

Cosmic Physical Science Challenge

Physical Science · Answer Key · 15 Questions

1. Which specific atmospheric layer of the Sun is responsible for the emission of the majority of the solar radiation we detect on Earth?

- A) Corona
- B) Photosphere**
- C) Chromosphere
- D) Transition Region

2. What is the physical process that prevents a white dwarf star from collapsing under its own gravity, creating a state of degeneracy pressure?

- A) Neutron degeneracy
- B) Electron degeneracy**
- C) Thermal expansion
- D) Nuclear fusion

3. The Chandrasekhar limit, which dictates the maximum mass of a stable white dwarf, is approximately how many solar masses?

- A) 0.44
- B) 1.44**
- C) 2.44
- D) 3.44

4. Which moon in the solar system exhibits a subsurface ocean beneath an icy crust, maintained by tidal heating from its parent planet Jupiter?

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

5. In the context of orbital mechanics, what is the 'Hill sphere' of a planet defined as?

- A) The region where tidal forces exceed planetary gravity
- B) The region where a planet's gravity dominates the attraction of satellites**
- C) The boundary of the planet's magnetosphere
- D) The point where solar wind pressure equals planetary gravity

6. What is the primary chemical composition of the atmosphere of Venus?

- A) Nitrogen and Oxygen
- B) Carbon Dioxide and Nitrogen**
- C) Hydrogen and Helium
- D) Methane and Ammonia

7. The 'Great Red Spot' on Jupiter is a persistent high-pressure storm. What is its approximate lifespan based on historical observation?

- A) 50 years
- B) 100 years
- C) 300+ years**
- D) 1000+ years

8. What defines the 'Roche limit' for a celestial body?

- A) The maximum density of a rocky planet
- B) The distance within which a celestial body disintegrates due to tidal forces**
- C) The escape velocity from a black hole
- D) The radius of a neutron star

9. Which galaxy is the largest member of the Local Group in terms of diameter?

- A) Milky Way
- B) Triangulum Galaxy
- C) Andromeda Galaxy**
- D) Large Magellanic Cloud

10. What type of radiation is primarily associated with the 'Hawking radiation' predicted to be emitted by black holes?

- A) X-ray
- B) Gamma-ray
- C) Thermal/Blackbody**
- D) Infrared

11. What is the orbital resonance ratio between Neptune and Pluto that prevents them from colliding despite their intersecting orbits?

- A) 1:1
- B) 2:3**
- C) 3:4
- D) 5:2

12. Which element is the primary product of the triple-alpha process occurring in the cores of red giant stars?

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

13. What is the term for the hypothetical spherical region of icy objects surrounding the Solar System at distances up to 100,000 AU?

- A) Kuiper Belt
- B) Asteroid Belt
- C) Oort Cloud**
- D) Scattered Disc

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

- A) 0.27 K
- B) 2.7 K**
- C) 27 K
- D) 270 K

15. Which celestial body has the highest surface gravity in the Solar System?

- A) Jupiter
- B) The Sun**
- C) Saturn
- D) Neptune