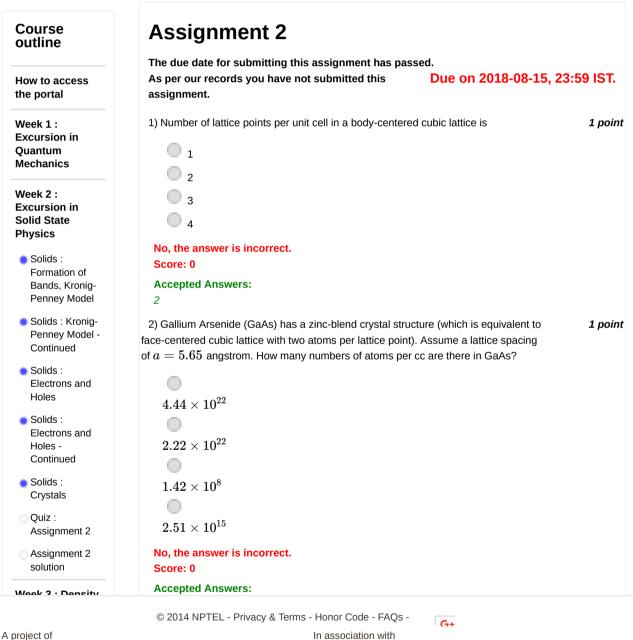
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Unit 3 - Week 2: Excursion in Solid State Physics







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Charge 164.1 Transport and Continuity Equation No, the answer is incorrect. Week 5: Metal-Score: 0 Semiconductor **Accepted Answers:** Junctions 2.88 Week 6 : PN 4) Consider a semiconductor whose energy dispersion relation for the conduction band is 1 point Junction $E = A + B(k - C)^2$ Week 7: Bipolar where, A, B and C are constants. Assume the mobility of the electron is μ_0 . Find the mean free time of Junction **Transistors** electrons in the conduction band. Week 8 : Metal Oxide μ_0 Semiconductor $2Bq\hbar^2$ Capacitor (MOSCAP) and CV $Bq\hbar^2$ Characteristics Week 9: $\mu_0 \hbar^2$ MOSFET: I 2BqNone of the above Week 10: MOSFET: II No, the answer is incorrect. Score: 0 Week 11: **Accepted Answers:** Circuits $\mu_0 \hbar^2$ 2BqWeek 12: Thin **Film Transistors** 5) Assume that the electrons in an n-doped crystalline silicon 1 point (TFTs), Tutorial suffer scattering only due to i) the lattice vibration and ii) the Sessions interaction with impurity ions. At an extremely low temperature region, mobility with increase in temperature. (Fill in the gap) increases decreases remains constant becomes zero No, the answer is incorrect. Score: 0 **Accepted Answers:** increases 6) Consider a 1D crystal with lattice constant 'a' and crystal length 'L'. Where do you observe 1 point the energy band gaps on the energy dispersion graph (E-k diagram)? At $k=n\,rac{\pi}{a}$, where n is an integer At $k=n\,rac{\pi}{L}$, where n is an integer At $k=n\,rac{\pi}{a}$, where n is any real number At $k=n\,rac{\pi}{L}$, where n is any real number

No, the answer is incorrect. Score: 0 **Accepted Answers:** At $k=n\,rac{\pi}{a}$, where n is an integer 7) What is a Brillouin zone? 1 point A region of position-space where the electrons can reside within. A region of energy-space that contains all the allowed energy levels. Another name for the unit cell of the crystal. A region of k-space that contains all the unique solutions of the wave-equation. No, the answer is incorrect. Score: 0 **Accepted Answers:** A region of k-space that contains all the unique solutions of the wave-equation. 8) Consider the following 1D band structure: 1 point $E(k_x) = \hbar v_F |k_x|$ where, v_F is a velocity. What is the effective mass? $m^*=\hbar v_F$ $m^* = \infty$ $m^* = 0$ Not defined No, the answer is incorrect. Score: 0 **Accepted Answers:** Not defined 9) Bloch's theorem for a periodic potential is given by, $\psi(x+a)=\psi(x)e^{ika}$, where 'a' is **1** point the lattice constant. Assume that u(x) is the periodic lattice potential given by u(x+a)=u(x). Which of the following represents an equivalent mathematical form of Bloch's theorem? $\psi(x+a)=u(x)e^{ikx}$ $\psi(x+a)=u(x+a)e^{ika}$

 $\psi(x)=u(x)e^{ikx}$

$$\psi(x) = u(x)e^{-x}$$

$$\psi(x)=u(x)e^{ik(x+a)}$$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$\psi(x) = u(x)e^{ikx}$$

10Molybdenum (Mo) crystallizes in a body-centered cubic structure with a lattice constant a=3.147 angstrom. If the radius of a Mo atom is one-half of the center-to-center spacing of the nearest neighbours, compute the percent of the cubic volume, a^3 , that is occupied by Mo atoms.

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