Course Code: 07ATB1/07ATZ1

VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

Residential & Autonomous – A Gurukula Institute of Life-Training
Re-accredited (3rd Cycle) with 'A' Grade (CGPA 3.59 out of 4.00) by NAAC
[Affiliated to Madurai Kamaraj University]

B.Sc. Botany/zoology Degree (Semester) Examinations, November 2020

Part – III: ALLIED Subject: First Semester: Paper – I

Course Title: CHEMISTRY FOR BIOLOGIST – I

Under CBCS and OBE – Credit 4

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL questions **(10 x 1 = 10)**

1) The …….. formula of a chemical compound is a graphical representation of the molecular structure.
   (a) Molecular (b) Structural (c) Empirical (d) Isomeric
2) Which of the following compounds may exist as cis-trans isomers?
   (a) 1-butane (b) 2-butene (c) cyclopropane (d) acetone
3) Nucleoophiles are ……. in nature.
   (a) electron rich (b) electron deficient
   (c) both electron rich and electron deficient (d) electron withdrawing
4) Ethyl acetoacetate exhibits which of the following isomerism
   (a) optical isomerism (b) geometrical isomerism
   (c) tautomerism (d) enantiomerism
5) Homolytic fission results in the formation of:
   (a) Carbocation (b) Carbanion (c) Free radicals (d) All the above
6) The stability of carbonium ion is influenced by:
   (a) Resonance (b) Inductive effect (c) both (a) and (b) (d) none of the above
7) Enzymes are
   (a) substances synthesized by chemists to decrease the reaction rate
   (b) highly porous substances to activate acids and bases
   (c) extremely poor in catalytic activity
   (d) catalysts found in organisms
8) When excited singlet molecule (S_1) return to ground state (S_0) with the emission within 10^{-8} second after absorption process, is called
   (a) fluorescence (b) phosphorescence (c) quantum yield (d) chemiluminescence
9) Which of the following is used as an indicator in volumetric analysis?
   (a) sodium hydroxide (b) sodium carbonate
   (c) oxalic acid (d) methyl orange
10) The equivalent weight of sulphuric acid is ……..
   (a) 49 (b) 98 (c) 23 (d) 100

SECTION – B

Answer any FIVE questions **(5 x 2 = 10)**

11) Define molecular formula.
12) What is meant by tautomerism?
13) Draw the geometry of methane and state its hybridization.
14) What do you mean by photochemical reaction?
15) What are catalysts? Give examples.
16) Write any two characteristics of primary standard solution.
17) Define indicator with an example.

SECTION – C

Answer ALL questions **(5 x 5 = 25)**

18) a) An organic substance contains the following percentage composition of elements. C= 18.6%; H=1.55%; Cl=55.04% and O=24.81%. Calculate its empirical formula.

(OR)

b) Explain geometrical isomerism with examples?

19) a) Explain Nucleophiles and its types with examples.

(OR)

b) Write the differences between resonance and tautomerism.

20) a) Write short notes on the hybridisation of carbon in methane.

(OR)

b) Write the differences between homolytic and heterolytic fission.

21) a) What are catalytic poisoning and promoters? Give examples.

(OR)

b) Discuss chemiluminescence with examples.

22) a) Write the principles of volumetric estimation.

(OR)

b) Explain with examples: i) Normality ii) Molarity

SECTION – D

Answer any THREE question **(3 x 10 = 30)**

23) What is meant by isomerism? How is it classified? Explain structural isomerism with examples.
24) Write short notes on i) substitution ii) addition and iii) elimination reactions.
25) Discuss the formation, structure and stability of carbocations with examples.
26) Discuss in detail about Jablonski diagram.
27) Explain in detail about primary and secondary standard substances.

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Course Code: 07ATP1

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B.Sc. Physics Degree (Semester) Examinations, November 2020

Part – III : ALLIED Subject : First Semester: Paper – I

Course Title: Chemistry for Physicist-I

Under CBCS and OBE – Credit 4

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions: **(10 X 1 = 10 Marks)**

1) When an electron drops from a higher energy level to a lower energy level, then
   (a) The energy is observed (b) The energy is released
   (c) The nuclear charge increases (d) The nuclear charge decreases
2) In the ground state of an atom, the electrons tend to occupy the available orbitals in the order of energies
   (a) Increasing (b) Decreasing (c) Any (d) None of these
3) The axial overlap between the two orbitals leads to the formation of a
   a) Multiple bond b) pi bond c) Sigma bond d) None of these
4) In a N_2 molecule there are
   (a) One sigma and one pi bond (b) One sigma and two pi bonds
   (c) Two sigma and one pi bond (d) Three sigma bonds
5) The correct decreasing order of repulsive interaction of electron pairs
   a) Bond pair – Bond pair > Lone pair–Lone pair > Lone pair– Bond pair
   b) Lone pair– Bond pair > Lone pair–Lone pair > Bond pair – Bond pair
   c) Bond pair – Bond pair > Lone pair– Bond pair > Lone pair–Lone pair
   d) Lone pair–Lone pair > Lone pair– Bond pair > Bond pair – Bond pair
6) Which of the following contains metallic bond?
   (a) Cu (b) Au (c) Ag (d) All of the above
7) In the nucleus , $^{238}_{92}U$ there are
   (a) 92 protons and 238 neutrons (b) 92 protons and 146 neutrons
   (c)146 protons and 92 neutrons (d) 238 protons and 92 neutrons
8) Which type of radiation has the greatest penetration ability?
   (a) α (b) neutron (c) β (d) γ
9) In titration end point can be determined by change in colour by the addition of
   (a) Solution (b) Acid (c) Base (d) Indicator
10) The equivalent weight of HCl is
   (a) 38.5 (b) 35.5 (c) 40 (d) 36.5

SECTION – B

Answer Any Five Questions: **(5 X 2 = 10 Marks)**

11. How fast must 54g tennis ball travel in order to have a de Broglie wavelength that is equal?
12. Define the term hybridisation. Give example for sp^2 hybridization
13. What is hydrogen bonding? Mention types of hydrogen bonding
14. Differentiate sigma bond and pi bond
15. Define mass defect and binding energy
16. Write down the equation of law of disintegration
17. How do you prepare 1 N NaOH in 500 mL?

SECTION – C

Answer ALL Questions: **(5 X 5 = 25 Marks)**

18. (a) Write the postulates and limitation of Bohr's theory.

(OR)

(b) Discuss in detail about the Bohr's of hydrogen spectrum series.

