

Advanced Aerospace and Planetary Science

Aerospace Engineering · Answer Key · 10 Questions

1. Which specific atmospheric phenomenon prevents the Parker Solar Probe from being destroyed by the Sun's intense heat?

- A) The Leidenfrost effect
- B) The solar wind's magnetic pressure
- C) The heat shield's carbon-carbon composite design**
- D) The probe's reflective liquid-nitrogen cooling system

2. What is the specific orbital velocity required for a spacecraft to maintain a stable circular orbit at an altitude of 300km above Earth?

- A) Approximately 7.7 km/s**
- B) Approximately 11.2 km/s
- C) Approximately 5.2 km/s
- D) Approximately 9.8 km/s

3. The 'Slingshot effect' or gravity assist maneuver relies on which fundamental physical principle to increase a spacecraft's velocity?

- A) Conservation of angular momentum
- B) Conservation of energy and momentum in a non-inertial frame**
- C) Centripetal force amplification
- D) Thermal expansion of propulsion systems

4. Which spacecraft became the first human-made object to enter interstellar space, officially crossing the heliopause in 2012?

- A) Voyager 2
- B) Pioneer 10
- C) Voyager 1**
- D) New Horizons

5. What is the primary function of a reaction wheel in a spacecraft's Attitude Determination and Control System (ADCS)?

- A) To generate thrust for orbital maneuvering
- B) To manage thermal dissipation
- C) To provide attitude control via conservation of angular momentum**
- D) To dampen vibrational frequencies from the launch vehicle

6. Which planet in our solar system possesses a retrograde rotation, meaning it rotates in the opposite direction of its orbit?

- A) Uranus
- B) Venus**
- C) Neptune
- D) Mars

7. What is the name of the region between Mars and Jupiter where the majority of the solar system's asteroids are located?

- A) The Kuiper Belt
- B) The Oort Cloud
- C) The Asteroid Belt**
- D) The Lagrange Point 4

8. The 'Hohmann transfer orbit' is an elliptical path used to transfer a spacecraft between two orbits of different altitudes with what property?

- A) Maximum possible time duration
- B) Minimum fuel consumption**
- C) Constant acceleration
- D) Maximum orbital inclination

9. What is the Roche limit in orbital mechanics?

- A) The minimum distance a moon can be from a planet before tidal forces cause it to break apart**
- B) The maximum velocity an object can achieve using a nuclear thermal rocket
- C) The point where solar radiation pressure exceeds gravitational pull
- D) The boundary where a spacecraft enters a planet's magnetosphere

10. Which element is the primary component of the upper atmosphere of Titan, the largest moon of Saturn?

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