Unit 9 - Week 8 : Third Generation Solar Cells

Assignment 8

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

Due on 2020-03-25, 23:59 IST.

1) In CIGS solar cells, what is the starting source of sulphur for window layer deposition? *1 point*

- $CdSO_4$
- H_2S
- $SC(NH_2)_2$
- S

No, the answer is incorrect.
Score: 0
Accepted Answers:
$SC(NH_2)_2$

2) $CuInSe_2$ (E_g=1.01 eV) is used as an absorber layer in solar cells. It is doped with Ga which occupies In site. For atomic ratio of In:Ga = 3:1, what is likely to happen? *1 point*

- Band gap will increase to 1.04eV.
- Band gap will decrease to 0.95 eV.
- Crystal structure changes.
- Short circuit current will decrease.

No, the answer is incorrect.
Score: 0
Accepted Answers:
Band gap will increase to 1.04eV.
Short circuit current will decrease.

3) In CIGS solar cells, which of the following defects are responsible for increased recombination: *1 point*

- Copper vacancies
- Indium atoms substituting copper sites
- Selenium vacancies
- Copper atom substituting indium sites

No, the answer is incorrect.
Score: 0
Accepted Answers:
Copper atom substituting indium sites

4) CIGS solar cells use soda lime glass as substrates. What could the possible reasons? *1 point*

- Soda lime glass suppresses the impurity formation in CIGS.
- Na in Soda lime glass substrates improves surface passivation of the films.
- Soda lime glass substrates improve crystallographic texture of CIGS
- Soda lime glass substrates reduce thermal stresses in CIGS films.

No, the answer is incorrect.
Score: 0
Accepted Answers:
Na in Soda lime glass substrates improves surface passivation of the films.
Soda lime glass substrates reduce thermal stresses in CIGS films.

5) What are the oxides that can be used as transparent electrodes in solar cells? *1 point*

- Pure zinc oxide
- Indium doped Tin Oxide
- Aluminum doped Zinc Oxide
- Pure Tin Oxide

No, the answer is incorrect.
Score: 0
Accepted Answers:
Indium doped Tin Oxide
Aluminum doped Zinc Oxide

6) Which of the following factors play an important role in improving efficiency of the Organic solar cells? *1 point*

- Using bulk heterojunction configuration
- High exciton binding energy
- Absorber thickness of the order of 1 micron
- Use of low bandgap polymers

No, the answer is incorrect.
Score: 0
Accepted Answers:
Using bulk heterojunction configuration

7) Which of the following is correct for organic solar cells? *1 point*

- Donor is p-type
- Acceptor is p-type
- Space charge region on donor side is smaller than on the acceptor side
- Acceptor concentration is very large in comparison to donor

No, the answer is incorrect.
Score: 0
Accepted Answers:
Donor is p-type
Space charge region on donor side is smaller than on the acceptor side

8) In comparison to inorganic semiconductor such as Si, Organic semiconductors possess which of the following attributes? *1 point*

- Lower light absorption
- Lower exciton diffusion length
- Lower bandgap
- Lower carrier mobilities

No, the answer is incorrect.
Score: 0
Accepted Answers:
Lower exciton diffusion length
Lower carrier mobilities

9) Performance of DSSC solar cells can be improved by: *1 point*

- Using dyes having broad absorption
- Using a metallic photosensitizer
- Using wide bandgap n-type photosensitizer
- Using counter electrode having lower catalytic activity

No, the answer is incorrect.
Score: 0
Accepted Answers:
Using dyes having broad absorption
Using wide bandgap n-type photosensitizer

10) In a perovskite solar cells, which of the following is correct: *1 point*

- Absorber layer is direct band gap material.
- Exciton diffusion lengths are below 100 nm.
- Absorber layer is 100 nm thick
- Absorber layer is a perovskite-structured material.

No, the answer is incorrect.
Score: 0
Accepted Answers:
Absorber layer is direct band gap material.
Absorber layer is a perovskite-structured material.

11) Which of the following is not strictly true for Dye sensitized solar cells (DSSC): *1 point*

- Highly ionic conductive electrolytes such as NaI, LiI are dissolved in protic solvents like acetonitrile, propylene carbonate.
- Wide band gap materials with high surface area are used as photoelectrodes.
- Polypyridyl compounds of Ruthenium and osmium are used as photosensitizers.
- Photosensitizers used should have wide band gap and high absorption coefficient.

No, the answer is incorrect.
Score: 0
Accepted Answers:
Highly ionic conductive electrolytes such as NaI, LiI are dissolved in protic solvents like acetonitrile, propylene carbonate.

