Q1. Explain how materials be distinguished in terms of surface morphology? Describe an experiment to determine the crystal structure of crystalline material. (4)

Q2. What is meant by close packed crystal structures? Describe such structures.(3)

Q3. Calculate number of atoms in 1.4 nm Pt nanoparticle if the density of Pt is 21.5 grams/cm^3. (3)

Q4. Explain why the low-dimensional materials systems exhibit exotic properties. (3)

Q5. What is De-Brogle hypothesis? How it helps to evolve length scale for optical property of semiconductor. (3)

Q6. Calculate length scales for InP material in determining optical property given that $m_e = 0.07\ m_o$, $m_h = 0.4\ m_o$ and $\varepsilon = 14$.

Q7. What is an exciton? Describe the excitons that can be created in different semiconductors. (3)

Q8. What is meant by binding energy of exciton? Derive an expression for calculating the binding energy of exciton. (4)

Q9. Explain the anomalous melting points of metallic nano particles. (3)

Q10. Starting from Grapheen, how other carbon nano materials be derived. (3)

Q11. What are the chemical routes to obtain large quantities of graphene oxide. (3)

Q12. How PVD techniques be utilised to produce CNT. How SWCNT can be produced in these techniques.

Q13. Explain quantum tunnelling. How this principle is utilised in constructing Scanning probe microscopy. (4)

Q14. Explain an experimental technique to determine the occupied and un-occupied energy states around Fermi level of a nanostructured sample. (3)

Q15. Explain principle of Atomic Force Microscopy and important parts of the system (3)