Q.P. Code – 42434

Fourth Semester B.Sc. Degree Examination, April/May 2019

(CBCS Scheme)

Paper IV – CHEMISTRY

Time : 3 Hours] *[Max. Marks : 90*

Instructions to Candidates :

1. *The questions paper has 2 parts A & B. Both the parts should be answered.*
2. *Write the equations/diagrams wherever necessary.*

PART – A

Answer any **TEN** of the following questions. Each question carries 2 marks. **(10 × 2 = 20)**

1. Why are the sizes of 4d and 5d transition elements almost same?
2. Explain ionization isomerism with an example.
3. Write the formulae of
   (a) Tetrachloro nickelate (II) ion
   (b) Tetra aqua dichloro chromium (III) chloride.
4. State any two differences between Schottky and Frenkel defects.
5. Write the unusual oxidation states of iron with examples.
6. What are the units of rate constant for a zeroth and first order reaction?
7. Calculate RMS velocity of O_2 molecules at 300 K.
8. What is pairing energy? Under what conditions does d^4 system form low spin complex.
9. Define activation energy. Write an expression to calculate activation energy.
10. What are Latimer diagrams?
11. Write an expression for Vanderwaal's reduced equation of state and explain the terms involved.
12. Mention any two limitations of collision theory.

PART – B

Answer any **SEVEN** questions in this Part. Each question carries 10 marks. **(7 × 10 = 70)**

13. (a) How do you prepare KM_nO_4 from M_nO_2? Give equation.

(b) All transition elements exhibit variable valency. Explain.

(c) What are paramagnetic substances? Calculate the magnetic moment of CO^{3+}. **(4 + 3 + 3)**

14. (a) What is lanthanide contraction? Discuss the causes and consequences of Lanthanide contraction.

(b) Compare the properties of lanthanides with that of actinides.

(c) Discuss the aqueous chemistry of Cu (I) and Cu (II). **(4 + 3 + 3)**

15. (a) Explain the formation, geometry and magnetic properties of $[N_i(CN)_4]^{2-}$ on the basis of VBT.

(b) What are inner orbital and outer orbital complexes? Give example.

(c) Define crystal field stabilization energy. Calculate CFSE for Fe^{3+} in a strong field and weak field. **(4 + 3 + 3)**

16. (a) Discuss the postulates of VBT.

(b) Explain optical isomerism taking $[CO(en)_3]^{3+}$ as an example.

(c) Write a note on Jahn-Teller distortion. **(4 + 3 + 3)**

17. (a) Explain the magnetic nature of $[COF_6]^{3-}$ and $[CO(NH_3)_6]^{3+}$ on the basis of CFT and calculate their magnetic moments.

(b) Discuss the electronic spectrum of $[V(H_2O)_6]^{3+}$ ion.

(c) Mention the factors affecting magnitude of 10 Dq. **(4 + 3 + 3)**

18. (a) Derive an expression for rate constant of a second order reaction when initial concentrations of the reactants are different.

(b) Show that for a first order reaction, the time required for 75% completion is twice the half life of the reaction.

(c) Explain the terms activated complex and transition state. **(4 + 3 + 3)**

19. (a) Derive an expression for most probable velocity (CMP).

    (b) (i) State Joule-Thomson effect

    (ii) Define the terms Joule-Thomson coefficient and inversion temperature.

    (c) The critical constants of HCl are T_C = 325 K and $V_C = 8.10 \times 10^{-5}$ m^3 mol^{-1}. Calculate Vanderwaals constant of the gas. **(4 + 3 + 3)**

20. (a) Discuss the procedure for the experimental determination of co-efficient of viscosity using Ostwald's viscometer.

    (b) How can you distinguish I order and II order reactions in terms of half life periods of the reactions?

    (c) Define (i) axis of symmetry (ii) plane of symmetry (iii) centre of symmetry. **(4 + 3 + 3)**

21. (a) Draw Andrew's isotherm plots of carbondioxide. State any three observations made from these plots.

    (b) Draw velocity distribution curve of a gas at different temperatures. State any two notable observations made from this curve.

    (c) Explain the terms :

    (i) Surface tension

    (ii) Viscosity of a liquid. **(4 + 3 + 3)**

22. (a) Explain how the structure of NaCl determined by rotating crystal method.

    (b) Calculate systematically the miller indices for the plane with intercepts (a, -2b, -3c).

    (c) Draw a neat diagram of simple, face centered and body centered cubic cell. **(4 + 3 + 3)**

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