R7603	Sub. Code
	536101

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2022.

First Semester

Chemistry

INORGANIC CHEMISTRY – I

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the questions.

1. The compound that gives a basic solution in HF is:

   (a) AsF5 (b) PF5

   (c) BF3 (d) BrF3

2. The geometry of H2S and its dipole moment are

   (a) linear and non-zero

   (b) linear and zero

   (c) angular and zero

   (d) angular and nonzero

3. Which of the following most stable complex?

   (a) $[Cu(H_2O)_6]^{2+}$ (b) $[Cu(en)_3]^{2+}$

   (c) $[Cr(SCN)_6]$ (d) $[Cu(en)_2(H_2O)]^{2+}$

4. Which of the following distorted octahedral complex?

(a) $[Mn(H_2O)_6]^{2+}$ (b) $[Fe(H_2O)_6]^{3+}$

(c) $[Cr(H_2O)_6]^{2+}$ (d) $[Cr(H_2O)_6]^{3+}$

5. According To Crystal Field Theory, Ni^{2+} can two have unpaired electrons in

(a) Octahedral geometry only

(b) Square planar geometry only

(c) Tetrahedral geometry only

(d) Both octahedral and tetrahedral geometry

6. Which of the following statement is incorrect?

(a) VBT cannot explain the formation of coordination covalent bonds.

(b) VBT fails to explain the magnetic properties of oxygen molecule.

(c) VBT does not explain the bonding in electron-deficient molecules.

(d) VBT fails to explain the hybridization of coordination complex.

7. In which of the following defect is created when an atom/cation leaves its original place in the lattice structure?

(a) Schottky defect

(b) Frenkel defect

(c) Metal excess defect

(d) Interstitial defect

8. What is the coordination number of atom in a HCP?

(a) 8 (b) 12

(c) 6 (d) 10

9. The pair of lanthanides with the highest third-ionization energy is:

(a) Eu, Gd (b) Eu, Yb

(c) Dy, Yb (d) Lu, Yb

10. Which of the following lanthanide ion is paramagnetic?

(a) La^{3+} (b) Ya^{2+}

(c) Lu^{3+} (d) Eu^{2+}

Part B $(5 \times 5 = 25)$

Answer **all** the questions, choosing either (a) or (b).

11. (a) Discuss Types of chemical bonds.

Or

(b) Discuss the process of Born Haber cycle.

12. (a) Explain the VBT using octahedral complexes.

Or

(b) Explain the Crystal Field stabilization Theory using octahedral complexes.

13. (a) Write short notes on angular overlap.

Or

(b) Write short notes on semi empirical methods.

14. (a) Describe the HCP structure density of cubic crystals.

Or

(b) Describe the short notes on A_2B type crystal.

15. (a) Write a short note on uses of Lanthanides and their compound.

Or

(b) Explain the spectral properties of Lathanides and Actinides.

Part C $(5 \times 8 = 40)$

Answer any **five** questions.

16. Explain concept of hybridization and molecular configuration of homo- and hetero nuclear diatomic molecules using MO theory.

17. Explain the Lattice energy principle and drive the equation of Born Land equation

18. Describe the factors affecting the magnitude of the spectrochemical series.

19. Explain the Jahn Teller distortion effect in geometry tetrahedral and octahedral complexes.

20. Explain the Ligand Field theory and extended Huckel theory.

21. Explain the sigma- and pi bonding octahedral theory using MOT.

22. Describe the crystal structure of AB type crystals of NaCl and CsCl.

23. Describe the detailed notes on Lanthanides occurrences and its relationship of oxidation state and size.

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M.Sc. DEGREE EXAMINATION, NOVEMBER 2022.

First Semester

Chemistry

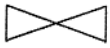
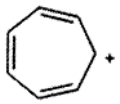
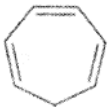
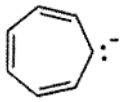
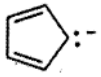
ORGANIC CHEMISTRY – I

(CBCS – 2022 onwards)

Time : Three Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** questions.

1. The IUPAC name  of s.
   (a) Bicyclo [2,2] pentane
   (b) Spiro [2,2] pentane
   (c) Spiro [2,1,0] pentane
   (d) Bicyclo [2,1,0] pentane
2. Which compound is not aromatic compound
   (a) 
   (b) 
   (c) 
   (d) 

