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Unit 5 - Week 3

Assessment 3

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.**

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_e= 9.11 x 10^{-31} kg; h = 6.627 x 10^{-34} Js; e = 1.602 x 10^{-19} C; k_B = 1.38 x 10^{-23} J/K

1) Which one of the following pairs of ternary compounds are lattice matched to InP? ***1 point***

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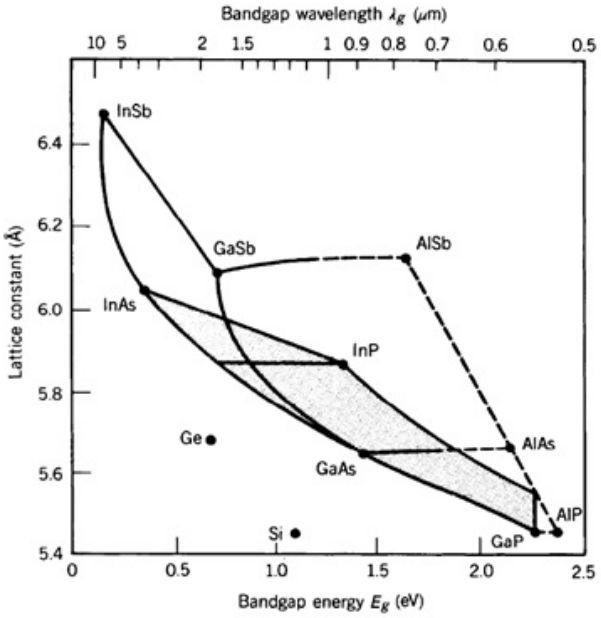

- $Al_{1-x}Ga_xAs$ and $In_{1-x}Ga_xAs$
- $In_{1-x}Ga_xAs$ and $GaAs_xSb_{1-x}$
- $GaAs_xSb_{1-x}$ and $Al_{1-x}Ga_xAs$
- $Al_{1-x}Ga_xSb$ and $AlAs_xSb_{1-x}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$In_{1-x}Ga_xAs$ and $GaAs_xSb_{1-x}$

2) Estimate the maximum permissible thickness of $In_{0.53}Ga_{0.47}As_{0.6}P_{0.4}$ layer (lattice constant = 5.8687 Å) that can be grown on InP substrate (lattice constant = 5.87 Å), without having any defects at the interface. ***1 point***

- 755 nm
- 1055 nm
- 2650 nm
- 1325 nm

No, the answer is incorrect.
Score: 0

Accepted Answers:
1325 nm

3) Which one of the following statements is *correct?* ***1 point***

- All double heterostructures are quantum wells.
- All semiconductor quantum wells are double heterostructures.
- The electron wavefunction is zero outside a semiconductor quantum well.
- In a quantum well, the de-Broglie wavelength of electron is much smaller than the width of the potential well.

No, the answer is incorrect.
Score: 0

Accepted Answers:

All semiconductor quantum wells are double heterostructures.

4) A light beam of wavelength 650 nm is incident on two semiconductors A and B, having bandgap energies E_g^A and E_g^B, respectively. It is observed that the light is highly attenuated after passing through Semiconductor A, while almost all the light passes through Semiconductor B. Which one of the following statements is *correct*? **1 point**

- $E_g^B > 2.0$ eV and $E_g^A > E_g^B$
- $E_g^A < 2.0$ eV and $E_g^B > E_g^A$
- $E_g^B < 1.8$ eV and $E_g^B > E_g^A$
- $E_g^A > 1.8$ eV and $E_g^A > E_g^B$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$E_g^A < 2.0$ eV and $E_g^B > E_g^A$

5) The direct bandgap energy (in eV) of the ternary compound $GaAs_{1-x}P_x$ is given by **1 point**

$$E_g(x) = 1.424 + 1.150x + 0.176x^2; 0 \leq x \leq 0.45$$

Which of the following alloy composition would correspond to a bandgap wavelength of 720 nm?

- $GaAs_{0.75}P_{0.25}$
- $GaAs_{0.70}P_{0.25}$
- $GaAs_{0.65}P_{0.30}$
- $GaAs_{0.60}P_{0.40}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$GaAs_{0.75}P_{0.25}$

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