

Advanced Astrophysics and Planetary Science Quiz

Physical Science · Answer Key · 15 Questions

1. Which specific spectroscopic signature indicates the presence of an M-dwarf star's atmospheric composition through the detection of titanium oxide?

- A) TiO bands**
- B) He-II lines
- C) Balmer series
- D) Paschen alpha

2. What is the precise value of the Chandrasekhar limit, the maximum mass a stable white dwarf star can attain?

- A) 1.2 solar masses
- B) 1.44 solar masses**
- C) 2.1 solar masses
- D) 3.0 solar masses

3. In orbital mechanics, what is the name of the point where a small body's orbit is at its greatest distance from the barycenter of the system?

- A) Periapsis
- B) Apocenter**
- C) Nodes
- D) Inclination

4. Which moon of Jupiter is geologically active and displays the most intense volcanic activity in the solar system due to tidal heating?

- A) Europa
- B) Ganymede
- C) Callisto
- D) Io**

5. What is the physical process responsible for the high-energy gamma-ray bursts observed from distant galaxies?

- A) Stellar collapse to a black hole**
- B) Supernova type Ia
- C) Thermal emission
- D) Bremsstrahlung

6. The cosmic microwave background radiation corresponds to a blackbody spectrum with a temperature of approximately how many Kelvin?

- A) 1.2 K
- B) 2.7 K**
- C) 5.5 K
- D) 10.3 K

7. Which chemical element is primarily produced in the core of a star through the triple-alpha process?

- A) Carbon**
- B) Neon
- C) Magnesium
- D) Silicon

8. What is the Roche limit defined as in the context of celestial mechanics?

- A) Distance where a moon breaks up**
- B) Orbital resonance threshold
- C) Light speed limit for gravity
- D) Maximum size of an asteroid

9. Which astronomical object is the primary source of the 'Great Attractor' gravitational anomaly?

- A) Norma Cluster**
- B) Virgo Cluster
- C) Coma Cluster
- D) Perseus Cluster

10. What is the approximate age of the universe according to the standard Lambda-CDM cosmological model?

- A) 12.4 billion years
- B) 13.8 billion years**
- C) 15.2 billion years
- D) 16.7 billion years

11. Which gas giant planet in our solar system has an axial tilt of approximately 98 degrees?

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

12. What defines the 'Goldilocks zone' (circumstellar habitable zone) around a star?

A) Presence of magnetic shielding

B) Liquid water stability

C) Atmospheric pressure

D) Escape velocity

13. Which subatomic particle is emitted in vast quantities during a core-collapse supernova, carrying away most of the released energy?

A) Neutrino

B) Muon

C) Gluon

D) Positron

14. What is the primary constituent of the atmosphere of Titan, the largest moon of Saturn?

A) Oxygen

B) Nitrogen

C) Methane

D) Carbon Dioxide

15. What term describes the apparent change in frequency of light from a galaxy moving away from an observer at a significant fraction of the speed of light?

A) Gravitational lensing

B) Cosmological redshift

C) Proper motion

D) Stellar parallax