Question Paper

Exam Date & Time: 25-Nov-2019 (08:30 AM - 11:30 AM)

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

FIRST SEMESTER B.TECH END SEMESTER EXAMINATIONS, NOV 2019

Engineering Physics [PHY 1051 - 2018 -PHY]

Marks: 50 **Duration: 180 mins.**

A

Answer all the questions.

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

1) What are Newton rings? Why they are circular? With a neat geometry, obtain an expression for the radii of dark rings. Mention two applications of Newton rings experiment. (5)

A)

B) The first-order diffraction maximum is observed at 12.6° for a crystal having a spacing between plane of atoms of 0.250 nm. (a) What wavelength X-ray is used to observe this first-order pattern? (b) At what angle, second order maximum is observed (c) How many orders can be observed for this crystal at this wavelength? (3)

C) Monochromatic light of wavelength 538 nm falls on a single slit with width 0.10 mm. Consider a point on the screen at 9.0° from the central maximum. Calculate the ratio of the intensity at this point to the intensity at the central maximum. (2)

2) Explain Compton Effect. Derive the Compton shift equation. For what value of photon scattering angle, we obtain maximum Compton shift (5)

A)

B) Explain the polarization phenomena by a) reflection b) double refraction (3)

C) An electron has a kinetic energy of 3.0 eV. (a) Find its wavelength. (b) Also find the wavelength of a photon having the same energy. Mass of an electron is 9.1×10^{-31} Kg ; speed of light in vacuum = 3×10^{8} m/s; Planck's constant=6.63×10^{-34} Js; Avagadro number = 6.023×10^{23} / mol; Boltzmann constant=1.38×10^{-23} J/K (2)

3) Sketch the potential-well diagram of finite height U and length L, obtain the general solution of the Schrödinger equation for a particle of mass m in it. (5)

A)

B) A quantum simple harmonic oscillator consists of an electron bound by a restoring force proportional to its position relative to a certain equilibrium point. The proportionality constant is 8.99 N/m. Calculate its energy in level n = 3. What is the longest wavelength of light that can excite the oscillator? Mass of an electron is 9.1×10^{-31} Kg ; speed of light in vacuum = 3×10^{8} m/s; Planck's constant=6.63×10^{-34} Js; Avagadro number = 6.023×10^{23} / mol; Boltzmann constant=1.38×10^{-23} J/K (3)

C) A tungsten target is struck by electrons that have been accelerated from rest through a 40.0-kV potential difference. Find the shortest wavelength of the radiation emitted. What is the kinetic energy of the accelerating electrons? Mass of an electron is 9.1×10^{-31} Kg ; speed of light in vacuum = 3×10^{8} m/s; Planck's constant=6.63×10^{-34} Js; Avagadro number = 6.023×10^{23} / mol; Boltzmann constant=1.38×10^{-23} J/K (2)

4) Explain the following terms: a) population inversion b) meta stable states. With relevant diagrams, briefly explain the working principle of laser. (5)

A)

B) Explain briefly (a) ionic bonding, (b) covalent bonding, (c) van der Walls bonding (3)

C) For copper at 300 K, calculate the probability that a state with an energy equal to 99.0% of the Fermi energy is occupied. Fermi energy of copper is $7.05\ eV$. Mass of an electron is 9.1×10^{-31} Kg ; speed of light in vacuum = 3×10^{8} m/s; Planck's constant=6.63×10^{-34} Js; Avagadro number = 6.023×10^{23} / mol; Boltzmann constant=1.38×10^{-23} J/K (2)

5) Obtain an expression for rotational energy of a diatomic molecule. Sketch schematically these rotational energy levels. (5)

A)

B) Sodium is a monovalent metal having a density of 971 kg/m^3 and a molar mass of 0.023 kg/mol. Use this information to calculate (a) the density of charge carriers and (b) the Fermi energy. Mass of an electron is 9.1×10^{-31} Kg ; speed of light in vacuum = 3×10^{8} m/s; Planck's constant=6.63×10^{-34} Js; Avagadro number = 6.023×10^{23} / mol; Boltzmann constant=1.38×10^{-23} J/K (3)

