

## KNOWLEDGE PROBE 2: ALTERNATIVE POWER SOURCES

### Solar Cells

#### Learning Objectives

1. Describe solar cell operation and specifications
  2. Identify the components of a solar cell.
  3. Identify solar cell applications.
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1. Another name for solar cell is
    - a. Photon battery
    - b. Photoresistive cell
    - c. Photovoltaic cell
    - d. Solar battery
  2. A common loaded output from a solar cell is about
    - a. 0.1 volt
    - b. 0.5 volt
    - c. 3.3 volts
    - d. 12 volts
  3. Most solar cells are made of
    - a. Aluminum
    - b. Germanium
    - c. Selenium
    - d. Silicon
  4. The basic structure of a common solar cell is a
    - a. Bipolar transistor
    - b. Diode
    - c. MOSFET
    - d. Resistor
  5. The voltage and current capability of a solar cell is dependent upon
    - a. Amount of light reaching the cell and cell surface area
    - b. The material from which the cell is made and cell surface area
    - c. Amount of light reaching the cell and the material from which the cell is made
  6. Light intensity is most often expressed in
    - a. Angstroms
    - b. Foot-candles
    - c. Lumens
    - d. Volts/square meter



7. The frequency range where most solar cells are the most sensitive to light is
  - a. 400 to 700 nm
  - b. 600 to 800 nm
  - c. 910 to 1310 nm
  - d. Anything over 1500 nm
8. Solar cells are sensitive to infrared.
  - a. True
  - b. False
9. What is the typical short circuit current for a typical small solar cell?
  - a. 10 mA
  - b. 20 mA
  - c. 40 mA
  - d. 300 mA
10. A solar cell has an open circuit voltage of 0.45 volts and a short circuit current of 35 mA. What is its internal resistance?
  - a. 4.3 ohms
  - b. 6.2 ohms
  - c. 9.8 ohms
  - d. 12.9 ohms
11. The most common solar cell application is
  - a. Charging secondary batteries
  - b. Powering cell phones
  - c. Powering satellites
  - d. Powering telemetry units
12. How many solar cells would it take to make a battery with sufficient voltage to recharge a 7.5 volt secondary battery? Assume a cell output of 0.5 volts.
  - a. 11 to 13
  - b. 15 to 17
  - c. 22 to 24
  - d. 33 to 35
13. What happens if the solar battery voltage drops below the voltage of the battery being charged?
  - a. Charging ceases
  - b. Nothing
  - c. Solar cells are forward biased by the battery and short it out causing a discharge
  - d. Solar panel and battery are destroyed



14. What is used to convert the DC power from a solar panel into 120 volts 60 Hz in a home solar system?
  - a. DC-DC converter
  - b. Inverter
  - c. Power supply
  - d. Regulator
  
15. Solar cells may be tested with an artificial light from a bulb.
  - a. True
  - b. False
  
16. Shorting a solar cell with light shining on it will destroy it.
  - a. True
  - b. False
  
17. Home solar power systems are more economical today than being tied to the standard electrical grid.
  - a. True
  - b. False
  
18. What is the optimum direction for pointing a solar panel at the sun?
  - a. East
  - b. North
  - c. South
  - d. West
  
19. How can a solar panel always be pointed at the sun?
  - a. Hand adjust the panel as the sun moves
  - b. It cannot
  - c. Place the panel on a rotating wheel
  - d. Use a feedback motor control system on the panel
  
20. What prevents a battery from discharging into the solar panel when the solar panel voltage drops below the battery voltage?
  - a. Build in a voltage regulator
  - b. Connect a diode in series with the battery and solar panel
  - c. Use a series current limiting resistor
  - d. Visually monitor the voltage at all times and disconnect when the condition occurs