Reg. No. : ....

Name : ....

II Semester M.Sc. Degree (Reg./Suppl./Imp.) Examination, April 2019
(2014 Admission Onwards)
CHEMISTRY
CHE 2C07 : Physical Chemistry – II

Time : 3 Hours
Max. Marks : 60

SECTION – A

Answer **all** questions. **Each** question carries **one** mark.

1. What are microstates and macrostates ?

2. Explain Stirling approximation.

3. Differentiate between Fermions and Bosons.

4. What is 'chiral pitch' in liquid crystal ?

5. What is Frenkel defect ?

6. Calculate the spin only magnetic moment of a square planar complex $[Ni(CN)_4]^{2-}$.

7. What do you mean by space group ?

8. What is the probable lattice type of crystalline material which give 111, 200, 113, 220, 222 XRD reflections ?

SECTION – B

Answer **eight** questions. Answer may be in **two** or **three** sentences. **Each** question carries **two** marks.

9. What is the translational partition function for argon confined to a volume of 1L at 298 K.

10. Define rotational temperature. Explain its significance.

P.T.O.

11. Account for the anomalous heat capacity behaviour of H_2 at low temperature.

12. ^{3}He will not show Bose-Einstein condensation. Why ?

13. Distinguish between planar and schlieren textures of liquid crystals with example.

14. Exemplify the concept of residual entropy.

15. What kind of defects would you expect to predominate in crystals of the following:
    a) NaCl doped with $MnCl_2$ and
    b) A piece of aluminium that has been hammered into a thin sheet.

16. How does the electrical conductivity of a metal change with temperature ? Give reasons.

17. Explain the phenomenon of piezo electricity with suitable example.

18. Molybdenum forms body-centered cubic crystals and, at 20°C, the density is 10.3 g cm^{-3}. Calculate the distance between the centers of the nearest molybdenum atoms.

19. Write down and explain Bragg's equation.

20. Calculate the structure factor for a cubic unit cell of AB in which the B atoms occupy the body-centered position.

SECTION – C

Answer **four** questions **each** in a paragraph. **Each** question carries **3** marks.

21. Calculate the standard molar entropy of gaseous argon at 25°C.

22. Define equipartition principle. Calculate C_v for ammonia using equipartition principle.

23. Write a brief note on thermionic emission based on free electron gas concept.

24. What is photoconductivity ? Explain with examples. What are important uses of such compounds ?

25. What do you mean by F-centers ? How are they created ?

26. Explain Meissner effect. Distinguish between Type I and Type II superconductors with suitable examples.

27. Calculate the ratio of the radii of small and large spheres for which the small spheres will just fit into octahedral sites in a close-packed structure of the large spheres.

28. Enlist the possible Bravais lattices and cell parameters for a cubic crystal system.

SECTION – D

Answer either **A** or **B** of **each** question. **Each** question carries **6** marks.

29. A) Derive Sackur-Tetrode equation for entropy of an ideal mono-atomic gas.

    OR

    B) Deduce an expression for vibrational partition function.

30. A) Compare Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics.

    OR

    B) Diagrammatically explain nematic, smectic and chiral phases in liquid crystals with suitable examples.

31. A) Explain the occurrence of para, ferro, antiferro and ferri magnetism in solids, with the help of suitable theories.

    OR

    B) Explain Band theory. How does band theory explain the conductivity in solids ?

32. A) Describe powder X-ray diffraction method for structure determination of solids.

    OR

    B) Briefly discuss Debye-Scherrer method of X-ray analysis.

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