C) A light-emitting diode (LED) made of the semiconductor GaAsP emits red light (λ= 650nm). Determine the energy-band gap E_g in the semiconductor. Calculate the frequency of the emitted photon. Mass of an electron is 9.1×10^{-31} Kg ; speed of light in vacuum = 3×10^{8} m/s; Planck's constant=6.63×10^{-34} Js; Avagadro number = 6.023×10^{23} / mol; Boltzmann constant=1.38×10^{-23} J/K (2)

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Question Paper

Exam Date & Time: 28-Nov-2018 (08:30 AM - 11:30 AM)

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

MANIPAL INSTITUTE OF TECHNOLOGY
FIRST SEMESTER B.TECH END SEMESTER EXAMINATIONS, NOV 2018

Engineering Physics [PHY 1051 - 2018 -PHY]

Marks: 50 **Duration: 180 mins.**

PART A

Answer all the questions.

Missing data may be suitably assumed.
Write specific and precise answers.
Draw neat sketches wherever necessary.

1) A) Obtain an expression for the radius of **mth** order bright ring in the case of Newton's rings. (4)

B) A diffraction grating has 10^4 rulings uniformly spaced over 25.0 mm. It is illuminated at normal incidence by yellow light from sodium vapor lamp which contains two closely spaced lines of wavelengths 589.00 nm and 589.59 nm. At what angle will the first order maximum occur for the first of these wavelengths? What is the angular separation between the first order maxima of these lines? (3)

C) Two slits are separated by 0.180 mm. An interference pattern is formed on a screen 80.0 cm away by 656.3 nm light. Calculate the ratio of intensity at a distance y = 0.600 cm to that at the central maximum, neglecting diffraction effects. (3)

2) A) Sketch the potential-well diagram of finite height **U** and length **L**, obtain the general solution of the Schrödinger equation for a particle of mass **m** in it. (5)

B) A 0.00160 nm photon scatters from a free electron. For what photon scattering angle does the recoiling electron have kinetic energy equal to the energy of the scattered photon? Compton wavelength = 2.43 pm. Planck's constant = 6.63×10^{-34} J-s, Speed of light in vacuum = 3.00×10^8 m/s (3)

C) Explain the law of Malus for polarized light with a diagram. (2)

3) A) Explain the physical significance of radial probability density. (5)

The wave function for H-atom in 2s state is

$$\psi_{2S}(r) = \frac{1}{\sqrt{32\pi a_o^3}} \left(2 - \frac{r}{a_o}\right) \exp\left(-\frac{r}{a_o}\right)$$

Write the expression for the radial probability density of H-atom in 2s state. Sketch schematically the plot of this Vs. radial distance.

B) An α- particle in a nucleus can be modeled as a particle moving in a *box* of length 1.0×10^{-14} m. Using this model, estimate the energy and momentum of an α- particle in its lowest energy state. How much will be its energy in the first excited state? Planck's constant = 6.63×10^{-34} J-s, Mass of an α- particle is = $4 \times 1.66 \times 10^{-27}$ kg. (3)

C) Show that the group speed of a wavepacket is equal to the particle speed for a free non- relativistic quantum particle. (2)

4) A) Write expression for total energy (vibrational and rotational) of a molecule. Sketch schematically these energy levels for a diatomic molecule for the lowest two vibrational energy values, indicating the possible transitions. Write the expressions for the energy of the emitted photon in this molecular energy transitions. (5)

B) The K series of the characteristic x -ray spectrum of tungsten contains wavelengths of 18.5 pm, 20.9 pm, and 21.5 pm. The K-shell ionization energy is 69.5 keV. Determine the ionization energies of the L, M, and N shells. Draw a diagram of the transitions. Planck's constant = 6.63×10^{-34} J-s, Speed of light in vacuum = 3.00×10^{8} m/s. (3)

C) The radius of our Sun is 6.96×10^{8} m, and its total power output s 3.77×10^{26} W. Assuming that the Sun's surface emits as a black body, calculate its surface temperature. Stefan constant, $\sigma = 5.67 \times 10^{-8}$ SI units. (2)

5) A) Write the expression for density-of-states function. Calculate the ratio of the number of allowed energy levels at 8.50 eV to the number at 7.00 eV, for a (5)

system of electrons confined to a three-dimensional box. If copper has a Fermi energy of 7.00 eV at 300 K, calculate the ratio of the number of occupied levels at an energy of 8.50 eV to the number at Fermi energy in copper. Boltzmann constant = 1.38×10^{-23} J/K.

