



SYED AMMAL ENGINEERING COLLEGE

An ISO 9001:2008 Certified Institution
Dr. E.M.Abdullah Campus, Ramanathapuram – 623 502.



DEPARTMENT OF PHYSICS

UNIT I - CRYSTAL PHYSICS

PART A

1. Define space lattice. **(Dec 2014, Dec 2009, May 2008)**
2. What is meant by single crystal?
3. Distinguish between crystal and amorphous **(Dec 2014)**
4. Define basis of the crystal.
5. How does a crystal structure form?
6. Distinguish primitive and non-primitive unit cell. **(June 2014, May 2011, Nov 2005)**
7. What is meant by Unit cell? **(Jan 2009)**
8. What are the Lattice parameters of a unit cell? **(Jan 2013)**
9. Name the seven Crystal Systems. **(Jan 2010)**
10. What are Bravais Lattices? **(May 2015, Jan 2013, Jan 2010, May 2010)**
11. What is Bravais lattice ? How many lattice types are possible in 3-D space ? **(Dec 2015)**
12. Define Co-ordination number. **(Dec 2014, Dec 2004)**
13. Define atomic radius **(Dec 2014, Jan 2006)**
14. Define packing factor and what is its unit? **(May 2015, June 2014, May 2007, April 2003)**
15. How carbon atoms are arranged in diamond and graphite structure? **(Dec 2015)**
16. Describe diamond structure. What type of bond is present in diamond ? **(Jan 2012)**
17. Write the uses of Graphite?
18. What are the various growth techniques under melt growth? **(Jan 2014)**
19. What are the limitations of Bridgman Technique?
20. A unit cell has the dimensions $a=b=c = 4.74 \text{ \AA}$ and $\alpha=\beta=\gamma= 60^\circ$. What is its crystal structure? **(Jan 2006)**
21. What are Miller Indices? **(Dec 2014, May 2014, May 2004, May 2003)**



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22. Draw the planes for Miller Indices (100), (110), and (111). **(Jan 2009, Jan 2006, May 2004)**
23. A crystal plane cuts at $3a$, $4b$ and $2c$ distance along the crystallographic axes. Find the miller indices of the plane. **(June 2014)**
24. Calculate the d-spacing of (321) plane of simple cubic unit cell of lattice constant 0.41nm . **(May 2015)**

PART B

1. What are Bravais lattices? Describe using diagrams of unit cell, the different Bravais lattices and their grouping into seven crystal systems. **(Dec 2014, Dec 2011, Jan 2010)**
2. Explain the No. of atoms, atomic radius, Co-ordination number, Packing factor for SC, FCC, BCC structures. **(May 2015, Jan 2013, Jan 2010, Jan 2009, Dec 2002)**
3. Explain HCP structure. Show that for an HCP structure $c/a = \sqrt{8/\sqrt{3}}$ and hence Calculate Packing Fraction for HCP structure **(or)** Determine the coordination number and packing density for hexagonally closed packed structure. Show that a HCP structure demands an axial ratio of 1.6333 **(May 2015, Dec 2015, June 2014, Jan 2014, Jan 2009, Apr 2003)**
4. Show that the FCC and HCP structures have the same atomic packing factor. **(May 2015, Dec 2015, May 2004)**
5. Derive the expression for the Inter planar spacing or d-spacing for (hkl) planes of a cubic structure. **(Or)** Write the procedure for finding the Miller Indices. Show that for a cubic lattice the distance between two successive planes (hkl) is given by $d = a/\sqrt{h^2+k^2+l^2}$ **(May 2015, Dec 2015, May 2004)**
6. Give the Procedure to find the Miller indices and write a note on graphite structure. **(May 2015, Dec 2014, Jan 2010)**



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7. Describe Bridgman and czochralski method of growing crystals. What are the advantages and limitations in these methods? **(May 2015,Dec 2015,Jan 2014,June 2014, Dec 2014)**
8. Explain Chemical Vapour Deposition (CVD) and Physical Vapour Deposition (PVD) for growing thin film crystals. **(Jan 2014)**
9. Explain the solution growth techniques for growing the crystal also give its merits and demerits.