3. Which of the following order of relative strength of acids is correct

(a) $CH_3COOH<HCN<H_2O<C_2H_5OH$

(b) $CH_3COOH<HCN<H_2O>C_2H_5OH$

(c) $CH_3COOH>HCN>H_2O>C_2H_5OH$

(d) $CH_3COOH>HCN>H_2O<C_2H_5OH$

4. Ionization of m-and p-substituted benzoic acid is a reference reaction Used in _____.

(a) Hammett equation

(b) Taft equation

(c) Dimroth's equation

(d) yukawa-Tsuno equation

5. Choose the correct one, which will react faster in the SN2 nucleophilic substitution reaction:

(a) $CH_3—CH=CH2=Br$

(b) $CH_2=CH–CH_2—Br$

(c) $CH_2=CH—CH_2=Br$

(d) $CH \equiv C—CH_2—Br$

6. What will be the reactivity of chlorobenzene in an electrophilic substitution reaction with benzene.

(a) Reacts very slowly than benzene

(b) Reacts in the same way as benzene

(c) Reacts faster than benzene

(d) Does not react with benzene

7. The concept of stereochemistry is based on:

(a) Molecular orbital theory

(b) Van't Hoff and Lebel's theory

(c) Free radical mechanism

(d) S_N2 mechanism

8. The order of stability of the different conformations of cyclohexane is:

(a) Chair form>boat form>twist boat form

(b) Chair form>twist boat form >boat form

(c) Twist boat form >boat form>chair form

(d) Boat form >chair form>twist boat form

9. The six conformers of butane are

(a) Four staggered and two eclipsed

(b) Two staggered and four eclipsed

(c) All six staggered

(d) Three staggered and three eclipsed

10. Which incorrect about alkyl bromide having molecular formula $C_5H_{11}Br$?

(a) One isomeric alkyl bromide undergoes E1 elimination at the fastest rate

(b) Only one is incapable of reacting by the E2 mechanism

(c) Only one isomer gives a single alkene on E2 elimination

(d) 2-Bromopentane gives the most complex mixture of alkenes on E2 elimination

Part B $(5 \times 5 = 25)$

Answer **all** questions, choosing either (a) or (b).

11. (a) Explain hyperconjugation with example.

Or

(b) Why higher annulenes exhibit two sets of ^1H NMR signals? Explain.

12. (a) Distinguish between kinetic controlled reaction and thermodynamic controlled reaction.

Or

(b) Discuss the significances of sigma and rho constants.

13. (a) Compare the features of S_N1 and S_N2 reactions. Discuss the factors that dictate the course of aliphatic nucleoplubic substitution reaction.

Or

(b) Discuss the mechanism of benzyne involved in aromatic nucleophile substitution.

14. (a) Draw Newman projection formula for erythro-2 bromo-3-chlorobutane and threo-2 bromo-3-chlorobutane.

Or

(b) Explain the E-Z notations with example.

15. (a) What is conformational analysis? Explain.

Or

(b) Write short note on Woodward reaction.

Part C $(5 \times 8 = 40)$

Answer any **five** questions.

16. Write short note(s) on

(a) Inductive effect;

(b) Resonance effect. (4+4)

17. (a) Distinguish between nonaromatic and antiaromatic compounds.

(b) What are annulenes? Indicate he numbers of inner hydrogens and outer hydrogens for [16]-annulene. (4+4)

18. Discuss briefly the isotope labeling and crossover experiments are useful in the analysis of mechanism of organic reactions. Explain with suitable examples.

19. Write short note(s) on

(a) Hammond postulate;

(b) Taft equations (4+4)

20. Distinguish between E_2 and E_1CI mechanisms with suitable example.

21. Discuss the stereochemistry of compounds containing sulphur and nitrogen atoms.

22. Write the Cahn-Ingold-Prelog rules and indicate how they can be used to assign the R/S configuration of chiral centres.

23. Write the confirmation, stability, and optical activity of cis, trans decalin.

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R7605	Sub. Code
	536103

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2022

First Semester

Chemistry

PHYSICAL CHEMISTRY — I

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A $(10 \times 1 = 10)$

Answer **all** questions.

1. Choose the wrong statement about the spin of an electron, according to quantum mechanics

   (a) It is related to intrinsic angular momentum

   (b) Spin is the rotation of an electron about its own axis

   (c) Value of the spin quantum number must not be 1

   (d) +1/2 value of spin

2. If the uncertainty in the velocity of a moving object is $1.0 \times 10^{-6}\ ms^{-1}$ and the uncertainity in its positions is 58m, the mass of this object is approximately equal to that of

   (a) Deuterium (b) Lithium

   (c) Electron (d) Helium

3. How many properties can be held by a group?

   (a) 2 (b) 3

   (c) 5 (d) 4

4. A cyclic group is always ————————

(a) Abelian group (b) Monoid

(c) Semi group (d) Sub group

5. The average rate and instantaneous rate of a reaction are equal

(a) At the start (b) At the end

(c) In the middle (d) Time interval equal to zero

6. If the rate of reaction is expressed by rate = $A[A]^2[B]$, the order of reaction will be

(a) 2 (b) 3

(c) 1 (d) 0

7. Which of the following follows the Carnot theorem?

(a) Heat engines (b) Gas turbine engines

(c) Gas compressors (d) All of the mentioned

8. Heat and work are ————————

(a) Point functions

(b) System properties

(c) Path functions

(d) Intensive and extensive properties

9. The law that explains the thickness of absorbing light and an optical path of light is

(a) Beer-lamberts law

(b) Grothus-Draper law

(c) Stark-Einstein's law

(d) None of these

10. The light formed from a chemical reaction is called

(a) Luminescence

(b) Bioluminescene

(c) Chemiluminescence's

(d) All of the above

Part B $(5 \times 5 = 25)$

Answer **all** questions, choosing either (a) or (b).

