MAR IVANIOS COLLEGE (AUTONOMOUS)
THIRUVANANTHAPURAM

Reg. No. :…… **Name :…….**

Third Semester B.Sc. Degree Examination, November 2015
First Degree Programme under CBCSS
Complementary Course: Chemistry – III (for Physics)
AUCH331.2d: Physical and Inorganic Chemistry I

Time: **3** Hours Max. Marks: **80**

SECTION – A

*Answer **ALL** questions in a word or one or two sentences.*

1. Give the expression to determine the RMS velocity of a gas.
2. The average number of collisions suffered by a single molecule per unit time per unit volume of a gas is called _____.
3. a = b = c ; α = β = γ = 900, represent _____ Crystal system.
4. What is meant by Miller indices ?
5. How is standard free energy change related to equilibrium constant ?
6. For the reaction: $CaCO_3$ (s) ⇄ CaO (s) + CO_2 (g), Kp = _____.
7. What is meant by conjugate acid – base pair ?
8. Name two metals that can be refined by the Van Arkel method.
9. What is the role of carbon monoxide in the refining of crude nickel ?
10. Why are nanomaterials chemically more reactive than their bulk forms ?

(10 × 1 = 10 Marks)

SECTION – B

*Answer any **EIGHT** questions, not exceeding a paragraph.*

11. What is meant by Boyle temperature of a gas ?
12. State the law of corresponding states.

13. What is meant by Joule Thomson effect ?
14. Crystalline solids are anisotropic. Comment.
15. Calculate the number of atoms present in a unit cell of body centered cubic lattice.
16. Why is chemical equilibrium considered dynamic ?
17. Kp for a reaction at 801 K and 953 K are 98 and 10.5 respectively. Calculate ΔH, assuming ΔH to be a constant in the above temperature range ?
18. What is Arrhenius concept of acids and bases ?
19. A buffer solution contains 0.40 mole of acetic acid and 0.20 mole of sodium acetate per litre. Calculate the pH of the solution, K_a of acetic acid = 1.75×10^{-5}.
20. Distinguish between calcination and roasting.
21. What is zone refining ? What are its applications ?
22. How is AFM useful in measuring nano structures ?

(8 × 2 = 16 Marks)

SECTION – C

*Short essay type : Answer any **SIX** questions.*

23. Define mean free path. How does it vary with
    i). increase in temperature.
    ii). decrease of pressure.
24. What are the causes for the deviation of real gases from ideal behaviour ? Deduce the modified gas equation for real gases.
25. Derive the Bragg's equation.
26. What are liquid crystals ? How are they classified ?
27. On the basis of Le Chateliers principle, explain the influence of pressure and temperature in the Haber process for the manufacture of ammonia.
28. Explain the buffer action of a mixture of acetic acid and sodium acetate.
29. Discuss the relationship between the occurrence of metals and the standard electrode potential.
30. Write a short note on the mechanical properties of nanomaterials.
31. Discuss briefly the two different approaches in nanofabrication.

(6 × 4 = 24 Marks)

SECTION – D

*Long essay type : Answer any **TWO** questions.*

32. Describe Linde's and Claude's process for the liquefaction of gases.
33. How can the crystal structure of NaCl deduced from X – ray diffraction studies ?
34. Derive expressions for the hydrolysis constant of a salt of strong acid and a weak base and its degree of hydrolysis.
35. What are the chief ores of titanium ? Explain how pure titanium can be obtained from one of them.

(2 × 15 = 30 Marks)

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