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UNIT-II - PROPERTIES OF MATTER AND THERMAL PHYSICS

PART- A

1. Define stress and strain and write down their units. **(Apr 2003)**
2. What do you infer from stress-strain diagram?
3. Define elastic limit of a body
4. Define young's, bulk and rigidity modulus of material. **(Dec 2011, Dec 2009, Apr 2007)**
5. State Hooke's law. **(May 2010)**
6. Define Poisson's Ratio. **(Jan 2014)**
7. Give the relation between the three moduli of elasticity.
8. Define neutral axis.
9. Define bending moment of a beam **(May 2002)**
10. How do temperature and impurity in a material affect the elasticity of the materials? **(May 2015)**
11. Name the factors which affect the elasticity of the body. **(Dec 2014)**
12. A elastic wire is cut into half its original length. How will it affect the maximum load the wire can support ? **(Dec 2015)**
13. What is thermal conduction? Define thermal conductivity in solid. **(Dec 2014)**
14. Define convection and radiation process
15. State Newton's law of cooling **(May 2015, Jan 2014, June 2014)**

PART B

1. Draw stress - strain diagram and discuss the behavior of ductile material under loading.
2. What young's, bulk and rigidity modulus of material? Derive the relation between the three elastic moduli. **(Dec 2011, Dec 2009, Apr 2007)**



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3. What is meant by bending of beams? Derive the expression for internal bending moment of a beam in terms of radius of curvature. **(May 2015, Jan 2014)**
4. Give an account of I shaped girders. **(May 2015, Jan 2014)**
5. What is cantilever? Derive an expression for depression at the free end of a cantilever, due to load. Describe an experiment to determine the Young's modulus of cantilever material using this expression. **(May 2015, Jan 2014, Dec 2014, Nov 2002)**
6. Derive the expression for Young's modulus of the material of the beam by uniform bending method and give the experimental procedure to find it. **(Dec 2014, Jan 1989)**
7. A copper wire of 3 m length and 1 mm diameter is subjected to a tension of 5 N. Calculate the elongation produced in the wire if the Young's modulus of elasticity of copper is 120 GPa. **(Jan 2014)**
8. Define Coefficient of thermal conductivity. Describe with relevant theory the method of determining the coefficient of thermal conductivity of a bad conductor by Lee's method. **(Jan 2014, Dec 2014)**
9. Discuss the radial flow of heat and hence derive an expression for the quantity of heat conducted through any section in unit time and Describe methods of determining thermal conductivity of rubber. **(May 2015)**
10. Derive expression for effective thermal conductivity through compound media in series and parallel. Also discuss the application of it. **(Dec 2014)**
11. Derive the equation for one dimensional flow of heat and solve it, under steady state condition. **(Jan 2014)**
12. State and explain Newton's law of cooling. How to experimentally verify it?



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UNIT-III - QUANTUM PHYSICS

PART – A

1. What is black body radiation?
2. State planck's hypothesis or assumptions **(Dec 2008)**
3. Define Wien's displacement law and Rayleigh - Jeans law. **(Dec 2014)**
4. Give the statement for Planck's law of radiation.**(Jan 2009)**
5. What is Compton Effect? Write an expression for Compton wavelength.**(Jan 2008)**
6. What is Compton wavelength? Give its value **(Jan 2014)**
7. What is Compton wave length? Does it depend on the wave length of the source?
(May 2015)
8. What are matter waves? **(Dec 2004)**
9. What are the properties of matter waves?**(Nov 2002)**
10. What is the physical significance of a wave function?**(May 2015, Dec 2014, Jan 2013, Jan 2009, Jan 2003)**
11. How de-Broglie justified his dual nature concept? **(May 2002)**
12. Write an expression for the de-Broglie wave length of matter waves? **(Dec 2014, May 2006)**
13. Write an expression for the de-Broglie wave length associated with electrons.
(Dec 2001)
14. Write down schrodinger time independent and time dependent wave equation **(Jan 2004)**
15. What do you meant by eigen value and eigen function. **(Jan 2004)**
16. For a free particle moving within a one dimensional potential box, the ground state energy cannot be zero. Why?
17. Calculate the minimum energy of an electron can possess in an infinitely deep potential well of width 4 nm. **(May 2015, Dec 2015)**



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18. What is the principle of electron microscope? **(Nov 2001)**
19. What is the principle of scanning electron microscope? **(May 2015)**
20. What is the principle of transmission electron microscope?

