

B.Sc. DEGREE END SEMESTER EXAMINATION MARCH 2017

SEMESTER – 2: PHYSICS (COMPLEMENTARY COURSE FOR B Sc CHEMISTRY)

COURSE: 15U2CPPHY4: ELECTRIC AND MAGNETIC PHENOMENA, THERMODYNAMICS AND
ELEMENTARY SOLID STATE PHYSICS*(Common for Regular 2016 Admn. / Supplementary 2015 & 2014 Admn.)*

Time: Three Hours

Max. Marks: 60

PART AVery short answer questions, Answer **all** questions. Each question carries 1 Mark.

1. How do you differentiate between polar and non-polar dielectrics? Give one example each.
2. What do you mean by magnetic susceptibility? What is its physical significance?
3. What is meant by thermodynamic equilibrium?
4. Define packing fraction in crystals. Which is the most densely packed structure amongst the various cubic structures?
5. What is the significance of Miller indices in defining crystalline planes?
6. Determine the efficiency of a heat engine working between temperatures 30K and 300K.
7. Define a heat engine. Write down the expression for its efficiency.
8. What do you mean by enthalpy of a system? How is it different from the internal energy of the system? (1 x 8 = 8)

PART BShort Answer questions, Answer **any six** questions. Each question carries 2 Marks.

9. Briefly discuss the various sources which contribute to the total polarizability of a dielectric material.
10. Distinguish between diamagnetic and ferromagnetic materials pointing out four differences. Give one example for each.
11. Briefly discuss ferromagnetic domains.
12. Define packing fraction and Coordination number in crystals? Deduce both of them in case of a face centered cubic lattice system.
13. Illustrate the concept of reciprocal lattice system in crystals. Substantiate the need of this concept over direct lattice system.
14. Explain the crystalline structure of sodium chloride.
15. Explain why gases have two specific heats. Why is the specific heat at constant pressure (C_p) is greater than the specific heat at constant volume (C_v)
16. Write down the two statements of the second law of thermodynamics. (2 x 6 = 12)

PART C

Problem/Derivations, Answer **any four** questions. Each question carries 5 Marks.

17. In a crystal, a lattice plane cuts intercepts of $1a$, $2b$ and $3c$ along the axes where a , b and c are primitive vectors of the unit cell. Determine the Miller indices of the given plane.
18. The distance between the adjacent planes in a calcite crystal is 3.04 \AA . Find the wavelength for which first order Bragg reflection occurs at 12.5° .
19. State and explain the relation connecting the displacement vector, polarization vector and the electric field in a dielectric.
20. A magnetic material has a magnetization of 2300 A/m and produces a flux density of 0.00314 Wb/m^2 . Calculate the permeability and the relative permeability of the material.
21. An inventor claims to have developed an engine working between 700K and 300K capable of having an efficiency of 60% . Check whether his claim is valid or not.
22. Air at Normal temperature and pressure (NTP) is compressed adiabatically to half its volume. Calculate the change in its temperature. (5 x 4 = 20)

PART D

Essay, Answer **any two** questions. Each question carries 10 Marks.

23. Obtain the expression for the capacitance of a parallel plate capacitor having a dielectric medium between the plates.
24. Derive Bragg's law for crystal diffraction. Describe an experimental method to study crystal structures using X-Ray diffraction.
25. Briefly discuss the origin of paramagnetic behavior. Derive and discuss Langevin's theory of paramagnetism
26. Derive Maxwell's thermodynamic relations.

(10 x 2 = 20)