12) In n-i-p structured Perovskite solar cells: *1 point*

- Spiro-oMeTAD acts as an electron transport layer
- Mesoscopic configuration results in better PCE over planar configuration
- TiO_2 is used as electron selective layer
- Al is used a top contact.

No, the answer is incorrect.
Score: 0
Accepted Answers:
Mesoscopic configuration results in better PCE over planar configuration
TiO_2 is used as electron selective layer
Al is used a top contact.

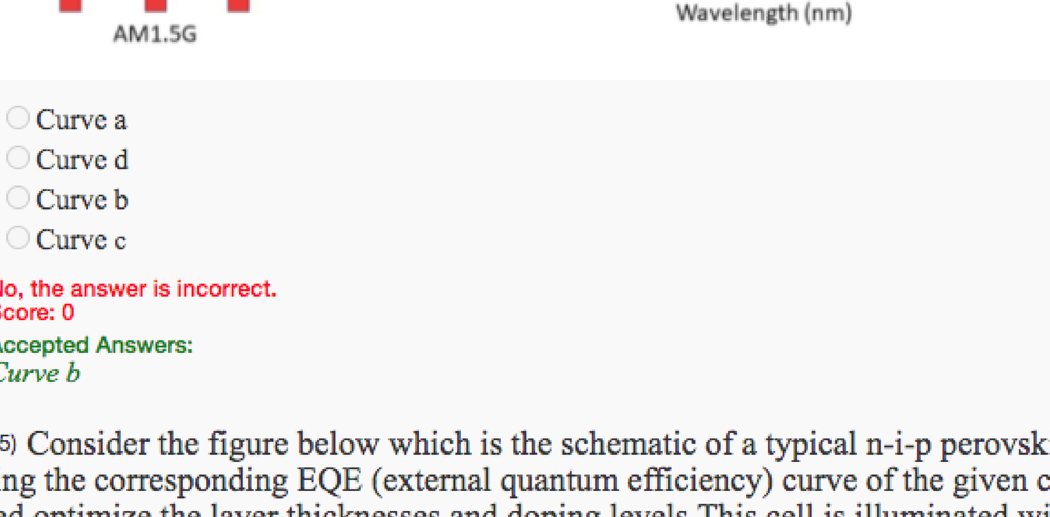
13) What is the correct sequence of processes taking place in Dye sensitized solar cells (DSSC)? *1 point*

- Photon absorption —> excitation of dye molecules —> oxidation of photo sensitizer —> electrical energy generation —> regeneration of dye molecules —> recapture of electrons by electrolyte
- Photon absorption —> oxidation of dye molecules —> excitation of photo sensitizer —> electrical energy generation —> regeneration of dye molecules —> recapture of electrons by electrolyte
- Photon absorption —> excitation of dye molecules —> oxidation of photo sensitizer —> electrical energy generation —> recapture of electrons of dye molecules —> regeneration of dye molecules
- Photon absorption —> excitation of dye molecules —> oxidation of photo sensitizer —> electrical energy generation —> regeneration of dye molecules —> recapture of electrons by photo sensitizer

No, the answer is incorrect.
Score: 0
Accepted Answers:
Photon absorption —> excitation of dye molecules —> oxidation of photo sensitizer —> electrical energy generation —> regeneration of dye molecules —> recapture of electrons by electrolyte

14) Consider the figure below which is the schematic of a typical n-i-p perovskite solar cell with curve labelled (c) being the corresponding EQE (external quantum efficiency) curve of the given cell. For optimization of the device, you need optimize the layer thicknesses and doping levels.This cell is illuminated with AM1.5G irradiation from the transparent conductive oxide (TCO) glass side. Answer the following questions: *1 point*

When thickness of p-type layer is increased then EQE is correctly represented by:



- Curve a
- Curve d
- Curve b
- Curve c

No, the answer is incorrect.
Score: 0
Accepted Answers:
Curve b

15) Consider the figure below which is the schematic of a typical n-i-p perovskite solar cell with curve labelled (c) being the corresponding EQE (external quantum efficiency) curve of the given cell. For optimization of the device, you need optimize the layer thicknesses and doping levels.This cell is illuminated with AM1.5G irradiation from the transparent conductive oxide (TCO) glass side. Answer the following questions: *1 point*

If thickness of n-type layer is reduced, then which curve correctly represents the EQE:

- Curve a
- Curve e
- Curve b
- Curve d

No, the answer is incorrect.
Score: 0
Accepted Answers:
Curve d