19. (a) Write down the postulates of VB theory

(OR)

(b) Illustrate sp and sp^3 hybridisation

20. (a) Draw the MO diagram of O_2 molecule. Calculate the bond order and magnetic properties of it

(OR)

(b) How will you calculate the lattice energy of NaCl by Born-Haber cycle?

21. (a) Differentiate between nuclear fission and nuclear fusion reaction

(OR)

(b) Briefly discuss Soddy's group displacement law

22. (a) Write a note on i) Molecular weight ii) Formula weight iii) Equivalent weight

(OR)

(b) What are primary standards? Write their requirements with examples.

SECTION – D

Answer Any Three Questions: **(3 X 10 = 30 Marks)**

23. Explain the following

(i) Aufbau principle (ii) Hund's rule (iii) Pauli exclusion principle (iv) Electronic configuration (v) Heisenberg's uncertainty principle

24. Illustrate the following with an example (i) s-s overlapping (ii) s-poverlapping (iii) p-p overlapping

25. Apply VSEPR theory for the following molecule and determine the structure

(i) CH_4 (ii) H_2O (iii) NH_3 (iv) PCl_5 (v) SF_6

26. Discuss any four applications of radio activity

27. (a) How do you prepare a standard solution? Explain. (5)

b) Discuss the different types of titrations. (5)

Course Code: 07CT11

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B.Sc. Chemistry Degree (Semester) Examinations, November 2020

Part – III: Core Subject: First Semester: Paper – I

Course Title: General Chemistry - I

Under CBCS and OBE – Credit 4

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer all the questions **(10 x 1 = 10 marks)**

1. The series of lines present in the visible region of Hydrogen spectrum is:
   (a) Lyman (b) Balmer (c) Paschenn (d) Brackett
2. The number of radial nodes for 3p orbital is:
   (a) 4 (b) 3 (c) 2 (d) 1
3. The order of screening effect of orbital is:
   (a) s>p>d>f (b) f>d>p>s (c) p>d>s>f (d) d>f>s>p
4. Which of the following compound has zero dipole moment:
   (a) H_2O (b) NH_3 (c) CO_2 (d) HCl
5. Which one of the following is the correct order of priority according to IUPAC?
   (a) Substituent > Functional group > double bond > triple bond
   (b) Double bond > Triple bond > Functional group > Substituent
   (c) Functional group > Triple bond > Double bond > Substituent
   (d) Functional group > Double bond > Triple bond > Substituent
6. The unequal distribution of carbon atoms on either side of the functional group gives rise to
   (a) Functional isomerism (b) Tautomerism (c) Positional isomerism (d) Metamerism
7. An aldehyde group exhibit
   (a) +M effect (b) – M effect (c) Both +M and – I effect (d) – I effect
8. Which one of the following has a pyramidal shape?
   (a) carbanion (b) carbocation (c) carbene (d) nitrene
9. When the concentration of the adsorbate is more on the surface than in the bulk, it is called
   (a) positive adsorption (b) negative adsorption (c) neutral adsorption (d) none of the above
10. Which of the following statement is **INCORRECT**?
    (a) Enzymes are in colloidal state (b) Enzymes are catalyst
    (c) Enzymes can catalyze any reaction (d) Urease is an enzyme

SECTION – B

Answer Any Five Questions **(5 x 2 = 10)**

11. What is Bohr's equation for energy levels?
12. Define radial and angular wave function?
13. How is sigma and pi bonds formed?
14. Define empirical formula.
15. Write any one example for elimination reaction.
16. Write any two characteristics of catalyst.
17. Give three applications of adsorption?

SECTION – C

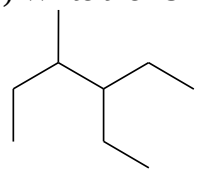
Answer all the questions **(5 x 5 = 25 marks)**

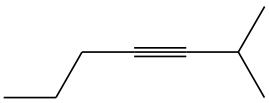
18. (a) How does Bohr's theory explain the spectrum of hydrogen atom? **(OR)**
    (b) Define: (i) Heisenberg's uncertainty principle.
    (ii)Aufbau principle (iii) Pauliexclusion principle
19. (a)Explain the Mulliken scale for the determination of electronegativity.Gives the disadvantage of pauling scale. **(OR)**
    (b) What is mean by electronegativity? Predict the increasing order of electronegativity from the following elements. (i) F, Li, C, O (ii) Te, Cl, S, Se (iii) Cs, At, Ti, I
20. (a)Explain the types of structural isomerism with examples. **(OR)**
    (b) Draw the structure of the following compounds according to IUPAC system.
    (i) 3,3,5-Trimethylhexan-2-one (ii) 6-Chloro-4-ethylhexan-3-one
    (iii) Benzene-1,4-dicarbaldehyde
21. (a) Write the differences between homolytic and heterolytic fission. **(OR)**
    (b) Write notes on (i) Mesomeric effect (ii) Polymerization reaction
22. (a) Distinguish between physical adsorption and chemical adsorption. What is an adsorption isobar? **(OR)**
    (b) List out the applications of catalysis.

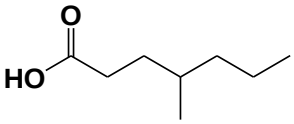
SECTION – D

Answer any THREE questions **(3 x 10 = 30 marks)**

23. Derive Schrodinger wave equation for the wave mechanical model of hydrogen atom. What is the significance of Ψ and Ψ^2 in it?
24. (i) Define covalent bond.What are the characteristic of covalent bond?
    (ii) Dipole moment of NH_3 is greater than NF_3 why? (5+5)
25. i) Write the IUPAC name for the following structure. (2+2)

A) 

B) 

C) 

(ii) Draw the structure of 2-ethyl-1-pentanol. (2)
(iii) Explain Huckel rule. (4)

26. (a) Discuss the formation, structure and stability of carbon free radical. (5)
    (b)Write a note on the following: (2.5+2.5)
    (i) Hyperconjugation (ii) Nucleophiles
27. What are the postulates of Langmuir adsorption isotherm? On the basis of these postulates, derive langmuir equation. How it can be used to determine the surface of an adsorption?