B) Draw the energy band diagram for p-type and n-type semiconductors. (3)

A light-emitting diode (LED) made of the semiconductor GaAsP emits red light (λ = 650nm). Determine the energy-band gap E_g in the semiconductor. Planck's constant = 6.63×10^{-34} J-s, Speed of light in vacuum = 3.00×10^{8} m/s

C) A ruby laser emits light at wavelength 694.4 nm. If this ruby laser pulse is emitted for 12 ps and the energy released per pulse is 150 mJ, how many photons are there in each pulse? Planck's constant = 6.63×10^{-34} J-s, Speed of light in vacuum = 3.00×10^{8} m/s. (2)

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Question Paper

Exam Date & Time: 01-Jan-2019 (08:30 AM - 11:30 AM)

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

FIRST SEMESTER B.TECH END SEMESTER MAKE UP EXAMINATIONS, DEC 2018

Engineering Physics [PHY 1051 - 2018 -PHY]

Marks: 50 **Duration: 180 mins.**

A

Answer all the questions.

Instructions to Candidates: Missing data may be suitably assumed

Physical Constants:

Speed of light in vacuum	$= 3.00 \times 10^{8}$ m/s	Electron charge	$= 1.60 \times 10^{-19}$ C
Electron mass	$= 9.11 \times 10^{-31}$ kg	Planck's constant	$= 6.63 \times 10^{-34}$ J.s
Boltzmann constant	$= 1.38 \times 10^{-23}$ J/ K		

1) Discuss qualitatively, the Fraunhofer diffraction at a single-slit. (4)

A)

B) A converging lens of diameter d = 32 mm has a focal length f = 24 cm. What angular separation (θ_R) must two distant point objects have to satisfy Rayleigh's criterion? Assume that the wavelength is λ = 550 nm. How far apart (Δx) are the centers of the diffraction patterns in the focal plane of the lens? (3)

C) The intensity on the screen at a certain point in a double-slit interference pattern is 64.0% of the maximum value. (i) What minimum phase difference (in radians) between sources produces this result? (ii) Express this phase difference as a path difference for 486.1 nm light. (3)

2) Solve the Schrodinger equation for a quantum particle of mass **m** trapped in a one-dimensional infinite potential well (box) of length **L** and obtain the expressions for wave-functions of the particle. (5)

A)

B) A 30 eV electron is incident on a square barrier of height 40 eV. What is the probability that the electron will tunnel through the barrier if its width is 0.10 nm? (3)

C) Distinguish between unpolarized and linearly polarized light. (2)

3) What are the features of photoelectric effect-experiment explained by Einstein's photoelectric equation? (4)

A)

B) Explain (i) Stefan's law (ii) Wien's displacement law (iii) Plank's law. (4)

C) An electron has a kinetic energy of 3.0 eV. Find its de Broglie wavelength. (2)

4) Sodium is a monovalent metal having a density of 971 kg/m^3 and a molar mass of 0.023 kg/mol. Use this information to calculate (a) the density of (5)

A)

charge carriers and (b) the Fermi energy. ($N_A = 6.023 \times 10^{23}$)

B) Explain the following terms with respect to LASER (i) spontaneous emission (ii) stimulated emission (iii) population inversion. (3)

C) Explain the origin of continuous X-rays. (2)

5) Based on the allowed states of a particle in a three dimensional box, derive the density-of-states function. (5)

A)

B) The J = 0 to J = 1 rotational transition of the CO molecule occurs at a frequency of 1.15×10^{11} Hz. (i) Use this information to calculate the moment of inertia of the molecule. (ii) Calculate the bond-length of the molecule. (3)
(Mass number: Carbon - 12, Oxygen - 16 and mass of proton $m_p = 1.67 \times 10^{-27}$ kg)

C) Most solar radiation has a wavelength of 1 μm. What energy gap should the material in solar cell have in order to absorb this radiation ? (2)

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REG. No.

