

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE  
Second Semester B.Sc Chemistry Degree Examination, March 2018  
BCHE2B02 – Theoretical and Inorganic Chemistry – II  
(2017 Admission onwards)

Max. Time: 3 hours

Max. Marks: 80

**Section A (One word)***Answer all questions. Each question carries 1 mark.*

1. A homonuclear diatomic molecule with bond order 3 is .....
2. Which has the highest bond order CO or NO?
3. How many radial nodes does the 4p orbital have?
4.  $\nabla^2$  is called the .....operator.
5. .... value of lattice energy of a crystal favours the formation of ionic bond.
6. A wave function  $\psi$  satisfying the condition  $\int \psi \psi^* d\tau = 1$  is said to be.....
7. The points of zero probability for the wave function is called .....
8. The effect that results in a decrease in the force of attraction of the nucleus for an electron, caused by the presence of intervening electrons, is called .....
9. Which has lower electron affinity –lithium or beryllium?
10. Among  $O_2$ ,  $O_2^-$  and  $O_2^{2-}$ , the diamagnetic species is .....

**(10 x 1 = 10 Marks)****Section B (Short Answer)***Answer any ten questions. Each question carries 2 marks.*

11. Define *eigen value* and *eigen function*.
12. Give the Born-Landé equation and explain the terms.
13. Mention two differences between a sigma bond and a pi bond.
14. What is the state of hybridisation of N in  $NH_4^+$  molecule and what is the H-N-H bond angle in the ion?
15. How does ionization enthalpy vary along a period? Explain.
16. What are the conditions for effective linear combination between atomic orbitals?  
Explain
17. Explain the term diagonal relationship.
18. Give reason for the equal bond lengths in the case of carbonate and borate anions.
19. An electron is in 4f orbital. What possible values of quantum numbers  $n$ ,  $l$ ,  $m$  and  $s$  can it have?
20.  $Fe^{2+}$  ion is less stable than  $Fe^{3+}$  ion. Why?
21. Write the Schrodinger wave equation. Explain the Hamiltonian operator.
22. Which has higher boiling point – *o*-nitrophenol or *p*-nitrophenol? Why?

**(10 x 2 = 20 Marks)**

**Section C (Paragraph)**

*Answer any five questions. Each question carries 6 marks.*

23. The dipole moment of LiH is  $1.964 \times 10^{-29}$  Cm, and the interatomic distance between Li and H in this molecule is 1.596Å. What is the percent ionic character in LiH?
24. Explain the following intermolecular forces: (i) Keesom forces; (ii) Debye forces; (iii) London forces.
25. What is hybridisation?  $sp^3d$  hybridisation does not give fully equivalent orbitals. Explain.
26. State and explain the postulates of quantum mechanics.
27. Explain with examples, the applications of dipole moment measurement in structural elucidation of molecules.
28. Explain the Born-Haber cycle with respect to NaCl.
29. Write the MO configuration of NO molecule. Calculate its bond order and predict its magnetic property.
30. Distinguish between the terms electronegativity and electron affinity. Explain the variation of electronegativity along a period and down a group.

**(5 x 6 = 30 Marks)**

**Section D (Essay)**

*Answer any two questions. Each question carries 10 marks.*

31. Write down the Schrodinger wave equation for a particle in a one dimensional box, solve it and get expression for the energy of electron. Explain the term zero point energy.
32. (i) State the Slater's rules for calculating effective nuclear charge.  
(ii) Calculate the effective nuclear charge experienced by 3d electron of Cr. ( $Z = 24$ )
33. Discuss the hydrogen bonding. Taking suitable examples explain how it effect the physical properties of compounds.
34. (i) State the important postulates of VSEPR.  
(ii) Apply the theory to predict the shape of  $\text{ClF}_3$ ,  $\text{SF}_4$  and  $\text{XeF}_4$ .

**(2 x 10 = 20 Marks)**

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Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE  
**Second Semester B.Sc Chemistry Degree Examination, March 2018**  
**BCHE2C02 – Physical Chemistry**  
 (2017 Admission onwards)

Max. Time: 3 hours

Max. Marks: 64

**Section A(One word)**

*Answer all questions. Each question carries 1 mark*

1. An isobaric process is one in which the -----of the system is kept constant.
2. The SI unit of entropy change is -----
3. For an ideal gas the compressibility factor is equal to ----
4. The most probable velocity of a gas ----with increase in temperature.
5. ----defect is observed in ionic compound with cations and anions of comparable size.
6. For a cubic Bravais lattice maximum number of atoms per unit cell is ----
7. Which colligative property is useful for the determination of molecular mass of proteins?
8. Liquids with high intermolecular forces have ----viscosity.
9. The pH of acid solution in standard hydrogen electrode is ----.
10. The conductance of a conductor of unit length and unit area of cross section is called ----

**(10x1=10 Marks)**

**Section B (Short answer)**

*Answer any seven questions. Each question carries 2 marks*

11. Distinguish between intensive properties and extensive properties.?
12. Define entropy of fusion? How is it related to enthalpy of fusion?
13. Calculate the average velocity of nitrogen molecule at 25<sup>0</sup>C ?
14. Define Boyle temperature?
15. State and explain Henry's law?
16. Define surface tension?
17. Explain reverse osmosis?
18. Differentiate between equivalent conductance and molar conductance.
19. Write a note on calomel electrode?
20. Define ionic product of water?

**(7x 2=14 Marks)**

### Section C (Paragraph)

*Answer any four questions. Each question carries 5 marks*

21. Explain physical significance of Gibb's free energy?
22. Write short note on Schottky and Frenkel defects.
23. Discuss the Maxwell's distribution of molecular velocities and the effect of temperature in the distribution.
24. Derive the Van't Hoff equation for osmotic pressure
25. Explain the construction and working of H<sub>2</sub>-O<sub>2</sub> fuel cell?
26. What is buffer solution? What are different types of buffer? Explain buffer action?

**(4 x 5=20 Mark**

### Section D(Essay)

*Answer any two questions. Each question carries 10 marks*

27. (a) Discuss the entropy criteria for reversible and irreversible processes. (7)  
(b) The heat of reaction at constant pressure for the reaction  
 $\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l})$  is -93.45KJ . Calculate the heat of reaction at constant volume. (3)
28. Explain the classification of liquid crystals based on the structure
29. Define vapour pressure? Explain the effect of temperature and intermolecular forces on the vapour pressure of liquids.
30. Discuss the application of conductance measurement in conductometric titrations.

**(2 x 10=20 Mark**