PART – B

1. Derive an expression for Planck's radiation law and discuss the same shorter wavelength and longer wavelength **(or)** What are the postulates of quantum theory of radiation? Derive the expression for Planck's quantum theory of radiation and also give its deduction to Wien's displacement law & Rayleigh-Jeans law. **(May 2015, Jan 2014, June 2014, Dec 2014, May 2008, May 2004).**
2. Derive the expression for the wavelength of scattered X-ray photon from a material and explain the experimental verification of Compton Effect **(or)** Derive an expression for Compton shift and show that it is independent of the wave length of incident photon. **(or)** Derive an expression for the change in wave length suffered by an X-ray photon when it collides with an electron. **(May 2015, Dec 2015, Dec 2014, May 2007)**
3. Derive the expression for de-Broglie wavelength for matter waves. Express the de-Broglie Wavelength in terms of Energy. Mention the characteristics of matter waves? And Explain in detail G.P Thomson's gold foil experiment that proved the existence of matter waves. **(May 2015)**
4. Derive Schrodinger's time independent and time dependent wave equation. **(May 2015, Jan 2013, Jan 2010, Jan 2004)**
5. Derive Schrodinger's wave equation for a particle in a box. Solve it to obtain Eigen function and show that Eigen values are discrete. **(or)** Derive the time independent Schrodinger's wave equation and by using it, find the wave function of a particle in 1-D potential well. **(or)** Solve Schrodinger's wave equation for free particle in a one



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dimensional box and find its energy value. **(May 2015, June 2014, Dec 2014, Jan 2004)**

6. Discuss the construction, working and applications of Scanning Electron Microscope. Also mention its advantages and disadvantages. **(Dec 2015, Dec 2014, Jan 2014, June 2014, Jan 2013)**
7. Explain the principle, construction, working and applications of Transmission Electron Microscope. Also mention its advantages and disadvantages. **(Dec 2014, Jan 2011)**
8. Distinguish between Scanning Electron Microscope (SEM) and Transmission Electron Microscope (TEM). **(Dec 2015)**



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UNIT IV – ACOUSTICS AND ULTRASONICS

PART – A

1. How to classify sound based on frequency (**or**) Enumerate the ways in which sound is classified. **(Jan 2005, June 2005)**
2. Distinguish between loudness and intensity of sound. **(Dec 2002)**
3. What is absorption coefficient? Mention its unit. **(Dec 2014, Dec 2005)**
4. Define sound intensity level and write its unit. **(Jan 2006)**
5. State weber-Fechner law. **(Jan 2006, Dec 2002)**
6. What is a decibel? **(Jan 2005)**
7. Define reverberation and reverberation time of an auditorium. **(May 2007, Dec 2001, Dec 2002)**
8. What are the requisites for a good auditorium? (**or**) What are the acoustical factors to be considered while we construct a building? (**or**) What are the requirements for good acoustics? **(Dec 2003, Jan 2002, Dec 1997)**
9. How to control reverberation in a hall? **(Jan 2004)**
10. Define standard reverberation time **(Dec 2002)**
11. Write down Sabine's formula for reverberation time **(Jan 2006)**
12. Mention any four sound absorbing materials. **(May 2004)**
13. How will you ensure adequate loudness in a hall? **(May 2005)**
14. What is focusing? **(Dec 2004)**
15. Mention the properties of ultrasonic. **(Jan 2011, Jan 2010, Jan 2009, Dec 2004)**
16. Can we use copper rod in magnetostriction generator. why? **(Jan 2014)**
17. Why not ultrasonics be produced by passing high frequency alternating current through a loud speaker? **(Nov 2004)**



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18. Are ultrasonic wave's electromagnetic waves. Give proper reason to your answer. **(Jan 2014, Dec 1997)**
19. Name the method by which ultrasonic waves are produced. **(May 2004)**
20. What is magnetostriction effect? How it is used for production of ultrasound? **(Dec 2015)**
21. Mention the applications of ultrasonic waves. **(Dec 2014)**

PART – B

1. Derive Sabine's formula for the reverberation time of a hall. Explain the growth and decay of sound energy **(OR)** Derive the expression for rate of growth and rate of decay of average energy of the sound in a hall. Hence derive an expression for reverberation time of the hall assuming that the average energy absorbed by all surface in one second to be equal to $E v A / 4$. Where E , v and A represent average energy density, speed of the sound and total absorption by the surface respectively. **(May 2015, Jan 2014, Jan 2006, Jan 2005)**
2. Explain the various factors affecting the architectural acoustics of a building and their remedies. **(or)** Explain in detail the acoustics demands of a hall. **(Dec 2015, Dec 2014, Dec 2002)**
3. Using Sabine's formula, explain how the sound absorption co-efficient of the material is determined ? **(May 2003)**
4. What is magnetostriction effect? Explain how ultrasonic waves can be produced by magnetostriction oscillator. Also mention its advantages, disadvantages and applications. **(Dec 2014, Dec 2005, May 2007)**
5. What is piezo electric effect? Describe the production of ultrasonic waves by piezo electric oscillator method. Discuss its advantages, disadvantages and applications. **(May 2015, Jan 2014, June 2014, May 2006)**



