Unit 7 - Week 6 : First Generation Solar Cells

Assignment 6

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

Due on 2020-03-11, 23:59 IST.

1) Extracted power from a solar cell can be maximized by: 1 point

- minimizing shunt resistance
- maximizing shunt resistance
- minimize series resistance
- maximizing series resistance

No, the answer is incorrect.
Score: 0
Accepted Answers:
maximizing shunt resistance
minimize series resistance

2) Solar cells having band gap of Eg_1 and Eg_2 (Eg_1>Eg_2) are illuminated by 1 Sun irradiation, then which of the following is expected to be true considering only optical losses? 1 point

- Voc_1<Voc_2
- Voc_2<Voc_1
- J_1>J_2
- J_1<J_2

No, the answer is incorrect.
Score: 0
Accepted Answers:
Voc_2<Voc_1
J_1<J_2

3) What affects the EQE (external quantum efficiency) of a solar cell? 1 point

- band wavelength of irradiation
- absorption coefficient of material
- collection of charge carriers
- incident power density of radiation

No, the answer is incorrect.
Score: 0
Accepted Answers:
band wavelength of irradiation
absorption coefficient of material
collection of charge carriers

4) Which amongst the following are favorable for efficient Si solar cells: 1 point

- Heavily doped base and lightly doped emitter
- Large built-in electric field
- Large diffusion length of minority charge carriers
- Higher optical depth for radiation energy below bandgap of material

No, the answer is incorrect.
Score: 0
Accepted Answers:
Large built-in electric field
Large diffusion length of minority charge carriers

5) For the same level of doping in the silicon solar cells, which of the following is valid? 1 point

- p-type doped base performs better than n-type doped base.
- Minority charge carrier mobility is higher in n type.
- Minority carrier diffusion length is larger in p-type.
- Carrier collection is better in p-type.

No, the answer is incorrect.
Score: 0
Accepted Answers:
p-type doped base performs better than n-type doped base.
Minority carrier diffusion length is larger in p-type.
Carrier collection is better in p-type.

6) For high efficiency single junction Si solar cells, which of the following should be done? 1 point

- Emitter should be n-type and very thin as compared to base
- Emitter should be p-type and thicker as compare to base
- Base should be thick and n-type as compared to emitter
- Base should be p-type and thick as compared to emitter

No, the answer is incorrect.
Score: 0
Accepted Answers:
Emitter should be n-type and very thin as compared to base
Base should be p-type and thick as compared to emitter

7) Typical absorber layer of a c-Si solar cell absorbs 26% of the light with wavelength λ = 1100 nm incident from the AM1.5 spectrum . Assuming that the absorption coefficient for infrared light is $\alpha(1100nm) = 10cm^{-1}$, the thickness of the absorber layer is: 1 point

- 200 μm
- 300 μm
- 100 μm
- 50 μm

No, the answer is incorrect.
Score: 0
Accepted Answers:
300 μm

8) In poly-Si solar cells, Silicon Nitride (SiN_x) coating on emitter: 1 point

- reduces the reflection losses
- reduces charge carrier recombination
- reduces surface recombination
- absorbs the light and gives rise to electron-hole pairs

No, the answer is incorrect.
Score: 0
Accepted Answers:
reduces the reflection losses

9) Which of the following statements is true? 1 point

- The open-circuit voltage decreases when the lifetime of the minority charge carriers increases.
- Carrier diffusion length decreases with increased doping concentration.
- The open-circuit voltage increases when the intrinsic density of charge carriers increases.
- The open-circuit voltage does not depend on the doping.

No, the answer is incorrect.
Score: 0
Accepted Answers:
Carrier diffusion length decreases with increased doping concentration.

10) Shunt resistance in the solar cells can be increased by: 1 point

- Increasing the dark saturation current
- Reducing defect density in the device
- Reducing non-radiative recombination
- Increasing the band-gap.

No, the answer is incorrect.
Score: 0
Accepted Answers:
Reducing defect density in the device
Reducing non-radiative recombination

11) Which of the techniques and associated role are correct among the following when improving the device efficiency is concerned? 1 point

- Use of texturing increases increases light trapping
- Use of buried contacts increases shunt resistance
- Surface passivation lowers surface recombination
- Use of ARC decreases reflection losses

No, the answer is incorrect.
Score: 0
Accepted Answers:
Use of texturing increases increases light trapping
Surface passivation lowers surface recombination
Use of ARC decreases reflection losses

12) Polycrystalline Si solar cells have lower efficiency due to: 1 point

- Lower bandgap
- Higher recombination
- Presence of grain boundaries
- Lower light absorption

No, the answer is incorrect.
Score: 0
Accepted Answers:
Higher recombination
Presence of grain boundaries

13) Dangling bonds in a-Si solar cells can be passivated by the use of: 1 point

- SiO_2 passivation
- Hydrogen passivation
- Gettering
- Texturing

No, the answer is incorrect.
Score: 0
Accepted Answers:
Hydrogen passivation

14) In Si solar cells, top contact is buried deeply to: 1 point

- Increase shunt resistance
- Reduce series resistance
- Increase carrier collection
- Increases V_{oc}

No, the answer is incorrect.
Score: 0
Accepted Answers:
Reduce series resistance
Increase carrier collection

15) In Si solar cells, series resistance is reduced by: 1 point

- heavier doping near the contacts
- optimizing the spacing between the contacts
- surface texturing
- deeply buried contacts

No, the answer is incorrect.
Score: 0
Accepted Answers:
heavier doping near the contacts
optimizing the spacing between the contacts
deeply buried contacts