VTM NSS COLLEGE, DHANUVACHAPURAM
Department of Chemistry
Question bank for S1 Physics (Course code: CH 1131.1)
Theoretical and Analytical Chemistry

Section B (2 mark questions)

1. Name two indicators used in complexometric titrations.

2. What is a primary standard? Give an example.

3. The energy and subshell of an electron is described using which quantum numbers?

4. What is hybridisation?

5. Define Bohr Bury's rule.

6. Define isothermal and adiabatic process

7. Define closed and isolated systems with one example each.

8. Sketch $d_{x^2-y^2}$ and d_{xy} orbitals

9. Write down the hybridisation and shape of NH_3 and CH_4 molecules.

10. State two types of hydrogen bonding with examples

11. Ice has less density than water. Why?

12. Name the indicator used in the titration of HCl and NH_4OH. Why?

13. Give the significance of the term heat and energy

14. What are the advantages of redox titrations?

15. Give the mathematical form of first law of thermodynamics

16. What is meant by error in analytical determination?

17. What is Rydberg equation?

18. Explain the stability of half filled and completely filled orbitals.

19. Discuss Fajan's rule

20. Bond angle of water is different from normal tetrahedral bond angle. Why?

21. What is molarity?

22. What is the difference between equivalence point and end point?

23. Give two factors which determine the lattice energy of an ionic compound.

24. What is a secondary standard? Give one example

25. Distinguish between sigma and pi bonds

26. What is energy sequence rule?

27. What is meant by bond order?

28. What is ionisation enthalpy and electron affinity?

29. State second law of thermodynamics.

30. A solution is prepared by dissolving 2g NaOH in distilled water to give 250 mL solution. Calculate the molarity of the solution.

31. Compare the lattice energy of the crystals LiCl and MgO

32. Give the mathematical relationship of Gibbs free energy.

33. The solubility of AgCl in water is 0.00278g/L. Calculate the solubility product of AgCl

34. Define entropy and internal energy.

35. Write Gibbs-Helmholtz equation and explain each terms in the equation.

36. How does the strength of intermolecular forces affect the boiling point of a liquid?

37. How can we prepare 2M, 500 ml NaOH solution (Mol wt. of NaOH = 40)

38. The K_{sp} of $PbBr_2$ is 4×10^{-6} at 300K. Find out the solubility of $PbBr_2$ at this temperature

39. Define the property of a system which regarded the measurement the disorder in it .

40. How does the concept of hybridisation explain the geometry of acetylene molecule?

Section C (4 mark questions)

