

***** EXAMINATION *****

**OPPORTUNITIES AND CHALLENGES FOR DEVELOPMENT OF A
MATURE CONCENTRATING PHOTOVOLTAIC POWER INDUSTRY**

1. **The current record efficiency for a 3-junction cell is:**
 - a) 20.8%
 - b) 40.8%
 - c) 60.8%
 - d) 80.8%

2. **In the coming years, multijunction cell efficiencies**
 - a) will have the potential to approach 30%
 - b) will have the potential to approach 40%
 - c) will have the potential to approach 50%
 - d) will have the potential to approach 60%

3. **Cumulative investment in CPV in 2010 is now**
 - a) on the order of \$1 billion
 - b) on the order of \$2 billion
 - c) on the order of \$5 billion
 - d) on the order of \$8 billion

4. **An advantage of the CPV approach is the reduced need for:**
 - a) solar power
 - b) capital investment
 - c) large factories
 - d) none of the above

5. **Types of diagnostics include:**
 - a) low short-circuit current
 - b) low open-circuit voltage
 - c) low fill factor for string of cells
 - d) all of the above

6. **The details of high volume manufacturing will be key to**
 - a) cost reduction
 - b) productivity
 - c) production loss
 - d) cost inflation

7. **A key concern of all of the CPV companies has been the:**
- a) availability of labor
 - b) availability of materials
 - c) availability of concentrator cells
 - d) availability of bi-concentrator cells
8. **A number of companies are creating cells with efficiencies:**
- a) greater than 10%
 - b) greater than 15%
 - c) greater than 30%
 - d) greater than 45%
9. **Cell efficiencies have been increasing at a rate of about:**
- a) 1% in recent years
 - b) 3% in recent years
 - c) 5% in recent years
 - d) 7% in recent years
10. **Lower costs will need to be achieved to be competitive in:**
- a) production
 - b) business
 - c) job security
 - d) All of the above
11. **In the last decade germanium wafers have been supplied by:**
- a) Biocore
 - b) Umicore
 - c) Tricore
 - d) Sincore
12. **Germanium is obtained as a by-product of:**
- a) zinc refining
 - b) coal burning
 - c) diamond mining
 - d) both a and b
13. **One of the world's largest germanium sources is**
- a) China
 - b) Australia
 - c) the United States
 - d) Europe
14. **Solar cells must be attached to a:**
- a) heat cell
 - b) heater
 - c) heat sink
 - d) none of the above

15. **Between flat-rate PV and high concentration PV falls**
- a) high risk PV
 - b) low-concentration PV
 - c) low risk PV
 - d) all of the above
16. **The primary concerns of optics are related to:**
- a) reliability
 - b) costs
 - c) productivity
 - d) material shortage
17. **Cell efficiencies are expected to increase toward:**
- a) 15%-20%
 - b) 35%-40%
 - c) 55%-60%
 - d) 75%-80%
18. **A claims of an efficiency of 39% has been claimed by**
- a) NREL
 - b) Sandia Laboratories
 - c) Emcore
 - d) none of the above
19. **Many CPV companies are considering:**
- a) horizontal integration
 - b) vertical integration
 - c) linear integration
 - d) parallel integration
20. **The direct solar resource is strong in southern:**
- a) Spain
 - b) Mexico
 - c) China
 - d) Europe

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