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Courses » Fundamentals of semiconductor devices

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Unit 2 - Basics of semiconductor physics

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Certification exam

Course outline

How to access
the portal

Basics of semiconductor physics

Introduction to semiconductors

Introduction to energy bands

Fundamentals of band structure

Band structure (contd.) and Fermi-Dirac distribution

Density of states

Quiz : Week 1 Assignment

Week 1 Assignment solution

Equilibrium carrier concentration

Carrier transport

Week 1 Assignment

The due date for submitting this assignment has passed.

Due on 2019-02-13, 23:59 IST.

Assignment submitted on 2019-02-08, 13:40 IST

1) 1) Lattice constant of a material depends on

1 point

- Temperature
- Strain
- Both of these
- None of these

No, the answer is incorrect.

Score: 0

Accepted Answers:

Both of these

2) The relation between energy and wave vector in the reciprocal space for free electron is _____ and the movement of electron in periodic potential is dependent on _____

1 point

- Parabolic, effective mass
- Hyperbolic, effective mass
- Parabolic, real mass
- Hyperbolic, real mass

No, the answer is incorrect.

Score: 0

Accepted Answers:

Parabolic, effective mass

3) Electron energy is _____ and the magnitude of electron momentum is _____ at the $k = 0$ point in the conduction band

1 point

- Minimum and minimum

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junction		
Bipolar Junction Transistor	ce De	Accepted Answers: Minimum and minimum
Metal Oxide Semiconductor Capacitor		
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Compound Semiconductors		
Opto-electronic devices: Solar cells and photo-detectors		
Opto-electronic devices: Light Emitting Diodes (LED)		
Applications of transistors and basics of microelectronic fabrication		

4) The E-k diagram of the conduction band of a material A is sharper or narrower than the E-k diagram for another material B. The relation between effective masses of material A and that of material B **1 point**

Effective mass of A > B

Effective mass of A < B

Effective mass of A = B

Needs additional information to conclude the result

No, the answer is incorrect.
Score: 0

Accepted Answers:
Effective mass of A < B

5) Effective mass of electrons in a material depends on **1 point**

Orientation of crystal

Strain in the crystal

Both of these

None of these

No, the answer is incorrect.
Score: 0

Accepted Answers:
Both of these

6) Determine the probability that an energy level is empty of an electron if the state is below the Fermi level by $3kT$? **1 point**

4.7×10^{-2}

4.7×10^{-5}

4.7×10^5

4.7×10^2

No, the answer is incorrect.
Score: 0

Accepted Answers:
 4.7×10^{-2}

7) Calculate the temperature at which the probability is 10^{-6} that an energy state 0.9 eV above the Fermi energy level is occupied by an electron. (Use, $k = 8.6E-5$ eV/K) **1 point**

757 K

471 K

581 K

601 K

No, the answer is incorrect.
Score: 0

Accepted Answers:

757 K

8) Silicon is an indirect band gap semiconductor material and GaN a direct semiconductor material. Which one of them is transparent at 300K? **1 point**

- Si
- GaN
- All of the above
- None of the above

No, the answer is incorrect.

Score: 0

Accepted Answers:

GaN

9) Determine the probability that an energy level is filled of an electron if the state is above the Fermi level by $2kT$? **1 point**

- 11×10^{-2}
- 55×10^{-5}
- 22×10^{-6}
- 33×10^{-4}

No, the answer is incorrect.

Score: 0

Accepted Answers:

11×10^{-2}

10) Which of the following statements is true in case of an LED? **1 point**

- Silicon can be used to make an LED, as their band gap is low (1.1 eV)
- GaN cannot be used to make LED as its band gap is high (3.4 eV)
- LEDs cannot be made of any semiconductor
- Only direct band gap semiconductors can be used to make LEDs

No, the answer is incorrect.

Score: 0

Accepted Answers:

Only direct band gap semiconductors can be used to make LEDs

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