

## StellarXplorers IV Semifinal Round (Semi) Quiz

### Answer Key

1. The art and science of designing and building systems that deliver capabilities to meet the user's needs is called \_\_\_\_\_. [Section 1.2]
  - a. **Systems Engineering**
  - b. Project Management
  - c. Mission Control
  - d. Flight Control
2. Who is best known for his observational astronomy, including building an observatory called Uraniborg on the island of Hven in the Danish Sound? [Section 2.1]
  - a. Aristotle
  - b. Nicolaus Copernicus
  - c. **Tycho Brahe**
  - d. Johannes Kepler
3. This American satellite was launched on August 12, 1960. It was an aluminum-coated plastic sphere which passively reflected voice and picture signals. It demonstrated the feasibility of satellite communications. [Section 2.2]
  - a. **Echo I**
  - b. Vanguard
  - c. Telstar
  - d. Explorer
4. NASA awards astronaut wings for any individual who attains the following height above Earth. [Section 3.1]
  - a. 50 km
  - b. **80 km**
  - c. 100 km
  - d. 130 km
5. What does sputtering do to a spacecraft over a long period of time? [Section 3.2]
  - a. **Damage the spacecraft's thermal coating**
  - b. Prevents the spacecraft from sending signals back to the ground station
  - c. Prevents the spacecraft from maneuvering
  - d. Damages the spacecraft's electronics

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6. Object A has a mass of 2 kg. and is traveling in a straight line at 100 km/s. Object B has a mass of 0.5 kg. and is traveling in a straight line at 500 km/s. Which object has more linear momentum? [Section 4.2]
- Object A
  - Object B
  - They have the same momentum
  - Need more information to determine which has more momentum
7. A person is riding on a swing. At what point will the Total Mechanical Energy be the greatest? [Section 4.3]
- At the swing's highest point
  - At the swing's lowest point
  - At a point somewhere between the highest and lowest point
  - The Total Mechanical Energy is a constant
8. Which of the six Classical Orbital Elements (COE) describes the "twist" or "swivel" of an orbit? [Section 5.1]
- Eccentricity ( $e$ )
  - Semi-Major Axis ( $a$ )
  - True Anomaly ( $v$ )
  - Right Ascension of the Ascending Node ( $\Omega$ )
9. What type of orbit has an eccentricity of 1 ( $e = 1$ )? [Section 5.1]
- Circular
  - Elliptical
  - Parabolic
  - Hyperbolic
10. A satellite is in a highly elliptical orbit with a Period of 12 hours. In what type of orbit is the satellite? [Section 5.1]
- Sun Synchronous
  - Semi-Synchronous
  - Molniya
  - Geostationary

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11. Which of these Electromagnetic radiation bands has the lowest frequency (f)? [Section 12.1]
- X-Ray
  - Visible Light
  - Infrared
  - Radio
12. For effective communication, the signal-to-noise ratio (S/N) must be greater than or equal to 1.0. To improve the signal-to-noise ratio, we could \_\_\_\_\_. [Section 13.1]
- Decrease signal strength
  - Increase the Data Rate (R)
  - Decrease the receiver's noise temperature (T)
  - All of the other three answers
13. Solar *cell efficiency*,  $\eta$ , is the percentage of incident solar energy that converts to electrical energy. Gallium-arsenide solar cells typically have a solar cell efficiency of about \_\_\_\_\_. [Section 13.2]
- 15%
  - 28%
  - 50%
  - 75%
14. As the amount of internal heat and the urgency to remove it increases, an active thermal control system is needed. An example is (are) \_\_\_\_\_. [Section 13.3]
- A heat-conducting metal connected to a radiator
  - Multi-Layer Insulation (MLI)
  - Heat pipes
  - All of the other three answers

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15. For long duration space missions, astronauts need an adequate volume for space to live in. NASA has done extensive analysis on this issue to determine the required volume of living space per astronaut which varies with the mission duration. Based on NASA's analysis, what is the Optimum for the Total Habitable Module Volume (living space) per Crewmember for a 6-month space mission? [Section 13.4]
- 5 m<sup>3</sup> per crewmember
  - 10 m<sup>3</sup> per crewmember
  - 15 m<sup>3</sup> per crewmember
  - 19 m<sup>3</sup> per crewmember
16. When a load is applied to a material, it will deform (stretch or shrink) a certain amount, depending on load. During the "elastic region", when the load is removed, the material will return to the original shape the material. During this phase, the relationship between stress and strain is linear, until it reaches a point called the \_\_\_\_\_ . [Section 13.5]
- Proportional Limit
  - Yield Point
  - Ultimate Tensile Strength
  - Failure Point
17. Kennedy Space Center is located at a latitude ( $L_0$ ) of  $28.5^\circ$ . A satellite's planned orbit has an inclination ( $i$ ) of  $23^\circ$ . How many launch windows are available each day? [Section 9.2]
- 0
  - 1
  - 2
  - 4
18. The velocity needed by the launch vehicle to get the launch vehicle from the launch site to orbit is called \_\_\_\_\_. [Section 9.3]
- Burnout Velocity ( $V_{bo}$ )
  - Design Velocity ( $\Delta V_{design}$ )
  - Velocity Needed ( $\Delta V_{needed}$ )
  - Velocity Launch Site ( $V_{launch\ site}$ )

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19. Electrostatic rockets use electric and magnetic fields to accelerate charged particles in a propellant. To create a more efficient electrostatic rocket, we need to increase the exhaust velocity. This can be accomplished with

\_\_\_\_\_ . [Section 14.1]

- a. A higher charge density
  - b. A higher mass flow rate
  - c. **A stronger electric field**
  - d. All of the other three answers
20. One type of electrostatic thruster applies a radial magnetic field to a conducting plasma and is called a \_\_\_\_\_ . [Section 14.2]

- a. Resistojet
- b. **Hall Effect Thruster**
- c. Pulsed Plasma Thruster
- d. Arcjet