B. Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2020
SEMESTER - **2: PHYSICS (COMPLEMENTARY COURSE FOR CHEMISTRY)**
COURSE: **15U2CPPHY4: ELECTRIC AND MAGNETIC PHENOMENA, THERMODYNAMICS AND ELEMENTARY SOLID STATE PHYSICS**

(For Supplementary/Improvement 2018 / 2017 / 2016 / 2015 / 2014 Admissions)

Time: Three Hours   Maximum Marks: 60

PART - A (Very short answer questions)
Answer all questions. Each question carries 1 Mark

1. Write down the Gauss's law in dielectrics.
2. Write down the relation connecting relative permeability and magnetic susceptibility.
3. Why the net magnetization of an antiferromagnetic material zero?
4. What are the basic requirements for a system to be in thermodynamic equilibrium?
5. What is Clausius statement of the second law of thermodynamics?
6. What happens to the entropy of the working substance during the Carnot cycle?
7. What is the difference between a primitive and a non-primitive unit cell?
8. Using a suitable figure, show the basic lattice parameters.   (1 x 8 = 8)

PART - B (Short Answer)
Answer any *six* questions. Each question carries 2 Marks

9. Distinguish between no-polar and polar dielectrics.
10. Discuss the different sources of polarizability in dielectrics.
11. Explain the domain theory of ferromagnetic materials.
12. What do you mean by a thermodynamic process? Distinguish between isochoric and isobaric processes.
13. Using a suitable block diagram, discuss the working principle of a refrigerator. What is meant by the term co-efficient of performance of a refrigerator?
14. State the third law of thermodynamics. What is its physical significance?
15. Draw the (111) and (110) planes of a simple cubic lattice.
16. Explain the seven crystal systems in terms of the lattice parameters.   (2 x 6 = 12)

PART - C (Problem/Derivations)
Answer any four questions. Each question carries 5 Marks

17. A rod of magnetic material 0.2 m long, 10 mm diameter and of relative permeability 1000 is placed inside a long solenoid wound with 300 turns/m. If a current of 0.5 A is passed through the rod, determine the magnetic moment of the rod.

18. A quantity of dry air at 300 K is compressed suddenly to one third of its volume. Determine the change in temperature. Given, $\gamma = 1.4$.

19. A Carnot engine whose low temperature reservoir is at 7 degree Celsius has an efficiency of 50 %. If it is desired to increase the efficiency to 70 %, by how many degrees should the temperature of the high temperature reservoir be increased?

20. One mole of oxygen gas expands isothermally to four times of its volume. Determine the change in entropy. Given, the gas constant R=8.314 J/mol/K.

21. Determine the ratio of intercepts of a (213) plane on the three axes of a simple cubic crystal.

22. The first order spectrum of a beam of X-rays diffracted by a crystal corresponds to an angle 3 degrees. Given that, the distance between the planes is 3A°. Determine the wavelength of the X-rays used. (5 x 4 = 20)

PART - D (Essay)

Answer any two questions (Each question carries 10 marks)

23. Obtain the Gauss's law in presence of a dielectric medium.

24. Explain the Carnot cycle with a neat PV diagram. Obtain an expression for the work done in a Carnot cycle.

25. Obtain Maxwell's thermodynamic relations from thermodynamic potentials.

26. What do you mean by the term packing fraction of a unit cell? Determine the packing fraction of a simple cubic, face centered cubic and body centered cubic crystal.

(10 x 2 = 20)

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