly between its star and an observer, allowing scientists to study the planet's atmospheric composition via light absorption?

A) Transit spectroscopy

- B) Planetary occultation
- C) Radiative forcing
- D) Limb darkening

20. The Moon has virtually no atmosphere; what is the primary reason for this?

A) It is too cold

B) Its low gravity cannot retain an atmosphere

- C) It is too close to the Sun
- D) It lacks volcanoes

21. Which of the following layers of Earth's atmosphere contains the majority of the planet's water vapor and is where weather occurs?

A) Stratosphere

B) Mesosphere

C) Troposphere

D) Thermosphere

22. What is the 'Goldilocks Zone' in climatology and astronomy?

A) The region around a star where liquid water can exist on a planet's surface

- B) The area of space between two galaxies
- C) The region where solar radiation is zero
- D) The zone of highest asteroid density

23. Mercury's atmosphere is extremely thin, consisting of atoms blasted off the surface by solar wind; this is technically referred to as what?

A) Exosphere

- B) Ionosphere
- C) Troposphere
- D) Magnetosphere

24. Which gas, when released into Earth's stratosphere, was historically responsible for the depletion of the ozone layer?

A) Chlorofluorocarbons (CFCs)

- B) Methane
- C) Carbon dioxide
- D) Water vapor

25. Jupiter's intense magnetic field creates an environment that traps high-energy particles, forming what around the planet?

A) Radiation belts

B) Ice rings

C) Carbon clouds

D) Oxygen shells