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL UNIVERSITY, MANIPAL

FIRST SEMESTER B.Tech. END-SEMESTER EXAMINATION - NOV 2017

SUBJECT: ENGINEERING PHYSICS (PHY1001)

Time: 3 Hrs. 20-11-2017 **Max. Marks: 50**

Note:

Answer **ALL** the questions. Each question carries **10** marks
Answer all the sub questions of a main question in a continuous sequence.
Write specific and precise answers. Any missing data may suitably be assumed.
Write question number on the margin only. Draw neat sketches wherever necessary.

Physical Constants:

Speed of light in vacuum	$= 3.00 \times 10^{8}$ m/s	Electron charge	$= 1.60 \times 10^{-19}$ C
Electron mass	$= 9.11 \times 10^{-31}$ kg	Avogadro number	$= 6.023 \times 10^{23}$ /mol
Boltzmann constant	$= 1.38 \times 10^{-23}$ J/ K	Planck's constant	$= 6.63 \times 10^{-34}$ J.s

1A. Obtain an expression for the width of the any principal maximum in diffraction pattern due to multiple slits. **[4]**

1B. A thin film of acetone (refractive index = 1.25) is coating a thick glass plate (refractive index = 1.50). Plane light waves of variable wavelengths are incident normal to the film. When one views the reflected wave, it is noted that complete destructive interference occurs at a wavelength of 600 nm and constructive interference at a wavelength of 700 nm. Calculate the minimum thickness of the acetone film. **[3]**

1C. A single slit is illuminated by light whose wavelengths are λ_A and λ_B, so chosen that the first diffraction minimum of λ_A component coincides with the second minimum of the λ_B component. What is the relationship between the two wavelengths? Do any other minima in the two patterns coincide? **[3]**

2A. Obtain an expression for numerical aperture in terms of refractive index of core and cladding and then arrive at the condition for ray propagation in an optical fiber. **[5]**

2B. In a double-slit experiment, the distance of the screen from the slits is 52 cm, the wavelength is 480 nm, slit separation is 0.12 mm and the slit width is 0.025 mm. What is the spacing between adjacent fringes? What is the distance from the central maximum to the first minimum of the fringe envelope? **[3]**

2C. Calculate the energy of a photon whose frequency is 620 THz. Determine the wavelength of this photon. **[2]**

3A. Derive the compton shift equation. **[5]**

3B. Neutrons (mass = 1.67×10^{-27} kg) in thermal equilibrium at room temperature (300 K) have kinetic energy of kT, where k is the Boltzmann constant. Find their momentum and de Broglie wavelength. **[3]**

3C. Find the peak wavelength of the blackbody radiation emitted by the tungsten filament of a light bulb, which operates at 2000 K. Sketch schematically the graph of intensity vs wavelength for this. Wien's constant = 2.898×10^{-3} m.K. **[2]**

4A. Calculate the probability that the electron in the ground state of H-atom will be found outside the Bohr radius (a_o). The wave function for an electron in H-atom is $\psi_{1S}(r) = \frac{1}{\sqrt{\pi a_o^3}} \exp\left(-\frac{r}{a_o}\right)$. **[5]**

4B. Sketch schematically, the lowest three energy states, wave-functions, probability densities for the particle in a one-dimensional "box". **[3]**

4C. What are the mathematical features of a wave function? **[2]**

5A. Draw a representative graph of Resistance Vs Temperature for a superconductor. Explain briefly the BCS theory of superconductivity in metals. **[5]**

5B. Show that the average kinetic energy $\left[E_{AV} = \frac{1}{n_e}\int EN(E)dE\right]$ of a conduction electron in a metal at zero K is (3/5)E_F, where the density of conduction electrons is $n_e = \frac{2}{3}\frac{8\sqrt{2}\pi m^{3/2}E_F^{3/2}}{h^3}$. E_F= Fermi energy. **[3]**

5C. Light from a hydrogen discharge tube is incident on a CdS crystal (E_G= 2.42 eV). Which spectral line from the Balmer series (656 nm, 486 nm, 434 nm, 410 nm) are absorbed and which are transmitted ? **[2]**

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MANIPAL INSTITUTE OF TECHNOLOGY

MAHE, MANIPAL

FIRST SEMESTER B.Tech. END-SEMESTER EXAMINATION - DEC 2017

SUBJECT: ENGINEERING PHYSICS (PHY1001)

Time: 3 Hrs. 23-12-2017 **Max. Marks: 50**

Note:

Answer **ALL** the questions. Each question carries **10** marks
Answer all the sub questions of a main question in a continuous sequence.
Write specific and precise answers. Any missing data may suitably be assumed.
Write question number on the margin only. Draw neat sketches wherever necessary.

