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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Second Semester B.Sc Chemistry Degree Examination, March /April 2019

BCHE2B02 – Theoretical and Inorganic Chemistry – II

(2018 Admission onwards)

3 hours   Max. Marks: 80

Section A (One word)

Answer all questions. Each question carries 1 mark.

1. Sketch the shape of d_z^2 orbital.

2. The band theory is used to explain the bonding in ....

3. How many radial nodes does the $3s$ orbital have?

4. In the expression $\hat{A} f(x) = c f(x)$, c, is called ....

5. The unit of dipole moment is ....

6. The magnetic quantum number value for the valence electron of potassium $(Z = 19)$ is

   ....

7. The shape of SF_4 molecule is...........................

8. Lanthanoids and actinoids are collectively known as .... elements.

9. Atomic radii of elements .... along a period.

10. Arrange the following in the order of decreasing bond dissociation energy: O_2, O_2^-,

    O_2^+, O_2^{2+} and O_2^{2-} ....

                                                                        (10 x 1 = 10 Marks)

Section B (Short Answer)

Answer any ten questions. Each question carries 2 marks.

11. What are well behaved wave functions ?

12. Write the Born-Lande equation and explain the terms.

13. Mention the limitations of the octet rule.

14. Explain eigen equation with examples.

15. Which has higher ionisation enthalpy- nitrogen or oxygen? Explain.

16. What are the conditions for effective linear combination between atomic orbitals?

    Explain

17. Explain the term diagonal relationship.

18. Differentiate between a sigma bond and a pi bond.

19. Calculate the electronegativity of Al $(Z = 13)$ on Allred-Rochow scale, given its

    screening constant $= 3.5$ and covalent radius $= 1.25$ Å.

20. The ionic radii of K^+ is smaller than that of Cl^- even though they are isoelectronic. Why?

21. Write the Schrodinger wave equation for hydrogen atom.

22. Why is PCl_5 a reactive molecule?   **(10 x 2 = 20 Marks)**

Section C (Paragraph)
Answer any five questions. Each question carries 6 marks.

23. What are quantum numbers? Explain the significance of each quantum number.

24. Write a note on intermolecular forces.

25. Explain the shapes of NH_4^+, H_3O^+, C_2H_2 and SO_4^{2-} ions using the concept of hybridisation.

26. State and explain the any three postulates of quantum mechanics.

27. Discuss the effect of hydrogen bonding on the physical properties of substances with suitable examples.

28. Draw the Born-Haber cycle with respect to NaCl and explain the applications.

29. Draw the MO configuration of CO and NO molecule. Calculate its bond order and predict its magnetic property.

30. Explain with examples, the applications of dipole moment measurement in structural elucidation of molecules.

$$(5 \times 6 = 30 \text{ Marks})$$

Section D (Essay)
Answer any two questions. Each question carries 10 marks.

31. Derive the solution for the Schrodinger wave equation for particle in a one dimensional box.

32. (i) State the Slater's rules for calculating effective nuclear charge. What are its applications.

    (ii) Calculate the effective nuclear charge experienced by $3d$ electron of Cr. (Z = 24)

33. (i) Discuss the fajan's rule and its application

    (ii) Define lattice energy. How it is help full to predict solubility of compounds.

34. (i) Explain the salient features of the band theory of metallic bonding.

    (ii) How does the theory explain the electrical conductivity of metals?

$$(2 \times 10 = 20 \text{ Marks})$$

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE
Second Semester B.Sc Degree Examination, March /April 2019
BCHE2C02 – Physical Chemistry
(2018 Admission onwards)

Time: 3 hours   Max. Marks: 64

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

1. Give an example for extensive property?

2. The ------ of the universe is always increase in the corse of every spontaneous process.

3. For an exothermic process the enthalpy change is -------

4. For an ideal gas the compressiblity factor (z) is equal to ------

5. Give an example for liquid crystal.

6. The SI unit of coefficient of viscosity is --------

7. ------is equal for isotonic solutions at same temperature?

8. The specific conductance of an electrolyte --------with decrease in concentration.

9. The arrangement of elements in the increasing order of standard reduction potential is called ---

10. The liquid drop assume spherical shape due to------property of the liquid.

(10 x1=10 Marks)

Section B (Short answer)
Answer any seven questions. Each question carries 2 marks

11. State and explain first law of thermodynamics?

12. Distinguish between state function and path function?

13. Define entropy of vapourisation and sublimation?

14. State and explain Dalton's law of partial pressure?

15. State the law of rational indices?

16. Define surface tension?

17. Mention the factors influencing viscosity?

18. Distinguish between electronic conductor and electrolytic conductor?

19. What is salt bridge?

20. Write Nernst equation and explain the terms in it?

(7x 2=14 Marks)

Section C (Paragraph)
Answer any four questions. Each question carries 5 marks

21. Derive the relationship between change in enthalpy and change internal energy and explain their significance?

22. Discuss the causes for the deviation of real gases from ideal behaviour?

23. Write notes on element of symmetry?

24. State and explain Henry's law? Give examples.

25. State and explain Kohlrausch's law? Explain one of its applications?

26. Write note on H_2-O_2 fuel cell?

(4 x 5=20 Marks)

Section D(Essay)
Answer any two questions. Each question carries 10 marks

27. (a) Write the conditions for equilibrium and spontaneity in terms of change in free energy and entropy? **(7)**

    (b) Calculate the Gibb's energy at 500K for the reaction $2NO(g) +O_2(g) \rightarrow 2NO_2(g)$. The enthalpy change and entropy changes are -110KJ and -150JK^{-1} respectively. Predict the feasibility of the reaction at this temperature. **(3)**

28. Discuss the non- stoichometric defects in crystals ? **(10)**

29. (a) Describe Berkely and Hertely's method for the measurement of osmotic pressure? **(7)**

    (b) Calculate the osmotic pressure at 283K of a 7% solution of Urea.(Molar mass of urea 60 gmol^{-1}) **(3)**

30. (a) Write note on hydrolysis of salts ?

    (b) What are buffer solutions illustrate buffer action. **(5)**

(2x10=20marks)