Assessment 7

The due date for submitting this assignment has passed. As per our records you have not submitted this assignment. Due on 2019-03-20, 23:59 IST.

Instructions:

1. Answer all questions; all questions carry equal mark.
2. All symbols have their usual meanings.
3. Only one of the options is correct.
4. You can see the correct answers after the last date of submission.

Note:

Marks obtained in this quiz will be counted towards your final score. You can take the quiz and submit it any number of times, and the latest submitted answers will be taken as your final submission.

Physical Constants:

\( m_0 = 9.11 \times 10^{-31} \text{ kg}; \quad h = 6.627 \times 10^{-34} \text{ J s}; \quad e = 1.602 \times 10^{-19} \text{ C}; \quad k_B = 1.38 \times 10^{-23} \text{ J/K} \)

1) Light of photon energy \( hv < E_g (= 1 \text{ eV}) \) is absorbed by a semiconductor sample. Which one of the following transitions would not have taken place in this absorption?

- Intraband free carrier transition
- Phonon transition
- Interband transition
- Excitonic transition

No, the answer is incorrect.
Score: 0

Accepted Answers:
Interband transition

2) Which one of the following statements regarding excitons is incorrect?

- Exciton is a bound state of electron and hole
- Electron and hole, forming the exciton, have very low kinetic energies
- Electron and hole, forming the exciton, are near the band edge
- Exciton effectively increases the bandgap energy

1 point
3) In the presence of an applied electric field, the band-edge wavelength $\lambda_g$ of a semiconductor effectively

- Increases with increasing electric field, and decreases with decreasing temperature
- Decreases with increasing electric field, and decreases with decreasing temperature
- Decreases with increasing electric field, and increases with decreasing temperature
- Increases with increasing electric field, and increases with decreasing temperature

No, the answer is incorrect.
Score: 0

Accepted Answers:

Exciton effectively increases the bandgap energy

4) The absorption spectrum of a semiconductor quantum well device, in the presence, and the absence of applied electric field, is shown in the figure. What would be a suitable wavelength of operation if the device is to be used as an efficient electro-absorption modulator?

- 1180 nm
- 1240 nm
- 1310 nm
- 1370 nm

No, the answer is incorrect.
Score: 0

Accepted Answers:

Increases with increasing electric field, and decreases with decreasing temperature

5) Consider the propagation of a beam of light through a MQW structure comprising of 50 quantum wells, each of thickness 10 nm, and of absorption coefficient $10^4$ cm$^{-1}$. Assume that there is no absorption in the barrier layers. The ratio of output light intensity to the intensity of light incident on the MQW structure is

- 0.021
- 0.135
- 0.368
- 0.606
No, the answer is incorrect.
Score: 0
Accepted Answers: 0.606