



Space Station Stumpers

A Quiz on Space Station Alpha's Power Systems

Time

15 minutes

Questions

1. What are two ways solar storms can affect the space station's electrical systems? **A: They can affect solar arrays (PV cells become less efficient at converting photons to electricity); and/or disrupt the computer systems ("flip their bits").**
2. What is the critical percentage for total power reduction on the space station? **A: 50% reduction in total power.**
3. What is one thing the astronauts can do to conserve power during a solar storm? **A: turn down power load of non-vital equipment.**
4. Who created the TV series *Star Trek*? **A. Gene Roddenberry**
5. What was the source of electrical power on the Enterprise? **A. Dilithium crystals.**
6. Is this source fictional or real? **A: fictional**
7. What is the word used to describe how earth-bound electrical power plants create electricity? **A. Induction or induce: Spinning electromagnets induce electricity in power lines.**
8. **Who discovered the photoelectric effect? A. Edmund Becquerel**
9. What is the photoelectric effect? **A. Light photons hitting a metal cause electrons to be released from the metal's atoms.**
10. Who explained what actually happens during the photoelectric effect? **A. Albert Einstein**
11. What is the primary substance used in photovoltaic arrays? **A. Silicon crystals.**
12. What does "doping" mean? **A. Injecting impurities into pure crystals of silicon, either boron or phosphorous molecules.**
13. What does "emf" mean? **A. electromotive force.**
14. How many volts of emf are needed to service a typical house in the US? **A. 120 or 240 volts.**
15. How large will the PV arrays on the space station be when complete? **A. 2/3 of a football field, or about 32,000 square feet.**
16. Batteries employ what type of process to create free electrons? **A. A chemical process.**
17. What type of batteries are used on the space station? **A. Nickel-Hydrogen batteries.**
18. What is the name for that period of time in which the space station is in the shadow of the Earth? **A. Eclipse period**
19. What is the name of that period of time in which the space station is in full sunlight? **A. Insolation period**
20. What percentage of the space station batteries' electrical power is depleted during one orbital period of eclipse? **A. 35%**
21. If they are not recharged by the solar arrays, how many orbits can the space station make before the batteries run down? **A. 35% depletion per 1/3 orbit (1/3 orbit = about 30 minutes) or just under one orbit (85.7 minutes)**
22. What is electricity? **A. electrons flowing in a wire/conductor.**
23. What metals make good conductors? **A. Gold, silver, copper, zinc, steel**
24. What substances make good insulators? **A. rubber, glass, air, wood**
25. Electrons flow from the positive pole of a battery through a conductor to the negative pole. True or false? **A. false – negative to positive. Electrons have a negative charge and thus gather at the negative pole and flow through a conductor towards the positive pole.**
26. What three components are needed to make a circuit? **A. a conductor (which may include a switch), a load, a power source (emf)**
27. Does a washing machine contain a part of an electrical circuit when turned on? Yes or No? **A. Yes.**
28. The power required by an electrical device to do its "work" is measured in terms of what? **A. Watts.**