University exam Question Bank

Dec 2012 to Dec2015

Q. No.	Question	Marks	Exam	Marking Scheme
	Interference			
1)	Prove that in Newton's Ring by reflected light the diameter of bright ring are proportional to the square root of the odd natural number.	**[06]**	**Dec 2012 May 2013 Dec2014**	
2)	Only Exptl arrangement diagram	**[03]**	**May2015**	
3)	What are the Newton's Rings? Draw experimental arrangement to obtain the Newton's rings in the Laboratory. Show that the diameter of nth dark Ring is directly proportional to square root of natural number.	[06]	**Dec 2013 Dec 2015**	
4)	Derive the equation of path difference between reflected rays when monochromatic light of wavelength 'λ ' falls with angle of incidence 'I' on the uniform thickness film of refractive index ' μ ' . Write the conditions of maxima and minima.	**[06]**	**May2014 May2015**	
5)	Interferences fringes are produced with monochromatic light falling normally on a wedge shaped film of refractive index 1.4. The angle of wedge is 10 sec of an arc and the distance between successive fringes is 0.5 cm. What is the wavelength of light used?	**[03]**	**Dec2013**	
6)	A monochromatic beam of light of wavelength 5893 A° is incident normally on the top of a glass which is coated by transparent material MgF_2 having R.I. 1.38. Calculate smallest thickness of the MgF_2 layer which will act as a non reflecting surface.	**[03]**	**Dec2014**	
	Diffraction			
7)	Define fringe width for wedge shaped film, obtain an expression for it.	**[03]**	**Dec 2012**	
8)	Find the half angular width of the central maxima in the fraunhofer diffraction pattern of slit having width 10×10^{-5} cm. When illumininated by light having wave length 5000 A^{o}.	**[03]**	**Dec 2012**	
9)	Monochromatic light from He-Ne laser source ($\lambda=6328A^{0}$) is incident normally on a diffraction grating having 6000lines/cm. Find the angle at which one would observe second order maximum.	**[03]**	**May 2013**	
10)	Define diffraction of light. Draw intensity distribution pattern obtained because of diffraction of light at a single slit and label the significant points in the same.	**[03]**	**May2014**	
11)	In a grating, the angle of diffraction for the second order principal maximum for the light of wavelength 5×10^{-5} cm is 30°. Calculate the number of lines per centimeter of the grating surface.	**[03]**	**May2014**	
12)	What is diffraction? Distinguish between Fresnel and Fraunhoffer Diffraction (atleast 2 points)	**[03]**	**Dec 2013 Dec2014**	
13)	A laser light of wavelength 6328 A.U. falls normally on a grating which is 2 cm long. The first order spectrum is observed at an angle of 20°. Find the total number of slits on grating.	**[03]**	**May2015**	