Physical Constants:

Speed of light in vacuum	$= 3.00 \times 10^{8}$ m/s	Electron charge	$= 1.60 \times 10^{-19}$ C
Electron mass	$= 9.11 \times 10^{-31}$ kg	Avogadro number	$= 6.023 \times 10^{23}$ /mol
Boltzmann constant	$= 1.38 \times 10^{-23}$ J/ K	Planck's constant	$= 6.63 \times 10^{-34}$ J.s

1A. Discuss qualitatively the diffraction due to multiple slits (eg., 5 slits). **[4]**

1B. In a Newton's rings experiment, the radius of curvature of the lens is 5.0 m and its diameter is 20 mm. How many rings are produced? How many rings would be seen if the arrangement is immersed in water (refractive index = 1.33) (Assume wavelength = 589 nm). **[3]**

1C. Calculate, approximately, the relative intensities of the first three secondary maxima in the single-slit diffraction pattern. **[3]**

2A. Explain the construction and operation of ruby laser with necessary diagrams. **[5]**

2B. What requirements must be met for the central maximum of the envelope of the double-slit interference pattern to contain exactly 11 fringes? **[3]**

2C. Calculate the energy of a photon whose frequency is 46.0 MHz. Determine the wavelength of this photon. **[2]**

3A. What are the observations in the in the experiment on photoelectric effect? **[5]**

3B. Certain ocean waves of wavelength λ travel with a phase speed of $v_P = \sqrt{\frac{g\lambda}{2\pi}}$, where g is the acceleration due to gravity. Find the group speed of a wave-packet of these waves in terms of phase speed. **[3]**

3C. Find the peak wavelength of the blackbody radiation emitted by the human body when the skin temperature is 35°C. Wien's constant is 2.898×10^{-3} m.K. Sketch schematically the graph of intensity vs wavelength for this. **[2]**

4A. Apply the schrodinger equation to a particle in a one-dimensional "box" of length L and obtain the energy values of the particle. **[5]**

4B. An electron with kinetic energy of 5.0 eV is incident on a barrier with thickness 0.20 nm and height 10.0 eV. What is the probability that the electron will tunnel through the barrier? What is the probability that the electron will be reflected? **[3]**

4C. X-rays of wavelength 0.20000 nm are scattered from a block of material. The scattered X-rays are observed at an angle of 90° to the incident beam. Calculate their wavelength and momentum. **[2]**

5A. Assuming the Fermi-Dirac distribution function , obtain an expression for the density of free-electrons in a metal with Fermi energy E_F, at zero K and, hence obtain expression for Fermi energy E_F in a metal at zero K. [Given: density-of-states function $g(E)dE = \frac{8\sqrt{2}\pi m^{3/2}}{h^3} E^{1/2} dE$] **[5]**

5B. Consider a system of electrons confined to a three-dimensional box. Calculate the ratio of the number of allowed energy levels at 8.50 eV to the number at 7.00 eV. Copper has a Fermi energy of 7.00 eV at 300 K. Calculate the ratio of the number of occupied levels at an energy of 8.50 eV to the number at Fermi energy. **[3]**

5C. The longest wavelength of radiation absorbed by a certain semiconductor is 0.512 μm. Calculate the energy gap for this semiconductor. **[2]**

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Question Paper

Exam Date & Time: 20-Dec-2019 (08:30 AM - 11:30 AM)

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

FIRST SEMESTER B.TECH END SEMESTER MAKE UP EXAMINATIONS, DECEMBER 2019

Engineering Physics [PHY 1051 - 2018 -PHY]

Marks: 50 **Duration: 180 mins.**

A

Answer all the questions.

