



MAR IVANIOS COLLEGE (AUTONOMOUS)
THIRUVANANTHAPURAM

Reg. No. :.....

Name :.....

Third Semester B.Sc. Degree Examination, November 2016

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 one or two sentences.

1. Which among the following statements is **not correct** regarding Boyle temperature:
(a) The temperature at which the attractive forces and the repulsive forces acting on the gas particles balance out is termed as Boyle temperature; (b) It is the temperature at which a non ideal gas behaves most like an ideal gas; (c) At the Boyle temperature the second virial coefficient, $B_2(T)$ becomes always zero.
2. Write the expression for root mean square velocity in terms of Boltzmann constant and temperature.
3. Check whether the following statement is true or false. If it is false, correct it.
The potassium chloride adopts a body-centered cubic structure.
4. Define the term *single crystal*.
5. Write Le Chatelier's principle.
6. Identify the Lewis base in the following reaction:
$$\text{SiF}_4 + 2 \text{F}^- \rightarrow \text{SiF}_6^{2-}$$
7. Name an amphoteric substance. Why is it called so ?
8. Name **any one** mineral containing Thorium.
9. Mention **any two** applications of Au nano – particles.
10. Expand AFM. What is it ?

(10 × 1 = 10 Marks)

P.T.O.

SECTION – B

Short answer type: Answer any EIGHT questions.

11. Explain the term *Lycurgus cup* in the context of nano – science.
12. What is the basic principle of transmission electron microscopy ?
13. What is the significance of Kroll process in the metallurgy of Ti ?
14. Explain the technique of roasting in the context of the sulphide ores of Cu and Zn.
15. What is meant by *buffer index* ?
16. Arrive at Henderson equation starting from the following expression:

$$[H^+] = K_a \frac{[Acid]}{[Salt]}$$

17. Explain the notion of conjugate acid – base pairs.
18. Write an expression to calculate the pH of the hydrolysed salt Solution of Sodium Acetate. Assume that you know the K_w , K_a and concentration.
19. Name **any four** crystal systems from the category of *seven crystal systems*. Draw them schematically.
20. Explain the mode of alignment of layers in cholesteric liquid crystals. What is its significance ?
21. State the law of corresponding states.
22. Explain the term *mean free path*.

(8 × 2 = 16 Marks)

SECTION – C

Short essay type: Answer any SIX questions.

23. Explain the basic principle of scanning tunneling microscopy.
24. Mention the metallurgical processes involved in the isolation of *Uranium* from its ore.
25. Define the term *buffer solution*. Can the aqueous solution of ammonium acetate be a buffer solution ? Explain your answer.
26. Mention the significance of Van't Hoff isotherm.
27. Describe the role of temperature and pressure on the formation of ammonia from nitrogen and hydrogen.
28. Draw the Bravais lattices for orthorhombic crystals.

29. In a diffraction experiment with X – rays of wavelength 1.54 \AA , a diffraction line corresponding to $2\theta = 20.8^\circ$ is observed. Find the inter – planar separation in Å .
30. Explain Joule–Thomson effect. Define Joule–Thomson coefficient. How is it related to C_p ?
31. Differentiate between Linde’s process and Claude’s process.

(6 × 4 = 24 Marks)

SECTION – D

Long essay type: Answer any TWO questions.

32. Write notes on (a) electrolytic refining of metals; (b) zone – refining for metals; and (c) van – Arkel method.
33. Define salt hydrolysis. Consider the case of hydrolysis of sodium acetate. Find the relationship between K_h , K_a and K_w . Also prove that weaker the acid greater is the hydrolysis constant of the salt.
34. Describe *any five* techniques for the preparation of nano – particles.
35. Explain the essence of *powder diffraction technique* for the structural characterization of materials.

(2 × 15 = 30 Marks)

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