X

Unit 4 - Carrier transport

Week3_Assignment

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment. **Due on 2019-02-20, 23:59 IST.**

1) As the electric field increases, the velocity of electrons travelling in the semiconductor increases. Which of the following statement is true when electron velocity is below the saturation velocity? ***1 point***

- Mobility of electrons increases with increase in electric field across material
- Mobility of electrons decreases with increase in electric field across material
- Mobility of electrons remains same with electric field across material
- Concept of mobility is not valid when electron travels with velocity below saturation velocity

No, the answer is incorrect.
Score: 0

Accepted Answers:
Mobility of electrons remains same with electric field across material

2) The E-k diagram for conduction band of material A is narrower or sharper than that of material B. The relation between electron mobilities in material A and B is ***1 point***

- Mobility of electrons in material A < material B
- Mobility of electrons in material A > material B
- Mobility of electrons in material A = material B
- More information is needed

No, the answer is incorrect.
Score: 0

Accepted Answers:
Mobility of electrons in material A > material B

- Increases, increases

No, the answer is incorrect.
Score: 0

Accepted Answers:
Increases, decreases

4) If the total mobility of electrons in a semiconductor material is 2000 cm^2/V.s and the ionized impurity limited mobility is 10000 cm^2/V.s, then phonon limited mobility is ***1 point***

- 500 cm^2/V.s
- 5000 cm^2/V.s
- 6000 cm^2/V.s
- 2500 cm^2/V.s

No, the answer is incorrect.
Score: 0

Accepted Answers:
2500 cm^2/V.s

5) Calculate the mean scattering time of an electron having mobility of 3000 cm^2/V.s at 300 K. Assume effective mass as mn=0.3*m0 . ***1 point***

- 15 s
- 10 ms
- 0.5 ps
- 1 us

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.5 ps

6) In an n-type semiconductor, electron concentration varies linearly from 5 x 10^{19} to 2 x 10^{16} cm^{-3} over 1 cm. Calculate the diffusion current density at 300 K? Assume D_n =30 cm^2/s. ***1 point***

- 240 A/cm^2
- 1 A/cm^2
- 24 A/cm^2
- 10 A/cm^2

No, the answer is incorrect.
Score: 0

Accepted Answers:
240 A/cm^2

7) Minority carriers are injected at one end of an n-type semiconductor and electric field of 70 V/cm is applied across it, which moves the carriers by 5 cm in 300 µs. Calculate the diffusion constant of the minority carriers at 300 K ***1 point***

- 100.4 cm^2/s
- 72.5 cm^2/s
- 6.2 cm^2/s
- 0.4 cm^2/s

No, the answer is incorrect.
Score: 0

Accepted Answers:
6.2 cm^2/s

8) A semiconductor with pn0 =10^{16} cm^{-3} is illuminated with light and 10^{12} cm^{-3} electron-hole pairs are generated every 3 us. Find the minority carrier concentration. Assume Tn = Tp = 1 us and ni = 10^{10} cm^{-3} ***1 point***

- 10^{10} cm^{-3}
- 10^{16} cm^{-3}
- 2 X10^{20} cm^{-3}
- 3X10^{11} cm^{-3}

No, the answer is incorrect.
Score: 0

Accepted Answers:
$3X10^{11}$ cm^{-3}

9) What is the charge state of an occupied donor (i.e. donor atom occupied by electron)? ***1 point***

- Negative
- Positive
- Neutral
- None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
Neutral

10) What is the charge state of an unoccupied acceptor (i.e. acceptor atom not occupied by electron)? ***1 point***

- Positive
- Negative
- Neutral
- None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
Neutral

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