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Course Code: 07CT12

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B.Sc. Chemistry Degree (Semester) Examinations, November 2020

Part – III : Core Subject : First Semester : Paper – II

GENERAL CHEMISTRY - II

Under CBCS and OBE – Credit 4

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions: **(10 X 1 = 10 Marks)**

1. The boiling point of liquid ammonia is
   a) – 36.3°C b) − 33.3°C c) − 23.3°C d) − 30°C
2. Lux-Flood acid is
   a) oxide ion acceptor b) oxide ion donor c) electron pair donor d) H^+ donor
3. Which of the following is an example for molecular or covalent hydrides?
   a) CaH_2 b) LaH_3 c) LiH d) NH_3
4. Lithium shows the diagonal relationship with
   a) Magnesium b) Boron C) Aluminium D) Carbon
5. The bond angle in alkyne is
   a) 180° b) 109°28' c) 120° d) 360°
6. Amongst the following hydrocarbons, the one having lowest boiling point is
   a) n-Hexane b) n-Pentane c) Isopentane d) Neopentane
7. In an adiabatic process _____ can flow into or out of the system.
   a) no heat b) heat c) matter d) no matter
8. Which out of the following is not an intensive property?
   a) pressure b) concentration c) volume d) density
9. The explanation of Brownian movement was given by
   a) Robert Brown b) Albert Einstien c) Robert Boyle d) Tyndall
10. An emulsion is a colloidal solution of a _____ dispersed in another liquid
    a) solid b) liquid c) gas d) medium

SECTION – B

Answer Any FIVE Questions: **(5 X 2 = 10 Marks)**

11. What are s-block elements and give examples?
12. List out the isotopes of hydrogen and draw their structures.
13. Draw the hybridization structure of CH_4 and C_2H_6.
14. Define heat capacity at constant pressure and heat capacity at constant volume.
15. What is the basic principle of Joule-Thomson effect?
16. Give any two points of difference between lyophobic and lyophillic colloids.
17. What is the role of Hg^{2+} ions in nucleophilic addition reaction of alkynes?

SECTION – C

Answer ALL Questions: **(5 X 5 = 25 Marks)**

18. a) HCl is a Lewis Acid. Justify with your answer.

(OR)

b) Discuss the classifications of non-aqueous solvents.

19. a) What are ortho and para Hydrogens and mention their physical and chemical properties.

(OR)

b) Explain the following chemical properties of s –block elements.

(i) Atomic and ionic radii (ii) Ionization enthalpy (iii) Hydration enthalpy

20. a) How will you prepare alkanes using Corey-House and Kolbes methods?

(OR)

b) Outline the relative acidities of ethane, ethylene and acetylene.

21. a) Write notes on the scope and limitations of thermodynamics.

(OR)

b) Describe the different types of thermodynamic processes.

22. a) Explain the Schulze-Hardy rule for coagulation

(OR)

b) What is Electrophoresis? How does this phenomenon provides an information about the sign of charge on particles.

SECTION – D

Answer Any THREE Questions: **(3 X 10 = 30 Marks)**

23. Write a brief note on Arrhenius Acid-Base theory.
24. Explain in detail about the diagonal relationship within s-block elements.
25. How will you prepare CCl_4 from CH_4 and explain its detail mechanism.
26. State and explain enthalpy of formation, enthalpy of combustion and enthalpy of Neutralisation with examples.
27. Describe the various methods for purifying colloidal solutions with suitable diagram.

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Course Code: 07CT31

VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

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B.Sc. Chemistry Degree (Semester) Examinations, November 2020

Part – III : Core Subject : Third Semester : Paper – I

Course Title: ORGANIC CHEMISTRY – I

Under CBCS and OBE – Credit 4

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions: **(10 X 1 = 10 Marks)**

Multiple Choice Questions

1. Vinyl chloride undergoes polymerization in the presence of benzoyl peroxide to form
   a) polyethylene b) polyvinyl chloride c) Teflon d) acetylene
2. Which of the following statements regarding the E2 mechanism is wrong?
   a) Reactions by the E2 mechanism are always bimolecular
   b) Reactions by the E2 mechanism are generally second order
   c) Reactions by the E2 mechanism usually occur in one step
   d) Reactions by the E2 mechanism usually occur in two steps
3. Electrolytic reduction of nitrobenzene in acidic medium gives
   a) aniline b) nitrosobenzene c) N-phenylhydroxylamine d) p-aminophenol
4. Coupling of diazonium salts with amines is most successful when the reaction medium is
   a) highly acidic b) strongly alkaline c) neutral d) moderately acidic
5. Sterically hindered aliphatic primary amine can be prepared by
   a) ammonolysis of halide b) Gabriel-phthalimide reaction
   c) Leucart reaction d) Ritter reaction
6. The process of converting an amine in to its quaternary ammonium salt on treatment with excess of methyl iodide is called
   a) carbylamine reaction b) Hofmann elimination
   c) Exhaustic methylation d) Friedel-Crafts alkylation
7. Clemmensens reduction will convert cyclobutanone to
   a) Cyclobutanol b) Cyclobutyraldehye c) n-Butane d) Cyclobutane
8. Knoevenagel reaction involves the interaction of an aromatic aldehyde and an active methylene compound in the presence of an amine like
   a) Aniline b) methylamine c) piperidine d) none of these
9. Number of optical isomers of compounds accompanied by having 'n' asymmetric carbon atom is given by…….
   a) 2^n b) n^2 c) 2n d) n/2
10. The production of optically active compound from a symmetric molecule without resolution is termed as
    a) Walden inversion b) partial racemization
    c) asymmetric synthesis d) partial resolution

SECTION – B

Answer Any Five Questions: **(5 X 2 = 10 Marks)**

11. How will you prepare vinyl chloride from vicinal halide?
12. Alkyl halides are easily hydrolysed while aryl halides are not. Why?
13. Give any two chemical tests for nitro group?
14. What do you mean by reductive amination reaction?
15. Define Hoffmann elimination reaction.

