44

1B2M20016 (Pages : 2) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Second Semester BSc Degree Examination, March/April 2020

BCH2B02 - Theoretical and Inorganic Chemistry – II

(2019 Admission onwards)

Time: 2 hours Max. Marks: 60

Section A (Short answers)
(Answer questions up to 20 marks. Each question carries 2marks)

1. Draw the radial distribution curves for 2*p* and 3*s*orbital of hydrogen atom.
2. Calculate λ of a particle of mass 6.9×10^{-19}kg with a kinetic energy of 1.047×10^{-12} J ($h = 6.626 \times 10^{-34}$ Js)
3. Explain the origin of Brackett series with the help of Bohr Theory.
4. Calculate the minimum energy required by photons to produce photoelectric effect with a metal that has a threshold frequency of $1.5 \times 10^{17} s^{-1}$.
5. Explain the significance of normalising a wave function.
6. Give an explanation for orbital degeneracy.
7. Among the two operators d/dx and $\sqrt{}$, one is linear. Explain
8. Draw and explain the structures of molecular orbitals formed by the combination of two *s* orbitals and combination of two *p* orbitals.
9. Identify the differences between molecular orbital theory and valence bond theory.
10. BeH_2 is linear but $SnCl_2$ is angular. Justify
11. Show that $(\cos ax)(\cos by)(\cos cz)$ is an eigenfunction of Laplacian operator.
12. Identify the bond angle in XeF_2. **[Ceiling of marks: 20]**

Section B (Paragraph)
(Answer questions up to 30 marks. Each question carries 5 marks)

1. Explain the importance of Davisson and Germer experiment.
2. Derive an expression for the radius of n^{th} Bohr orbit of hydrogen atom.
3. Explain Schrodinger wave equation in spherical polar coordinates and discuss the terms.
4. Write a note on the importance of expectation value in quantum mechanics.
5. Compare the stability of O_2 and F_2 with the help of molecular orbital theory.

18. The functions given are defined in the interval x = -a and x = +a.

$F_1(x) = N_1 (a^2-x^2)$ and $F_2(x) = N_2 x(a^2-x^2)$. Assume the values of the functions to be zero for x<-a and x> +a, calculate the normalization constants N_1 and N_2. Show that the above functions are orthogonal.

19. With the help of Molecular Orbital Theory explain the shape and hybridization of PCl_5 and SF_6.

[Ceiling of marks: 30]

Section C (Essay)
(Answer any one. Each question carries 10 marks)

20. What are postulates of quantum mechanics. Explain.

21. Explain the formation of H_2^+ with the help of molecular orbital theory.

[1 x 10 = 10]

45

1B2M20017 (Pages : 2) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Second Semester B.Sc. Degree Examination, March/April 2020

BCH2C02 - Physical Chemistry

(2019 Admission onwards)

Time: 2 hours Max. Marks: 60

Section A (Short answers)

(Answer questions up to 20 marks. Each question carries 2 marks)

1. What is meant by a state function? Give an example.
2. Distinguish between isobaric and isochoric process.
3. Define the term coefficient of viscosity. Give the SI unit of viscosity.
4. Explain why water exhibits capillary rise.
5. What is meant by ionic product of water? How does it vary with temperature?
6. The resistance of a 0.5M solution of an electrolyte placed between two platinum electrodes 20 cm apart and area of cross-section 4 cm^2 is 20 ohms.Calculate the molar conductance of the solution.
7. A sample of an ideal gas is allowed to expand from an initial volume of 0.20 L to a final volume of 3.50 L against a constant external pressure of 0.995 atm. At the same time, 117 J of heat is transferred from the surroundings to the gas. What is the total change in the internal energy of the gas in Joules?
8. Calculate the Miller indices of a plane which makes intercepts 1/2a, 1/2b, and c on the crystallographic axes .
9. What is meant by compressibility factor?
10. Write the Van der Waal 's equation for 'n' moles of a gas and explain the terms.
11. A sample of gas occupies a volume of 900 cm^3 at 27^0 C. Calculate the temperature at which it will occupy a volume of 300 cm^3, provided the pressure is kept constant.
12. Define osmotic pressure.

[Ceiling of marks: 20]

Section B (Paragraph)

(Answer questions up to 30 marks. Each question carries 5 marks)

13. Discuss the non - stoichiometric defects in crystals.
14. What are reference electrodes? Explain the construction and working of standard hydrogen electrode.
15. (a)Calculate the EMF of the cell $Zn_{(S)} \mid Zn^{2+}(aq, 0.01\ M) \parallel Cu^{2+}(aq, 1\ M) \mid Cu_{(S)}$.
    Given $E^0\ Zn^{2+}/Zn = -0.76$ V and $E^0\ Cu^{2+}/Cu = 0.34$ V. (3 marks)
    (b)Explain why the solution of K_2CO_3 is basic. (2 marks)
16. State and explain Kohlrausch 's law. Give three applications.
17. (a)At what temperature will a 5% solution of sucrose (molar mass = 342 g/mol) show an osmotic pressure of 4 atm?
    (b)Which among ethanol or diethyl ether will have higher vapour pressure and why?
18. Discuss the conductometric titration curves of
    (a) Strong acid against a weak base. (b) weak acid against weak base.
19. What are buffer solutions? Explain the buffer action of NH_4Cl-NH_4OH buffer.

[Ceiling of marks: 30]

Section C (Essay)

(Answer any one. Each question carries 10 marks)

20. (i) What is the physical significance of Gibb's Free energy? Explain the effect of temperature on the spontaneity of a reaction. (7 marks)
    (ii)The enthalpy change and entropy change for a process are 131 kJ and 134 kJ respectively. Calculate the minimum temperature above which the reaction is spontaneous. (3 marks)
21. (i)Explain Maxwell's distribution of molecular velocities. What is the effect of temperature in the distribution? (7 marks)
    (ii) Calculate the temperature at which the RMS velocity of O_2 gas will become equal to that of H_2 molecule at 27^0 C. (3 marks)

[1 X 10 = 10]