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6. What is acoustic grating? How it is used to find the velocity of ultrasonic waves in liquid medium? **(Jan 2012)**
7. Explain the process of Non-destructive testing to find flaw in materials using ultrasonic waves by pulse echo method. **(May 2015, Dec 2015, June 2014, May 2007)**
8. Describe the different modes of scanning used in ultrasonic imaging technique. **(Dec 2015, Jan 2010, Jan 2009)**
9. What is sonogram? Describe the principle and working of sonogram. **(Jan 2010)**



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UNIT V - PHOTONICS AND FIBER OPTICS

PART – A

1. What are the characteristics of laser? **(May 2003, May 2001)**
2. What is normal population, population inversion and metastable? **(Dec 2014)**
3. What are the conditions to achieve laser action? **(Dec 2014, Dec 2008)**
4. Compare the characteristics of laser with ordinary source of light. **(Jan 2003)**
5. Distinguish between spontaneous and stimulated emission. **(May 2015, Jan 2013)**
6. What is pumping? What are the different methods of pumping? **(Dec 2008, May 2003)**
7. Write down any two uses of laser in medicine. **(Dec 2013)**
8. How are laser classified? **(May 2003)**
9. Why Nd:YAG laser is more efficient than Ruby Laser? **(Dec 2015)**
10. Can a two level system be used for production of Laser? Why? **(Jan 2014)**
11. What is the role of Nitrogen and Helium in CO₂ laser? **(June 2014)**
12. What is the role of resonator in laser? **(Jan 2004)**
13. What are the pumping methods used Nd:YAG laser and semiconductor laser? **(Dec 2014)**
14. Define acceptance angle. **(Jan 2003)**
15. Define numerical aperture. **(June 2014, May 2007, Dec 2003)**
16. Why optical fibres are called wave guides? **(Dec 2002)**
17. What is the principle of optical fibre?
18. Why four level is preferred compared to three level lasers? **(May 2015)**
16. What are Einstein co-efficients? **(Jan 2009)**
17. What is population inversion and how it is achieved? **(Jan 2009)**
18. What is optical pumping? **(Jan 2009)**
19. What is meant by active medium in laser? **(May 2005)**
20. What are the three important components of any laser device? **(Jan 2008)**



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21. What is the basic principle of optical fiber communication system? **(Jan 2009)**
22. What is meant by attenuation? **(Dec 2008)**
23. What are the uses of optical fiber? **(Dec 2014)**
24. Draw the block diagram of optical fiber communication system. **(May 2015)**
25. What are the active and passive sensors? **(Dec 2014)**
26. Give any four advantages of optical fiber communication system. **(Dec 2015, Jan 2014)**

PART – B

1. What is stimulated emission? Explain the existence of stimulated emission using Einstein's theory. **(or)** Derive the expression for the Einstein's coefficient of spontaneous and stimulated emissions. **(Jan 2010)**
2. Describe principle, construction and working of a Nd:YAG laser with neat diagram. Also mention its advantages, disadvantages and applications. **(May 2015, Jan 2013, Jan 2010)**
3. Describe the vibrational modes of CO₂ molecule.
Describe the construction and working of CO₂ laser with energy level diagram. Discuss its advantages. **(Dec 2015, Jan 2014, June 2014, Dec 2014, Jan 2011, Jan 2010)**
4. With suitable diagram explain how the laser action is achieved in homo junction and Hetero junction semiconductor laser. **(Jan 2005)**
5. Explain total internal reflection with suitable diagram. Derive the expression for Numerical aperture and Acceptance angle. **(Dec 2015, Dec 2014, Nov 2000)**



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6. How optical fibers are classified based on modes, material and refractive index profile. How are signals transmitted through them. **(May 2015, June 2014, Dec 2014, Dec 2006)**
7. What is the basic principle of fiber optic communication? Draw the block diagram of an optical Fibre communication system and explain the working. Give the advantages of Optical Fibre communication over other conventional communication system. **(Jan 2013)**
8. Write a note on bending losses in an optical fiber. **(Jan 2009)**
9. Explain the construction and working of displacement and temperature fiber optical sensors. **(Jan 2014, Jan 2009)**