16. Give the equation for Wolff-Kishner reduction.
17. How do you draw Newmann projection formula?

SECTION – C

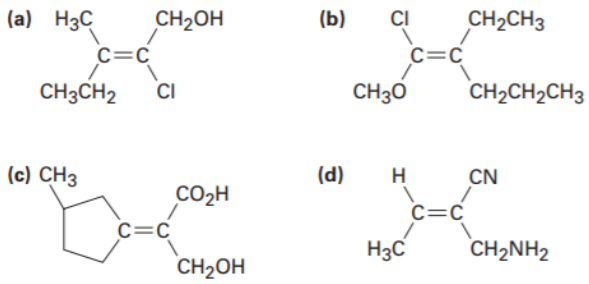
Answer ALL Questions: **(5 X 5 = 25 Marks)**

18. a) How is allyl iodide prepared from glycerol? Discuss its electrophilic addition and nucleophilic substitution reactions.
    (OR)
    b) How is chlorobenzene prepared? What happens when chlorobenzene is treated with following reagents.
    (i) $Cl_2/FeCl_3$ (ii) HNO_3/H_2SO_4 (iii) CuCN/200°C (iv) Mg
19. a) Give any one method of preparation of nitromethane. Discuss its chemical properties.
    (OR)
    b) Discuss the electrophilic and nucleophilic substitution reactions of nitrobenzene.
20. a) What is Hinsberg reagent? How is it used to deferentiate the primary, secondary and tertiary amines?
    (OR)
    b) Compare the basicity of primary, secondary and tertiary amines in aqueous and gaseous phases.
21. a) How will you prepare acetophenone? What happens when acetophenone reacts with Iodine in the presence of sodium hydroxide?
    (OR)
    b) (i) How will you distinguish between acetaldehyde and benzaldehyde?
    (ii) Give any one chemical test for aliphatic aldehyde and aliphatic ketone.
22. a) Define the following terms.
    (i) Plane of symmetry (ii) asymmetry (iii) optical isomerim (iv) enantiomers
    (OR)
    b) Discuss the optical activity of allenes, biphenyls and spiranes.

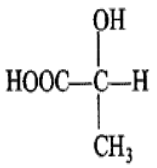
SECTION – D

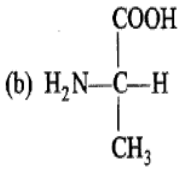
Answer Any Three Questions: **(3 X 10 = 30 Marks)**

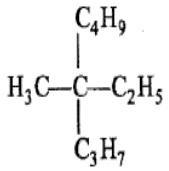
23. Give the mechanism, stereochemistry and kinetics of S_N1 and S_N2 reactions with reference to alkyl halides.
24. (i) Discuss the reduction of nitrobenzene under various conditions.
    (ii) How is benzene diazonium chloride prepared? What happen when benzene diazomium chloride is treated with benzene in the presence of sodium hydroxide?
25. (i) Interpret the basicity of aniline. Discuss the effect of substituent on the basicity of aniline.
    (ii) Derive the mechanism of carbylamine reaction.
26. Deduce the mechanism for following reactions.
    (i) Claisen condensation (ii) Reformatsky reaction.
27. (i) Assign E/Z for following alkenes.

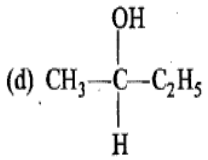


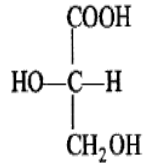
(ii) Assign R/S for following compounds.

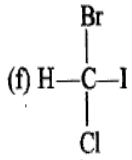
(a) 

(b) 

(c) 

(d) 

(e) 

(f) 

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Course Code:07CT32

VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

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B.Sc.Chemistry Degree (Semester) Examinations, November 2020

Part – III : Core Subject : Third Semester : Paper – II

PHYSICAL CHEMISTRY -I

Under CBCS and OBE – Credit 4

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions: **(10 X 1 = 10 Marks)**

1. The entropy of the system increases in the order
   (a) gas < liquid < solid (b) solid < liquid < gas (c) gas < solid < liquid (d) none of these
2. In a process ΔH = 100 kJ and ΔS = 100 JK^{-1} at 400 K. The value of ΔG will be
   (a) zero (b) 100 kJ (c) 50 kJ (d) 60 kJ
3. Which of the following thermodynamics functions have been called "the arrow of time"
   a) Enthalpy b) Gibb's free energy c) Entropy d) Helmholtz free energy
4. The relation between probability and entropy is given by
   a) S = ln w b) S = ln w2 c) w = ln S d) S = k ln w
5. A buffer solution comprises which of the following?
   (a) a weak acid in solution (b) a strong acid in solution
   (c) a weak base in solution (d) a weak acid and its conjugate base in solution
6. The precipitation of salt takes place if its ionic product is
   (a) equal to its solubility product (b) less than its solubility product
   (c) greater than its solubility product (d) none of the above
7. The Rhechor is the
   (a) molar volume of the liquid at the temperature at which viscosity is zero
   (b) molar volume of the liquid at the temperature at which viscosity is unity
   (c) molar volume of the liquid at the temperature at which viscosity is infinite
   (d) surface tension of the liquid at the temperature at which viscosity is zero
8. Transition temperature of anti-ferromagnetic substance is called as
   a) neel Point b) curie point c) isoeutetic point d) isothermal point
9. For an associate molecule K_D is given by
   a) C1/$\sqrt[n]{C2}$ b) P1/$\sqrt[n]{P2}$ c) T1/$\sqrt[n]{T2}$ d) R1/$\sqrt[n]{R2}$
10. The equilibrium constant for the following chemical reaction is

$$I^- + I_2 \rightleftharpoons I_3^-$$

   a) K= $[I_3^-]/[I_2][I^-]$ b) K= $[I^-]/[I_2][I_3^-]$ c) K= $[I_2]/[I_3^-][I^-]$ d) K= $[I_3^-]/[I_2]$

SECTION – B

Answer Any Five Questions: **(5 X 2 = 10 Marks)**

11. Justify the Second law of thermodynamics, which states that **"**the net entropy of the universe tends to increase**"**
12. In the solid state at 0 K, nitric oxide is capable of existing in two orientations, NONO and NOON, which have practically equal probabilities, Calculate the molar entropy of NO at 0 K.
13. State third law of thermodynamics
14. A buffer solution containing 0.015 mole of ammonium hydroxide and 0.025 mole of ammonium chloride. Calculate the pH of the solution. Dissociation constant of NH_4OH at room temperature is 1.80×10^{-5}
15. Give example for salts of strong acids and strong bases, salts of weak acids and strong bases, salts of strong acids and weak bases and salts of weak acids and weak bases
16. How will you determine the structure of benzene by parachors?

17. Write down the limitations of distribution law

SECTION – C

Answer ALL Questions: **(5 X 5 = 25 Marks)**

18. a) Six moles of an ideal gas expand isothermally and reversibly from a volume of $1dm^3$ to a volume of $10\ dm^3$ at 27˚C .What is the maximum work done? Express the result in joule.

