

Unit 6 - Week 4: Fundamentals of Photovoltaic Conversion

Course outline
How does an NPTEL online course work?
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<input type="radio"/> Lec 9: Fundamentals of PV cells
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Assignment 4

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-10-14, 23:59 IST.

- 1) The optimum wavelength of light (in μm) for photovoltaic generation of a Calcium sulfide (CdS) cell having Band gap of 2.42 eV will be 1 point
- a. 0.512
 b. 0.846
 c. 0.114
 d. 1.429

No, the answer is incorrect.
Score: 0

Accepted Answers:
a. 0.512

- 2) A silicon crystal is doped with an impurity from the 5th group of concentration 10^{15}cm^{-3} . The effective density of states in the conduction band is $2.82 \times 10^{22}\text{cm}^{-3}$ and Boltzmann constant is 8.62×10^{-5} eV per Kelvin. If the band gap for silicon is 1.12 eV, the shift of Fermi energy level (in eV) with the conduction band at the temperature of 27 degree Celcius is 0 points

- a. 0.785
 b. 0.285
 c. 0.550
 d. 0.985

No, the answer is incorrect.
Score: 0

Accepted Answers:
b. 0.285

- 3) The region where the electrons and holes diffused across the junction is called 1 point
- a. P-n junction
 b. Depletion region
 c. Augmentation region
 d. Band gap

No, the answer is incorrect.
Score: 0

Accepted Answers:
b. Depletion region

- 4) The amount of photo generated current increases slightly with increase in 1 point
- a. Temperature
 b. Photons
 c. Diode current
 d. Shunt current

No, the answer is incorrect.
Score: 0

Accepted Answers:
a. Temperature

- 5) The maximum current provided by the PV array when the output connectors are shorted together is called 1 point
- a. Shunt current
 b. Short circuit current
 c. Light generated current
 d. None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
b. Short circuit current

- 6) High values of short circuit current is obtainable with _____ band gap material, while high values of open circuit voltage is possible with _____ band gap material. 1 point
- a. low, low
 b. high, low
 c. high, high
 d. low, high

No, the answer is incorrect.
Score: 0

Accepted Answers:
d. low, high

- 7) A PV module composed of 36 solar cells occupied a total area of 0.605 sq. meter with each pseudo solar cell having an area of 0.015 sq. meter. The packing factor of the module is 1 point
- a. 0.442
 b. 0.568
 c. 0.892
 d. 0.604

No, the answer is incorrect.
Score: 0

Accepted Answers:
c. 0.892

Common data for Q8 – Q10

A solar cell comprises of the following data:

- Open circuit voltage, $V_{oc} = 0.24$ V
- Short circuit current, $I_{sc} = 10.24$ mA
- Maximum voltage, $V_{max} = 0.14$ V
- Maximum current, $I_{max} = 6.5$ mA
- Area of the cell = 4 sq. cm

- 8) The fill factor of the cell is 1 point
- a. 0.37
 b. 0.25
 c. 0.42
 d. 0.20

No, the answer is incorrect.
Score: 0

Accepted Answers:
a. 0.37

- 9) The maximum power (mWatt) attained by the cell is 1 point
- a. 0.84
 b. 0.91
 c. 0.76
 d. 1.02

No, the answer is incorrect.
Score: 0

Accepted Answers:
b. 0.91

- 10) The solar cell efficiency (percentage) at an intensity of 200 Watt per sq. meter is 1 point
- a. 2.05
 b. 3.40
 c. 1.13
 d. 2.35

No, the answer is incorrect.
Score: 0

Accepted Answers:
c. 1.13

Common data for Q11 and Q12

PV source supplying power to a load whose load line intersects I-V characteristics at 9 V and 5 A. The maximum current and voltage are measured to be 5 A and 23 V. If the cost of the MPPT is Rs.3500 and the cost of electricity may assumed as Rs.6 per unit. Take the efficiency of the MPPT to be 95%.

- 11) If the MPPT is interposed between the source and the load, the additional power (Watt) gain will be 1 point
- a. 48.5
 b. 64.2
 c. 59.8
 d. 74.9

No, the answer is incorrect.
Score: 0

Accepted Answers:
b. 64.2

- 12) The time (hours) required by the system to operate in order to recover the cost of MPPT will be 1 point
- a. 10135
 b. 7526
 c. 8865
 d. 9080

No, the answer is incorrect.
Score: 0

Accepted Answers:
d. 9080

Common data for Q13 - Q15

The dark current density for a silicon solar cell at 40 degree Celcius is 3.6×10^{-8} Ampere per sq. meter and the short current density is 220 Ampere per sq. meter. Take the charge of electron to be 1.602×10^{-19} coulombs and Boltzmann constant is 1.381×10^{-23} Joule per Kelvin.

- 13) The maximum power output per unit cell area (in Watt per sq. meter) is 1 point
- a. 109.85
 b. 95.2
 c. 120.45
 d. 125.03

No, the answer is incorrect.
Score: 0

Accepted Answers:
a. 109.85

- 14) If the global solar radiation incident on the cell is 850 Watt per sq. meter, the conversion efficiency (in percentage) of the cell is 1 point
- a. 6.42
 b. 25.12
 c. 12.9
 d. 20.6

No, the answer is incorrect.
Score: 0

Accepted Answers:
c. 12.9

- 15) The cell area (in sq. meter) required to produce an output of 36 W is 1 point
- a. 0.3277
 b. 0.895
 c. 0.148
 d. 1.285

No, the answer is incorrect.
Score: 0

Accepted Answers:
a. 0.3277