	Sound			
14)	Explain any one application of Ultrasonic Waves.	**[03]**	**Dec 2012**	
15)	The average reverberation time of a hall is 1.5 sec. and the area of the interior surface is 3340m^2. If the volume of the hall is 13000m^3. Find the absorption coefficient.	**[03]**	**Dec 2012**	
16)	Define i) Reverberation ii) Intensity of sound iii) Timber of sound	**[03]**	**Dec 2013**	
17)	What is Piezo electric effect? Explain the method of obtaining ultrasonics by using Piezo-electric oscillator.	**[06]**	**Dec 2013 May2015 Dec2015**	
18)	Distinguish between musical sound and noise	**[03]**	**Dec2014**	
19)	Discuss the use of ultrasonics for flaw Detection.	**[03]**	**May 2013**	
20)	A auditorium of volume 5500m^3 is found to have reverberation time 2.5 secs. The sound absorbing surface of the auditorium has an area of area of 750m^2. Calculate the average absorption coefficient of the auditorium.	**[03]**	**May 2013**	
21)	Explain how cavitation technique can be used for cleaning purpose	**[03]**	**May2014**	
22)	Calculate the intensity level of a fighter plane just leaving the runway having a sound intensity of about 100 W/m^2. Given that threshold intensity = 10^{-12} W/m2	**[03]**	**May2014**	
23)	Define magnetostriction effect. Explain how magnetostriction oscillator is used to produce ultrasonic waves with the help of neat circuit diagram.	**[06]**	**May 2013 Dec2014 May2014**	
24)	State any two factors affecting the acoustics of a hall and explain in brief remedies on that.	**[03]**	**May2015 Dec 2015**	
25)	Calculate the reverberation time of hall with volume of 1500 m^3 and total absorption is equivalent to 100 m^2 Sabine.	**[03]**	**May2015**	
	Laser			
26)	Explain any one application of Laser.	**[03]**	**Dec 2012**	
27)	Explain the process of recording Hologram with the help of LASER.	**[03]**	**May 2013 May2014**	
28)	Explain the following: i) Stimulated Emission. ii) Metastable State. iii) Population Inversion.	**[03]**	**Dec2013**	
29)	Explain only pumping process in Ruby laser	**[03]**	**May2014 May2015 Dec2015**	
30)	Explain construction and working of Ruby laser	**[06]**	**Dec2014**	
	Polarization			
31)	Explain how piezoelectric effect can be used for generating Ultrasonic Waves ?	**[06]**	**Dec 2012**	
32)	State the Phenomena of Double Refraction. Hence explain Huygen's Wave Theory of Double Refraction.	**[06]**	**Dec 2012**	
33)	How should the Polarizer and Analyzer be oriented to reduce intensity of beam to (i) 50% (ii) 0.25 of its original intensity ?	**[03]**	**Dec 2012**	
34)	Define Double refraction. Explain Huygen's Theory of	**[06]**	**May 2013**	

	Double refracting crystal with diagram.		**May2014**	
35)	Explain the propagation of light through a quartz crystal plate for normal incidence When **[6]** i) Optic axis is parallel to the crystal surface and lying in the plane of incidence. ii) Optic axis is perpendicular to the crystal surface and lying in the plane of incidence. iii) Optic axis is inclined to the crystal surface and lying in the plane of incidence	**[06]**	**Dec2013**	
36)	Calculate the specific rotation of the sugar solution of 4.5% concentration, if the plane of Polarization is rotated through 6.8^0 in passing through a length of 1.8 decimeter of the solution. **[3]**	**[03]**	**Dec2013**	
37)	At what angle of incidence should a beam of sodium light be directed upon the surface of diamond crystal to produce complete polarized light (Data Given: Critical angle for diamond=24.5^0).	**[03]**	**May 2013**	
38)	A retardation plate of thickness 2.275×10^{-3} cm is cut with its faces parallel to optic axis. If the emergent beam of light is elliptically polarized. Find the wavelength of monochromatic light made incident normally on the plate. Given that, $\mu_0 = 1.586$, $\mu_e = 1.592$.	**[03]**	**May 2015 Dec 2015 (similar type)**	
39)	How should the polarizer and analyzer be oriented to reduce the beam of light to i) 50% ii) 25% of its original intensity.	**[03]**	**Dec2014**	
40)	State and prove Law of Malus.	**[03]**	**May2015 Dec2015**	
	Solid State Physics			
41)	Draw energy band picture for P-N junction in case of (i) Zero Bias (ii) Forward Bias (iii) Reverse Bias	**[03]**	**Dec 2012**	
42)	A silver wire is in the form of a ribbon 0.5cm wide and 0.1 mm thick. When a current of 2A passes through the ribbon perpendicular to 0.8 Tesla Magnetic Field. Calculate the Hall Voltage produced. (Given : Density of Silver = 10.5 gm/cc, Atomic Weight of Silver = 108, Avogadros No. 6.02×10^{23} gm/mole)	**[03]**	**Dec 2012**	
43)	Derive an expression for Conductivity in Semiconductor.	**[06]**	**Dec 2012**	
44)	Define Fermi level. Plot the variation of Fermi level with the increase of temperature for n-type and p-type semiconductor.	**[03]**	**May 2013**	
45)	Calculate the conductivity of Ge sample if the donor impurity is added to an extent of one part in 10^8 Ge atoms at room temperature. (Data Given : $N_a=6.023x10^{23}$ atoms/gm-mole. At. Wt. of Ge =72.6 Density of Ge =5.32gm/cc. ,=3800 cm^2/v-s.)	**[03]**	**May 2013**	
46)	Define Hall effect. Derive the expression of Hall coefficient,	**[06]**	**May 2013 Dec2014 May2015 Dec2015**	