(OR)

b) Derive the required expression to show that mixing of gases is always accompanied by increasing in entropy

19. a) The free energy change (ΔG) accompanying a given process is -85.77 kJ at 25˚C and -83.68 kJ at 35˚C. Calculate the change in enthalpy (ΔH) for the process at 30˚**C**

(OR)

b) Analyze the origination of the concept "residual entropy" and its calculation.

20. (a) Write a note on buffer action of acidic and basic buffer solution

(OR)

(b) How will you determine degree of hydrolysis by indirect method and freezing point depression method

21. (a) Explain the following (i) Dunstan rule (ii) Molar Viscosity (iii) Additive and constitutive property

(OR)

(b) Illustrate optical activity and chemical constitution of tartaric acid

22.(a) Derive an equation for (i) Solute undergoes dissociation (ii) Solute undergo association

(OR)

(b) Discuss the applications of distribution law in solvent extraction, Chromatography and in distribution indicators

SECTION – D

Answer Any Three Questions: **(3 X 10 = 30 Marks)**

23. Evaluate the Carnot cycle for establishing the maximum convertibility of heat into work.

24. Derive the Clapeyron equation in the form $dp/dt = \Delta H_v / (TV_g)$ and it applications.

25.(i) Derive Henderson-Hasselbalch equation

(ii) Discuss in detail about the phenomenon of hydrolysis of salt.

26.Account on dipole moment and chemical constitution

27.(i) Derive thermodynamic derivation of Nernst's distribution law

(ii) Determination of equilibrium constant from distribution coefficient

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Course Code: 07CT51

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B.Sc. Chemistry Degree (Semester) Examinations, November 2020

Part – III : Core Subject : Fifth Semester : Paper – I

Course Title: ORGANIC CHEMISTRY -II

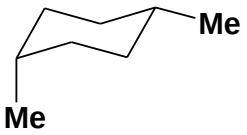
Under CBCS and OBE – Credit 4

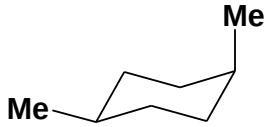
Time: **3** Hours Max. Marks: **75**

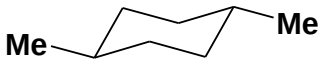
SECTION – A

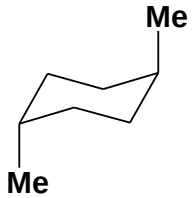
Answer ALL questions **(10 x 1 = 10)**

1) What will be the product when malonic acid is heated?
   a) Acetic acid b) oxalic acid c) formic acid d) all the above
2) Which of the following will convert carboxylic acid into alcohol?
   a) NBS b) $LiAlH_4$ c) $NaBH_4$ d) $KMnO_4$
3) Which of the following will exhibit keto-enol tautomerism?
   a) Acetaldehyde b) Ethylacetoacetate c) Carboxylic acid d) Amide
4) The process of exchanging a substituent from ester with another group of alcohol is known as….
   a) Hydrolysis b) Hydrogenolysis c) Acetolysis d) *trans*-esterification
5) On treatment of indole with con.HNO_3 and con. H_2SO_4 gives…
   a) 3-Nitroindole b) Polymeric products c) 5-Nitroindole d) 2-Nitroindole
6) The hybridization of N-atom in pyridine is……
   a) sp b) sp^3 c) sp^2 d) sp^3d
7) The Michael addition is useful for the formation of……bonds.
   a) C-N b) C-Cl c) C-O d) C-C
8) Which of the following reagent will give syn-dihydroxylation product with an alkene?
   a) $LiAlH_4$ b) NBS c) SeO_2 d) OsO_4
9) How many butane gauche interactions are possible in cis-decalin?
   a) 0 b) 1 c) 2 d) 3
10) Which of the following is the most stable conformation of trans-1,4-dimethylcyclohexane?

a) 

b) 

c) 

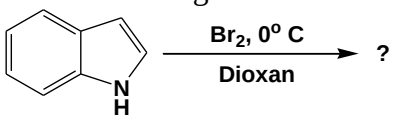
d) 

SECTION – B

Answer any FIVE questions **(5 x 2 = 10)**

11) What do you mean by Hunsdiecker reaction?
12) Write any one method of preparation of acid chloride from carboxylic acid.

13) What happens when pyridine is treated with $NaNH_2$/liq. NH_3?
14) Predict the correct product in the following reaction.



15) What is Simmon-Smith reaction?
16) Illustrate any one synthetic use of SeO_2.
17) Draw the most stable conformation of *cis*-1,3-dimethylcyclohexane.

SECTION – C

Answer ALL questions **(5 x 5 = 25)**

18) a) Discuss briefly the effects of substituents on the acidity of carboxylic acid.

(OR)

b) Explain Blanc's rule by taking adequate examples.

19) a) Give an account on the alkaline hydrolysis of esters.

(OR)

b) Discuss any two synthetic uses of acetoacetic ester.

20) a) Write any three chemical properties of pyrrole.

(OR)

b) Illustrate any two methods of preparation of quinoline.

21) a) Discuss the mechanism of McMurry coupling reaction.

(OR)

b) Compare the synthetic utility of $LiAlH_4$ and $NaBH_4$.

22) a) Discuss the conformational analysis of n-butane.

(OR)

b) Write a note on:
(2.5+2.5)
A) butane gauche interaction B) 1,3-diaxial interaction

SECTION – D

Answer any THREE question **(3 x 10 = 30)**

23) a) Give a brief account on the reduction of carboxylic acid to alcohol. **(5)**
b) Explain in detail the action of heat on α,β-hydroxy acids. **(5)**

24) a) Give an account on nucleophilic acyl substitution with example. **(5)**
b) Explain any two synthetic uses of malonic ester. **(5)**

25) a) Write any three chemical properties of thiophene. **(5)**
b) Explain why electrophilic substitution occurs at C3 position in indole? **(5)**

26) a) Write a note on the following reactions: (2+2+2)
A) Reimer-Tiemann
B) Baeyer-Villiger oxidation
C) Wittig reaction
b) Discuss the synthetic utility of OsO_4. (4)

27) a) Discuss the conformational analysis of 1,2 and 1,4-dimethylcyclohexane and predict the stability. (5)
b) Explain axial haloketone effect. (5)

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Course Code: 07CT52

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B.Sc. Chemistry Degree (Semester) Examinations, November 2020

Part – III : Core Subject : Fifth Semester : Paper – II

Course Title: INORGANIC CHEMISTRY -II

Under CBCS and OBE – Credit 4

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions: **(10 X 1 = 10 Marks)**