41. What is an ionic bond? Discuss the factors which favour the formation of ionic bond.

42. Write a note on spontaneity of a chemical reaction

43. Explain the dsp^3 hybridisation

44. Derive Gibbs-Helmholtz equation

45. Define heat capacity of gases. How they are related?

46. Define VSEPR theory. What are the applications and its limitations?

47. Explain the principle of dichrometric titrations

48. Briefly discuss the energetic of ionic bond formation

49. Describe how hydrogen bonding affects the boiling point of compounds.

50. Describe the Born-Haber cycle considering the formation of NaCl

51. Discuss the theory of redox indicators

52. What is common ion effect? What are its applications?

53. What are transition elements? Write any three general characteristics

54. State and explain Fajan's rule

55. Explain Pauling's scale of electro negativity

56. Show that $C_p - C_v = R$ for one mole of an ideal gas.

57. Explain principle of permanganometric titrations

58. Explain how paper chromatography is carried out. Write any two of its applications.

59. What are spontaneous and non-spontaneous processes? Explain

60. Explain sp^3d2 hybridisation.

61. How will you analyse a compound qualitatively?

62. What are the significance of Pauli's exclusion principle?

63. Explain Mullikan's approach of electro negativity

64. Describe the titration curve of a strong acid with weak base

65. Distinguish between orbit and orbital

66. Discuss the theory of acid-base indicators

67. Derive expression for the frequency of spectral lines of hydrogen atom.

68. Explain atomic spectra of hydrogen atom.

69.   State the Heisenberg's uncertainty principle and its significance.

70. Explain the shape of SF_6 molecule

71. Water (H_2O) exists as liquid while hydrogen sulphide (H_2S) is a gas at room temperature. Why?

72. Discuss hydrogen bond with examples.

73. Define dipole moment. What is the dipole moment of CO_2?

74. Give an account on salting out process.

75. Explain the action of phenolphthalein indicator.

76.   Briefly discuss iodometric and iodimetric titrations

77. Derive an expression for work done in the reversible isothermal expansion of an ideal gas.

78. What is spontaneity? Explain spontaneity in terms of entropy and free energy.

79. Discuss energetic of chemical bond formation using hydrogen molecule as example.

80.   Draw and explain the titration curve of a weak acid - strong base titration with suitable example. Mention the indicator used.

Section D (15 mark questions)

81. Explain the applications of thin layer chromatography.

82. (a) What is common ion effect? What are its applications?

    (b) What is the significance of ΔG and ΔH?

83. Explain hydrogen bond and its consequences.

84. What is titration curve? Discuss the titration curve for the neutralisation of

    (a) strong acid $\times$ strong base

    (b) strong acid $\times$ weak base

85. What are quantum numbers? Discuss.

86. (a) Six moles of an ideal gas expand isothermally and reversibly from a volume of 1 dm^3 to a volume of 10 dm^3 at 27°C. What is the maximum work done? Express the result in Joules.

    (b) Explain various electro negativity scales.

87. Discuss the MO diagram of O2 molecule, its bond order, stability and magnetic behaviour.

88. Define hybridisation and its characteristics. Explain sp, sp^2, sp^3 and dsp^2 hybridisation with examples.

89. (a) Derive Gibbs-Helmholtz equation

    (b) Show that the decrease in G in a process is equal to the useful work done by the system.

90. Briefly outline the use of the principle of common ion effect and solubility product in the separation of cations in qualitative analysis.

91. (a) Discuss Bohr's theory, its merits and demerits.

    (b) Explain the origin of atomic spectra.

92. (a) What is Hund's rule of maximum multiplicity? Apply this rule to explain the electronic configuration of nitrogen atom and hydrogen atom.

    (b) Explain the significance of four quantum numbers.

    (c) What are the limitations of Bohr Theory?

93. (a) What are sp^3d, sp^3d^2, sp^3d^3 hybridisations?

    (b) Write the geometry of $BeCl_2$, PCl_5, SF_6, IF7.

    (c) Which is more polar - HF or HCl. Why?

94. (a) What are polar and non polar covalent bonds?

    (b) Discuss the consequences of hydrogen bonding.

(c) Discuss inter and intra molecular hydrogen bonding with examples.

95. (a) Draw the MO diagrams of N2 and O2 molecules

(b) Which is paramagnetic? Why?

(c) Calculate the bond order.

96. (a) Explain Beer's law and Lambert's law.

(b) Discuss the principle of calorimetry

(c) Explain the calorimetric estimation of iron.

97. (a) What are acid-base indicators?

(b) Explain the use of indicators in acid-base titrations.

(c) Write the action of methyl arrange indicator.

98. (a) Why does the heat capacity of a gas at constant volume differ from that at constant pressure?

(b) Derive the relation between Cp and C_v.

(c) What is internal energy and enthalpy?

99. (a) What is meant by reversible process?

(b) Derive an expression for work done in the reversible isothermal expansion of an ideal gas.

(c) Calculate the work done in expanding one mole of an ideal gas from a volume of 2 dm^3 to 20 dm^3 at 27∘C.

100. (a) Calculate q, W, ΔU and ΔH for the reversible isothermal expansion of one mole an ideal gas at 27∘C from a volume of 10 dm^3 to 20 dm^3.

(b) Show that maximum work is produced in a reversible isothermal expansion of a gas.