47)	What is the effect of following factors on the conductivity of semiconductors? [3] i) Increase in impurity of concentration. ii) Increase in temperature. iii) Increase in intensity of light.	**[03]**	**Dec2013**	
48)	The hall coefficient of a specimen of a doped Silicon is found to be $3.66 \times 10 m^{-3}/C$. The resistivity of the specimen is $8.93 \times 10^{-3} \Omega m$. Determine the mobility of the charge carriers. [3]	**[03]**	**Dec2013**	
49)	Explain the classification of solids into conductors, semiconductors and insulators on the basis of band theory of solids. [6]	**[06]**	**Dec2013**	
50)	Explain Fermi dirac probability distribution function with the meaning of each symbol in it.	**[03]**	**Dec2014 May2014 Dec2015**	
51)	Derive the expression for the conductivity of intrinsic and extrinsic semiconductor.	**[06]**	**May2014**	
52)	Calculate the conductivity of pure silicon at room temperature when the concentration of charge carriers is $1.6 \times 10^{10}/cm^3$. Given that, $\mu_e = 1500\ cm^2/V.Sec.$, $\mu_h = 500\ cm^2/V.Sec.$	**[03]**	**Dec2014**	
53)	A slab of silicon 2 cm in length 1.5 cm wide and 2 mm thick is applied with magnetic field of 0.4 T along its thickness. When a current of 75 A flows along the length, the voltage measured across the width is 0.81 mV. Calculate the concentration of mobile electrons in silicon	**[03]**	**May2014**	
54)	What is Fermi level ? Show the position of Fermi level in P-type semiconductor at temperature T = 0 K and T > 0 K.	**[03]**	**May2015**	
55)	Calculate the number of acceptors to be added to a germanium sample to obtain the resistivity of 10 cm. ($\mu = 1700\ cm^2/V.sec.$)	**[03]**	**May and Dec 2015**	
	Wave Mechanics			
56)	Define Phase Velocity and Group Velocity. Hence obtain the relation between Vp and Vg for DeBroglie Wave.	**[06]**	**Dec 2012 Dec2014 Dec2015**	
57)	Explain the physical significance of Ψ and $\|\Psi\|^2$.	**[04]**	**Dec 2012**	
58)	An electron is bounded by an infinite potential well of width 2×10^{-8}cm. Calculate the lowest two permissible energies of an electron.(Given : h = 6.64×10^{-34} J–sec., m = 9.1×10^{-31}kg).	**[03]**	**Dec 2012**	
59)	Derive Schroedinger's Time Independent Wave Equation.	**[06]**	**Dec 2012 May 2013 Dec2014 May2014 Dec2015**	
60)	Derive an expression for energy of a particle trapped in an infinite potential well. [6]	**[06]**	**Dec2013**	
61)	State and explain De Broglie's hypothesis of matter waves. State any two properties of matter waves. [4]	**[04]**	**Dec2013**	
62)	The uncertainty in the location of the particle is equal to its De Broglie wavelength. Show that the uncertainty in the velocity of a particle is equal to the particle velocity itself. [3]	**[03]**	**Dec2013**	
63)	Calculate the de Broglie wavelength of electron having kinetic energy 1 KeV.	**[03]**	**Dec2014 Dec2015**	
64)	State DeBroglie's Hypothesis. Hence obtain the relation for DeBroglie's Wave Length in terms of Energy.	**[04]**	**Dec 2012**	