1. In the complex formation, the central metal atom / ion acts as
   (a) Lewis base (b) Bronsted base (c) Lewis acid (d) Bronsted acid
2. Which of the following rules is not correct regarding IUPAC nomenclature of complex ions?
   (a) cation is named first and then anion
   (b) In coordination sphere, the ligands are named alphabetically
   (c) positively charged ligands have suffix 'ate'
   (d) More than one ligand of particular type are indicated by using di, tri, tetra, etc.,
3. The value of the 'spin only' magnetic moment for one of the configurations 2.84 BM. The correct one is
   (a) d^4 (in strong field ligand) (b) d^4 (in weak field ligand)
   (c) d^3 (in weak as well as strong fields) (d) d^5 (in strong field ligand)
4. Find out wrong statement for an octahedral complex
   (a) An ion with d^5 configuration has one unpaired electron both in weak and strong fields
   (b) An ion with d^6 configuration is diamagnetic in a strong field
   (c) A central metal ion with d^8 configuration has two unpaired electrons
   (d) In d^4, d^5, d^6 and d^7 configurations, weak and strong field complexes have different number of unpaired electrons
5. Which ion is kinetically inert?
   (a) Cr^{2+} (b) Co^{3+} (c) Co^{2+} (d) Fe^{3+}
6. The reactions of $[PtCl_4]^{2-}$ with NH_3 gives rise to
   (a) $[PtCl_4(NH_3)_2]^{2-}$ (b) *trans*-$[PtCl_2(NH_3)_2]$
   (c) $[PtCl_2(NH_3)_4]$ (d) *cis*-$[PtCl_2(NH_3)_2]$
7. Ferrocene is
   (a) $Fe(\eta^5\text{-}C_5H_5)_2$ (b) $Fe(\eta^3\text{-}C_5H_5)_2$ (c) $Cr(\eta^5\text{-}C_5H_5)_2$ (d) $Fe(\eta^5\text{-}C_5H_5)_3$
8. The catalyst used in the Wacker process of oxidation of ethane to ethanol is
   (a) $PdCl_2$ (b) V_2O_5
   (c) Ni complexes (d) $[RhCl(PPh_3)_3]$
9. According to old Pauling model, the magnetic behaviour of (Fe) ions in oxy-Hemoglobin and oxy-Myoglobin are
   (a) Paramagnetic;Diamagnetic (b) Paramagnetic;Paramagentic
   (c) Diamagnetic;Diamagnetic (d) Diamagentic:Paramagnetic
10. Gd^{3+} is used as
    (a) NMR contrast agent (b) EPR contrast agent (c) Antibacterial agent (d) None of the above

SECTION – B

Answer Any Five Questions: **(5 X 2 = 10 Marks)**

11. Differentiate bidentate and ambidentate ligands (any four points)
12. Give any four examples for chelating ligands. Rationalize chelate Vs. stability
13. Write down the limitations of VB theory and CFT of complexes
14. Why d^9 copper complexes complexes have more Jahn-teller distortion?
15. Compare paramagnetism and diamagnetism
16. Calculate EAN for $[ClMn(CO)_5]$ and $[\eta^5\text{-}(C_5H_5)_2Fe]$
17. Define cooperativity effect

SECTION – C

Answer ALL Questions: **(5 X 5 = 25 Marks)**

18. (a) Discuss Werner's theory of coordination complexes

    (OR)

    (b) Brieflly discuss geometrical isomerism of geometrical isomerism of four coordinated complexes
19. (a) Draw and exmplain MO diagram of $[Co(NH_3)_6]^{3+}$

    (OR)

    (b) Explain the factors affecting crystal field splitting theory of complexes
20. (a) Both S_N1CB and S_N2 mechanisms in a ligand substitution reaction with a metal complex give second order kinetics; explain this statement

    (OR)

    (b) Discuss the theories of trans effect.
21. (a) How are organometallic compounds classified?

    (OR)

    (b) Deduce the mechanism of Wilkinson's catalytic process of Hydrogenation of alkene.
22. (a) Give the structure and function of carboxy peptidase A and carbonic anhydrase

    (OR)

    (b) biological functions and toxicity of Copper, Arsenic, Mercury, Iodine and Zinc

SECTION – D

Answer Any Three Questions: **(3 X 10 = 30 Marks)**

23. Illustrate the following isomerism of coordination complexes (i) ionization (ii) hydrate (iii) linkage (iv) optical isomerism of octahedral complexes (2+2+2+4)
24. Apply VB theory to predict the structure and magnetic properties of the following complexes: (i) $[Co(NH_3)_6]^{3+}$ (ii) $[CoF_6]^{3-}$ (iii) $[Ni(Cl)_4]^{2-}$ (iv) $[Ni(CO)_4]$ and (v) $[MnCl_4]^{2-}$
25. Interpret the mechanism of inner sphere and outer sphere electron transfer reaction.
26. (i) Explain the nature of bonding in mononuclear metal carbonyls. (7)

    (ii) Identify the hybridization and shape of $Ni(CO)_4$. (3)
27. (i) Draw the structure of heme. Describe the structural features and functions of haemoglobin

    (ii) Discuss the role of Na+ and K^+, Mg^{2+} and Ca^{2+} in biological systems

Course Code:07EP5A

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B.Sc Chemistry Degree (Semester) Examinations, November 2020

Part – III : Elective Subject : Fifth Semester : Paper – I

PHYSICAL CHEMISTRY-III

Under CBCS and OBE – Credit 5

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions: **(10 X 1 = 10 Marks)**

Multiple Choice Questions :

1. Debye-Huckel-Onsager is applicable to
   (a) weak electrolyte (b) strong electrolyte (c) all electrolyte (d) non-electrolyte

2. Equivalent conductance of NaCl, HCl nd CH_3COONa is 126.45, 426.16 and 91 ohm^{-1} cm^2 eq^{-1}. What would be the equivalent conductance of acetic acid at infinite dilution?
   (a) 678.90 (b) 390.71 (c) 253.62 (d) 101.38

