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Reg. No. :

Code No. : 7819

Sub. Code : WCHM 12/
VCHC 12

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2024.

First Semester

Chemistry — Core

STRUCTURE AND BONDING IN INORGANIC
COMPOUNDS

(For those who joined in July 2023 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (15 × 1 = 15 marks)

Answer ALL questions.

Choose the correct answer :

1. More electronegative substituent occupy the low electro negativity P_z , d_z^2 orbital in TBP structures. This is known as
- (a) Apicophilicity (b) Hybridisation
(c) Ionisation (d) Electron affinity

2. According to the VSEPR theory the order of repulsion between the electron pair is

- (a) $L_p - L_p > L_p - B_p > B_p - B_p$
(b) $B_p - B_p > L_p - B_p > L_p - L_p$
(c) $L_p - B_p = L_p - L_p > B_p - B_p$
(d) $L_p - B_p > L_p - L_p > B_p - B_p$

3. The bond angle in water is 104.5° . The p and s characters are respectively

- (a) 80 and 20 (b) 70 and 30
(c) 60 and 40 (d) 75 and 25

4. $(Si_2O_7)^{6-}$ is the general formula of _____ silicates.

- (a) meta (b) pyro
(c) ortho (d) closo

5. Which one of the polyacid is used in the qualitative analysis of phosphate?

- (a) Isopoly tungstate (b) Isopoly vanadate
(c) Isopoly molybdate (d) None

6. From Wade's rule the number of frame work electrons for the closo structure is _____

- (a) $2n + 2$ (b) $2n + 4$
(c) $2n + 6$ (d) $2n + 8$

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7. The limiting radius ratio for octahedral structure is _____
(a) 0.155 – 0.225 (b) 0.414 – 0.732
(c) 0.732 – 0.999 (d) none
8. Which one of the following correctly represents the orthorhombic system?
(a) $a \neq b \neq c$ (b) $a = b = c$
(c) $a \neq b = c$ (d) $a = b \neq c$
9. The symmetry element associated with the combination of a mirror and translation along the mirror is known as _____
(a) Glide plane (b) Screw axis
(c) Burger's vector (d) Mirror plane
10. The radius ratio of Rutile is _____
(a) 0.155 – 0.214 (b) 0.414 – 0.732
(c) 0.214 – 0.414 (d) above 0.730
11. Which of the following metal oxide do not adopt spinel structure?
(a) CO_3O_4 (b) Mn_3O_4
(c) CaO (d) None

12. Most of the superconductors crystallise in _____ crystal structure.
(a) Perovskite structure
(b) Spinels
(c) Rock salt
(d) Zinc blende
13. Intrinsic semiconductivity is due to
(a) thermal means (b) pressure
(c) doping (d) none
14. Hall effect is due to the reflection of _____ in a magnetic field.
(a) electrons in n – type semiconductor
(b) positive holes in p – type semiconductor
(c) both (a) and (b)
(d) none
15. Which of the following defects are known as stoichiometric defects?
(a) Schottky defect
(b) Frenkel defect
(c) Metal excess and deficient defect
(d) Both (a) and (b)



PART B — ($5 \times 4 = 20$ marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

16. (a) Construct the Born Heber cycle for the enthalpy of formation of NaCl.

Or

- (b) Write a note on Bents rule and apicophilicity.

17. (a) Explain with example two dimensional and three dimensional silicates.

Or

- (b) What are zintl ions? Draw the structure of any two zintl ions.

18. (a) Calculate void space in simple cubic close packing.

Or

- (b) What are the seven crystal classes? Give example.

19. (a) Write a note on the structure of cadmium iodide.

Or

- (b) Explain the sol-gel method of synthesis of crystals.

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20. (a) Explain the intrinsic semiconductors with example.

Or

- (b) Discuss one optical property (photo electric effect) of semiconductors.

PART C — ($5 \times 8 = 40$ marks)

Answer ALL questions, choosing either (a) or (b)
Each answer should not exceed 600 words.

21. (a) Discuss the molecular orbital theory of BeH_2 and CO_2 molecule.

Or

- (b) Derive Bron Lande equation. What are its disadvantages? How is it rectified using Kapustinski equation?

22. (a) Explain the structure and uses of one homo nuclear and hetero nuclear poly acid.

Or

- (b) Write a detailed note on :

- (i) Heteroborane
(ii) Metalloborane with examples.

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23. (a) How will you determine the crystal structure using X-ray diffraction method?

Or

- (b) Illustrate with examples the glide planes and screw axis.

24. (a) Explain the structure of
(i) fluorite (ii) zinc blende.

Or

- (b) Describe the hydrothermal method of synthesis of crystals with example.

25. (a) Discuss the Frenkel and Schottky defect with examples.

Or

- (b) What are colour centers? How are they classified? Explain the mechanism of colour centers.
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