65)	The position and momentum of 1 kev electron are simultaneously measured. If its position is located within $1A^o$. Find the percentage of uncertainty in its momentum.(Given : h = 6.64×10^{-34} J-sec., m = 9.1×10^{-31} kg)	**[03]**	**Dec 2012**	
66)	Define phase velocity, Group velocity and Derive their expressions.	**[04]**	**May 2013 May2014**	
67)	Starting from , $\lambda = h/mv$. obtain . $\lambda = h/\sqrt{2mE}$, where E is KE of the particle.	**[03]**	**May2014**	
68)	Calculate the De-Broglie wavelength associated with 1 Mev proton(m_p=1.67x10^{-27} kg).	**[03]**	**May 2013**	
69)	Explain Heisenberg Uncertainty Principle and prove this principle using single slit Diffraction experiment. Derive it in energy and time (May2014)	**[06]**	**May 2013 Dec2013 Dec2014 May2014 Dec2015**	
70)	Explain in brief, working of Scanning Tunneling Microscope (STM). [	**[04]**	**May2014**	
71)	What accelerating potential would be required for a proton with zero initial velocity to acquire a velocity corresponding to its de-Broglie wavelength of 10^{-10} m. [Given: mp = 1.67×10^{-27} kg].	**[03]**	**May2014**	
72)	Explain the normalization of wave function (sub que 2014) What is wave function ψ ? Write down the conditions satisfied by wave function ψ . **[4]**	**[04]**	**Dec2013 Dec2014 Dec2015**	
73)	Calculate the energy difference between the ground state and first excited state of an electron in the rigid box of length 1 A^0. **[3]**	**[03]**	**Dec2013**	
74)	Calculate the energy and momentum of an electron confined in a rigid box of width $2A^0$ for lowest energy state.	**[04]**	**May 2013**	
75)	Does the matter waves are electromagnetic waves? Explain.	**[03]**	**May 2013**	
76)	An electron is trapped in a rigid box of width 2 A^o . Find its lowest energy level.	**[03]**	**Dec2014**	
	Superconductivity			
77)	Explain the Phenomena of Super-conductivity. Explain Type - I and Type - II Super-conductors.	**[06]**	**Dec 2012 Dec2013 Dec2014 May2015**	
78)	Explain BCS Theory of Super-conductivity.	**[04]**	**Dec 2012 Dec2013 May2014**	
79)	State and explain : (a)Meissner Effect (b)Persistent Current / Critical field (Dec15)	**[03]**	**Dec 2012 Dec2015**	
80)	Differentiate between Type-I and Type –II Superconductor with diagram.	**[04]**	**May 2013**	
81)	Explain two applications of Superconductivity List of any 6 applications (May2014 May 2015)	**[03]**	**May 2013 May2014/15**	

82)	Explain Meissner effect and Critical magnetic field for superconductivity.	**[06]**	**May 2013 Dec2014 May2014 May and Dec2015**	
83)	Explain AC-DC Josephson effect	**[04]**	**Dec2013**	
84)	Explain any two applications of superconductor	**[04]**	**Dec2014**	
	Physics of Nanoparticles			
85)	Explain any two applications of Nano-technology.	**[04]**	**Dec 2012 May2014 Dec2015**	
86)	Explain any two properties of Nano-particle.	**[03]**	**Dec 2012 Dec2015**	
87)	Explain Synthesis of Metal Nano-particle by Method Collidal Route.	**[06]**	**Dec 2012 Dec2013 Dec2014**	
88)	Explain the synthesis of nanoparticles through colloidal route with diagram .//Any Physical method of synthesis of nanopartical (May 2014)	**[06]**	**May 2013 May2015**	
89)	Explain the optical and electrical properties o f nanoparticles./// Electrical and Structural (May2014) Medical Application (May2015)	**[04]**	**May 2013 May2014**	
90)	Explain the applications of nanoparticles in medical and electronic industry. Auto industry (Dec2014)	**[03]**	**May 2013 Dec2014**	
91)	Explain following properties of Nano-particles: i) Optical property. ii) Electrical property.	**[04]**	**Dec2013 Dec2014 May2015**	
92)	Explain the applications of nano particles in medical and electronic field.	**[03]**	**Dec2013**	