3. Potential of SHE is considered as
   (a) zero (b) unity (c) constant (d) multiple of 1
4. For the reduction of silver ions with copper metal the standard cell potential was found to be +0.46V at 25°C. The value of standard Gibbs energy, ΔG° wll be (F = 96500 C mol^{-1})
   (a) -44.5 KJ (b) -98.0 KJ (c) -89.0 KJ (d) 89.0 KJ
5. In electrolytic cell
   (a) chemical energy is converted into heat (b) electrical energy converted into heat (c) chemical energy is converted into electrical energy (d) electrical energy converted into chemical energy
6. When a lead storage battery is discharged
   (a) sulphuric acid is consumed (b) lead sulphate is consumed (c) SO2 is evolved (d) lead is formed
7. The principle axis of benzene molecule has _____ fold axis
   a) C 2 b) C 4 c) C 6 d) C 8
8. The total number of products for a C_{2V} multiplication table is
   a) 1 b) 24 c) 32 d) 16
9. "It is a homogeneous and physically distinct part of a system which is bounded by a surface and is mechanically separable from other parts of the system" This is the definition of:
   a) Phase b) Component c) Degrees of Freedom d) Equilibrium
10. The Clapeyron-Clausius equation is given by:
    a) ln P 1 /P 2 = ΔH vap /R {T 2 -T 1 /T 1 T 2 } b) ln P 2 /P 1 = ΔH vap /R {T 2 -T 1 /T 1 T 2 }
    c) ln P 2 /P 1 = ΔH vap /R {T 1 -T 2 /T 1 T 2 } d) ln P 1 /P 2 = ΔH vap /R {T 1 -T 2 /T 1 T 2 }

SECTION – B

Answer Any Five Questions: **(5 X 2 = 10 Marks)**

11. A solution of salt (1.0 N) surrounding platinum electrodes 2.1cm apart and 4.2 cm^2 in area was found to offer a resistance of 50 Ω. Calculate the equivalent conductivity of the solution.
12. What is transport number? How is it related to velocity of the ions?
13. Derive a relationship between EMF of a cell and ΔG, ΔH and ΔS.
14. Define salt bridge? Give its importance.
15. Write the difference between primary cell and secondary cell
16. What do you mean by abelian and non –abelian group?
17. Define degrees of freedom

SECTION – C

Answer ALL Questions: **(5 X 5 = 25 Marks)**

18. a) Illustrate the diagrammatically moving boundary method for the determination of transport number.

(OR)

b) Evaluate the titration curves for the neutralization of (i) Strong acid vs Strong base (ii) Weak acid vs Strong base (iii) Ammonium hydroxide vs HCl

19. a) What is an electrochemical series? Using the data given in the series explain why?

(OR)

b) Give the Nernst equation showing effect of electrolyte concentration on the potential of an oxidation-reduction electrode.

20. a) Describe construction and working different types of potentiometric titration with suitable example. **(OR)**

b) Explain diagrammatically the working principle of hydrogen and oxygen fuel cell.

21. a) Illustrate the diagrammatically that water molecule is abelian where as ammonia molecule is non-abelian. **(OR)**

b) Construct the group multiplication table for C_{2V} point group.

22. a) Discuss the derivation of the Gibbs phase rule from thermodynamic consideration.

(OR)

b) Draw and explain the phase diagram of one component three phase system.

SECTION – D

Answer Any Three Questions: **(3 X 10 = 30 Marks)**

23. How does Debye-Huckel theory explain the behavior of strong electrolytes?
24. Discuss in detail about the different types of reversible electrodes
25. Describe the use of emf measurements to determine the P^H of aqueous solutions. Include in your answer a reference of both Hydrogen, Glass, Calomel and Quine hydrone electrode.
26. Illustrate the types of symmetry elements.
27. Draw a well labelled phase diagram of Lead and silver (Pb / Ag) system and discuss its sailent features.

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Course Code: 07NE11

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B.A./B.Sc Degree (Semester) Examinations, November 2020

Part – IV : NME : First Semester : Paper – I

Course Title: FOOD CHEMISTRY

Under CBCS – Credit 2

Time: **2** Hours Max. Marks: **75**

SECTION – A

Answer ALL the questions **(10 X 1 = 10)**

1. Sources of proteins includes
   a) Fish b) poultry c) eggs d) all of them
2. The mineral which controls the functioning of thyroid is
   a)Calcium b)Iron c)Phosphorous d)Iodine
3. What is the herb/spice commonly associated with Indian food?
   a) Oregano b) Bay leaf c) Curry d) Red pepper
4. The first spice used by man is..
   a) Saffron b) Pepper c) Cardamom d) Cinnamon
5. The Government of India promulgated a Fruit Products order in
   a) 1948 b) 1946 c) 1955 d) 1976
6. Turmeric powder is commonly adulterated by
   a) Lead chromate b) Date husk c) Starch d) Chicory
7. Which is least likely to cause food poisoning?
   a) Raw sprouts b) Chicken c) Salad d) Mayonnaise
8. 'Cold sterilization' refers to the preservation of food by
   a) Refrigeration b)Radiation c)Dehydration d)Lyophilisation
9. Which one is green manure/biofertillizer
   a) Sesbania b) Rice c) Oat d) Maize
10. A protein rich organism is
    a) Spirulina b) Chlamydomonas c) Ulothrix d) Oedoganium

SECTION –B

Answer any FIVE Questions: **(5 X 2 =10)**

11. Define the term 'Food'
12. Write any two Nutrients and their sources.
12. Write any three advantages of grinding process.
13. Define the term '**Spices'** with examples.
14. Mention any two important medicinal values of **Aniseed.**
15. Write any three intentional adulterants.
16. What is meant by slow freezing process?
17. What is meant by Organic foods and give suitable examples?

SECTION –C

Answer ALL the Questions: **(3 X 9 =27)**

18. a) Write any six nutrients, deficiency and their sources.

(OR)

b) Discuss the Cleaning and Peeling process.

19. a) Discuss the medicinal uses of using garlic and pepper in our diet.

(OR)

b) Explain the methods available to detect the following adulterants.
a) Milk b) Honey c) Chilli powder

20. a) Write down the principles of Food preservation.

(OR)

b) List out the general procedures for Canning process.