All questions carry equal marks.

11. (a) Describe Planck's three experimental observations that explain the photoelectric effect.

Or

(b) State Heisenberg's uncertainte principle Give its mathematical expression.

12. (a) Identify the point groups for the following

(i) $POCl_3$ (ii) SF_6

(iii) Br_2 (iv) $Ni(CN)_4^{2-}$.

Or

(b) Explain reducible and irreducible representations.

13. (a) Explain Lindemann-Hinshelwood mechanism.

Or

(b) Derive Nernst-Einestin equation.

14. (a) Explain Carnot's cycle.

Or

(b) State and explain 1st law of thermodynamics.

15. (a) Explain Grothus-Draper law.

Or

(b) Write short notes on quantum yield.

Part C $(5 \times 8 = 40)$

Answer any **five** questions.

Essay type questions.

16. Explain Bohr's correspondence principle with suitable examples.

17. Discuss in detail about symmetry elements and symmetry operations with suitable examples.

18. Derive Eyring equation.

19. Discuss the Maxwell relations.

20. Discuss in detail about Jablonski diagram.

21. Give an account on solar energy conversion.

22. Derive the Schroedinger equation for 1-D box.

23. Derive and explain Bronsted-Bjerrum equation.

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R7606	Sub. Code
	536052

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2022

First Semester

Chemistry

INSTRUMENTAL METHODS OF ANALYSIS

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A $(10 \times 1 = 10)$

Answer **all** the questions.

1. Rf value is ————————

   (a) Distance travelled by the compound at it's point of maximum

   (b) Distance travelled by the standard

   (c) Solvent travelled

   (d) None of the above

2. Which force is at work in Paper Chromatography?

   (a) Hydrogen bonding

   (b) London force

   (c) Electric static force

   (d) All of the above

3. Which of the following error is caused by poor calibration of the instrument?

(a) Random error (b) Gross error

(c) Systematic error (d) Precision error

4. In an experiment, it is found that the experimental value is very close to actual value, hence the experimental value can be called ————————

(a) Accurate (b) Precise

(c) Suitable (d) Mean

5. Which of the following is the principle of Atomic Absorption Spectroscopy?

(a) Radiation is absorbed by non-excited atoms in vapour state and are excited to higher states

(b) Medium absorbs radiation and transmitted radiation is measured

(c) Colour is measured

(d) Colour is simply observed

6. Which of the following is not a fuel used in flame photometry?

(a) Acetylene (b) Propane

(c) Hydrogen (d) Camphor oil

7. Which of the following is also known as X-ray photoelectron spectroscopy?

(a) Auger electron spectroscopy

(b) Electron impact spectroscopy

(c) Electron spectroscopy for chemical analysis

(d) Secondary ion mass spectroscopy

8. The resolving power of TEM is derived from

(a) Electrons (b) Specimens

(c) Power (d) Ocular system

9. The limiting current in a linear sweep voltammogram is related to:

(a) The standard reduction potential for the redox couple under investigation

(b) The reduction potential of the reference electrode

(c) The point at which concentration polarization begins

(d) The concentration of the analyse of interest

10. Which of the following electrochemical methods requires the formation of an insoluble form of the analyte?

(a) Electrogravimetry (b) Coulometry

(c) Potentiometry (d) Voltammetry

Part B $(5 \times 5 = 25)$

Answer **all** the questions, choosing either (a) or (b).

11. (a) Explain the working principle of Gas Chromatography (GC).

Or

(b) Explain the theory of chromatography.

12. (a) Write short notes on Random and normal errors.

Or

(b) Discuss the Significant figures.

13. (a) Explain the principle and application of atomic absorption spectroscopy (AAS).

Or

(b) Describe the short notes on Mass Spectrometry.

14. (a) Explain the principle and application of X-ray diffractometer (XRD.

Or

(b) Explain the principle and application of Atomic force microscopy (AFM).

15. (a) Write a principle and application of amperometric technique.

Or

(b) Write a short note on Electrogravimetry.

Part C $(5 \times 8 = 40)$

Answer any **five** questions.

16. Explain the principle and application of LC/MS and HPLC.

17. Describe the basics of paper and thin layer chromatography.

18. Discuss the classification of errors.

19. Explain the principles and applications of Flame photometry and Atomic emission spectrometry

20. Explain the principles and applications of SEM and TEM

21. Explain the principles and applications of TG, DTA and DSC.

22. Explain the basics and application of electrochemical sensors.

23. Explain the principles and applications Potentiometry and Electrogravimetry.

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