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

1) Obtain an expression for linear position of bright fringes and fringe width in the case of double-slit interference. Sketch the plot of intensity versus path difference. (5)

A)

B) Light of wavelength 540 nm passes through a slit of width 0.200 mm. (a) The width of the central maximum on a screen is 8.10 mm. How far is the screen from the slit? (b) Determine the width of the first bright fringe to the side of the central maximum. Calculate the intensity on the screen at a point 2.1 mm from the central maximum. (3)

C) Mirror M_1 in Michelson Interferometer is moved through a certain displacement. During this displacement, 250 fringe reversals are counted. The light being used has a wavelength of 632.8 nm. Calculate the displacement of the mirror M_1. (2)

2) Explain photoelectric effect. What are the observations in the experiment on photoelectric effect. Sketch schematically the following graphs with reference to the photoelectric effect: (a) photoelectric current vs applied voltage (b) kinetic energy of most-energetic electron vs frequency of incident light. (5)

A)

B) Distinguish between unpolarized and linearly polarized light. Explain Malus law. (3)

C) A 0.880 MeV photon is scattered by a free electron initially at rest such that the scattering angle of the scattered electron is equal to that of the scattered photon. Determine the scattered electron and photon angles. Electronic charge=1.6×10^{-19} C ; Mass of an electron is 9.1×10^{-31} Kg ; speed of light in vacuum = 3×10^{8} m/s; Planck's constant=6.63×10^{-34} Js; Avagadro number = 6.023×10^{23} / mol; Boltzmann constant=1.38×10^{-23} J/K (2)

3) By solving the Schrödinger equation, obtain the wave-functions for a particle of mass m in a one-dimensional "box" of length L. (5)

A)

B) Electrons are incident on a pair of narrow slits 0.060 μm apart. The 'bright bands' in the interference pattern are separated by 0.40 mm on a 'screen' 20.0 cm from the slits. Determine the potential difference through which the electrons were accelerated to give this pattern. Electronic charge=1.6×10^{-19} C ; Mass of an electron is 9.1×10^{-31} Kg; speed of light in vacuum = 3×10^{8} m/s; Planck's constant=6.63×10^{-34} Js; Avagadro number = 6.023×10^{23} / mol; Boltzmann constant=1.38×10^{-23} J/K (3)

C) For a H-atom, determine the number of allowed states corresponding to the principal quantum number n = 2, and calculate the energies of these states. (2)

4) The wave function for H-atom in ground state is $\psi_{1S}(r) = \frac{1}{\sqrt{\pi a_0^3}} \exp\left(-\frac{r}{a_0}\right)$. Obtain an (5)

A)

expression for the radial probability density of H-atom in ground state. Sketch schematically the plot of this vs. radial distance.

B) Obtain an expression for vibrational energy of a diatomic molecule. Sketch schematically these vibrational energy levels. Obtain expression for vibrational transition photon energies. (3)

C) A K^+ ion and a Cl^- ion are separated by a distance of 5.00×10^{-10} m. Assuming the two ions act like point charges, determine (a) the force each ion exerts on the other and (b) the potential energy of the two-ion system in electron volts. Electronic charge=1.6×10^{-19} C; Mass of an electron is 9.1×10^{-31} Kg ; speed of light in vacuum = 3×10^{8} m/s; Planck's constant=6.63×10^{-34} Js; Avagadro number = 6.023×10^{23} / mol; Boltzmann constant=1.38×10^{-23} J/K (2)

5) Sketch schematically the plots of Fermi-Dirac distribution function for zero kelvin and for temperature above zero kelvin. Derive an expression for density-of-states. (5)

A)

B) An HCl molecule is excited to its first rotational energy level, corresponding to J = 1. If the distance between its nuclei is r_o = 0.1275 nm, what is the angular speed of the molecule about its center of mass ? Electronic charge=1.6×10^{-19} C; Mass of an electron is 9.1×10^{-31} Kg ; speed of light in vacuum = 3×10^{8} m/s; Planck's constant=6.63×10^{-34} Js; Avagadro number = 6.023×10^{23} / mol; Boltzmann constant=1.38×10^{-23} J/K (3)

C) Most solar radiation has a wavelength of 1 μm or less. What energy gap should the material in solar cell have in order to absorb this radiation ? Is silicon (E_g= 1.14 eV) appropriate? Electronic charge=1.6×10^{-19} C ; Mass of an electron is 9.1×10^{-31} Kg ; speed of light in vacuum = 3×10^{8} m/s; Planck's constant=6.63×10^{-34} Js; Avagadro number = 6.023×10^{23} / mol; Boltzmann constant=1.38×10^{-23} J/K (2)

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