SECTION –D

Answer any TWO Questions: **(2 X 14=28)**

21. Explain in detail about the food groups classification.

22. Briefly note down the benefits of following Indian spices.

a) Black Pepper b) Turmeric c) Cumin seeds d) Ginger

23. Write briefly about the Indian AGMARK Standard**.**

24.a) Explain the following terms in detail. **(7)**

a) Quick Freezing b) Dehydro freezing c) Pasteurization

b) Write down the food irradiation process and its uses. **(7)**

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Course Code:07SB31

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B.Sc. Chemistry Degree (Semester) Examinations, November 2020

Part – IV : SBS : Third Semester : Paper – I

Course Title: MEDICINAL AND PHARMACEUTICAL CHEMISTRY

Under CBCS – Credit 2

Time: **2** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions: **(10 X 1 = 10 Marks)**

1. To call ambulance, you need to dial
   a)100 b)101 c)102 d)108
2. Which among the following is not the symptom of internal bleeding
   a)darkness of face b)rapid pulse c)sweating d)shallow breathing
3. The father of modern chemotherapy is
   a)Paul Anastas b)Paul Ehrlich c)George Henry d)George Ehrlich
4. Stibophen is a drug containg the organometallic element:
   a)Arsenic b)Antimony c)Mercury d)Bismuth
5. From which language was the term 'anaesthesia' derived?
   a)Greek b)Latin c)Spanish d)Sanskrit
6. The compound which has gained reputation as "truth serum" is:
   a)thio pental sodium b)benzocaine c)methohexitone d)amethocaine
7. Which among the following is not a respiratory depressant
   a)morphine b)pethidine c)methadone d)phenacitin
8. The compound with the IUPAC name 2-(4-isobutylphenyl) propionic acid is:
   a)ibuprofen b)indomethacin c)naproxen d)phenacetin
9. The term 'septic' means:
   a)ugly b)germs c)pungent d)rot
10. Chemical name of Dettol is:
    a)4-chloro-3,5-xylenol b)4-chloro-3-methylphenol
    c)2-isopropyl-5-methylphenol d)None of the above

SECTION – B

Answer Any Five Questions: **(5 X 2 = 10 Marks)**

11. What is first aid box? What are its contents?
12. Define transporting and handling casuality.
13. What is Pharmacology.
14. Differentiate general and local anaesthetics.
15. Write one use and one property each for Ibuprufen and Naproxn.
16. Draw the structure of any two nitrofuran derivative.
17. Write the formula of phenol coefficient.

SECTION – C

Answer ALL Questions: **(3 X 9 = 27 Marks)**

18. a) Give a note on first aid for i) Unconsciousness ii) Blood loss iii) Shock. (OR)
    b) Explain i) Antimetabolites b) Chemotherapy c) Pharmacognosy
19. a) Tabulate the properties of the following anaesthetics:
    i) Benzocaine ii) Cocaine (OR)
    b) Tabulate the properties of the following analgesics:

i) Pethidine ii) Methadone

20. a) What are the conditions to be an ideal antiseptic or disinfectant. Point out the differences between antiseptics and disinfectants. (OR)

    b) Draw the structure and write the uses of chlorinated phenols.

SECTION – D

<u>Answer Any Three Questions:</u> **(2 X 14 = 28 Marks)**

21. Define First Aid. Jot down the basic rules. Write the same for burns and fractures.
22. Explain the biological classification of drugs in detail. Define pharmacophore and pharmacopoeia.
23. Quoting the structure and properties, jot the advantages and disadvantages of any five commonly used anaesthetics.
24. Write the structure, properties and therapeutic uses of salicylic acid derivatives as analgesics.

Course Code: 07SB51

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B.Sc. Chemistry Degree (Semester) Examinations, November 2020

Part – IV : SBS : fifth Semester : Paper – I

Course Title: Water Analysis

Under CBCS – Credit 2

Time: **2** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions: **(10 X 1 = 10 Marks)**

1. Which source of water is free from hardness and surface impurities?
   a) Surface water b) Underground water
   c) Rain water d) Sea water
2. Which of the following is the physical monitoring of the lake?
   a) PH b) COD c) BOD d) Turbidity
3. Disinfection of water results in
   a) Removal of turbidity b) Removal of hardness
   c) Killing of disease bacteria d) complete sterilization
4. Which of the following techniques is used for reducing the total dissolved solids (TDS) in the water?
   (a) Osmosis (b) Ion exchange (c) Distillation (d) Both b and c
5. Permanent hardness of water is caused due to the presence of dissolved
   a) Calcium hydrogen carbonates b) Magnesium hydrogen carbonates
   c) Chlorides of magnesium d) Sulphates of magnesium
6. Select the incorrect statement from the following option.
   a) Electrodialysis reversal (EDR) was introduced in the commercial sector to improve electrodialysis process
   b) The EDR process and conventional ED unit operates on the same principle, except at intervals of several times an hour
   c) The reversal feature is useful in breaking up films, scales and other deposits
   d) Electrodialysis process is not economical as per capital cost
7. Electrodialysis is based on the fact that the ions present in saline water migrate towards their respective electrodes under the influence of applied _____
   a) Current b) Resistance c) Conductance d) EMF
8. The ion-exchange membrane are electrically conductive and are not permeable to _____ flow, even under pressure.
   a) Electron b) Oil c) Fluorine d) Water
9. Method of rainwater harvestings are..
   a) check dam b) khet talavdi c) rain water harvesting d) all of the above
10. When did the Ganga Action Plan launched?
    a) 1980 b) 1982 c) 1984 d) 1986

SECTION – B

Answer Any Five Questions: **(5 X 2 = 10 Marks)**

11. Why TDS is important in water?
12. Define Osmosis?
13. How to remove hardness of water at home?
14. How do you purify brackish water?
15. Why EDTA is used in complexometric titration?
16. What is the importance of rain water harvesting?
17. What does water reuse mean in practice?

SECTION – C

Answer ALL Questions: **(3 X 9 = 27 Marks)**

18. a) What is the cause of temporary hardness? How it is removed by Clark's process and why the reagent used in it must be calculated? **(OR)**
    b) Discuss drinking water quality standards in India.
19. a) Identify the problems to determine temporary and permanent hardness. **(OR)**
    b) Explain desalination of sea water by reverse osmosis.
20. a) How does electrodialysis (EDR) work? **(OR)**
    b) Explain the following terms in purification of water:
    (i) Coagulation and Flocculation (ii) Filtration and (iii) Disinfection

SECTION – D

Answer Any Three Questions: **(2 X 14 = 28 Marks)**

21. Explain briefly how to remove permanent hardness using following methods:
    (i) Ion Exchange and (ii) Demineralization method
22. Briefly explain the following water quality parameters:
    (i) Physical Characteristics (ii) Chemical Characteristics and
    (iii) Microbiological Characteristics of water.
23. How to determine hardness of water by EDTA method?
24. Expalin the objective of implementing the Ganga Action plan. What was the result of Ganga Action plan ?