[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 2202 **GC-3** **Your Roll No.....**

Unique Paper Code : 32175902

Name of the Paper : GE-2 Chemical Energetics, Functional Group Organic Chem-I

Name of the Course : **B.Sc. (Other Hons. Courses) CBCS**

Semester : I / III

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **six** questions in all, three questions from each section.
3. Use **separate sheet** for section A and section B.
4. Use of scientific calculators and log tables in allowed.

SECTION A

(PHYSICAL CHEMISTRY)

Attempt any *three* questions in this section. All questions carry equal marks.

1. (a) (i) If a solution has a pH of 5.50 at 25°C. Calculate its [OH^-]. (2)

(ii) Using Le-Chatelier's principle, predict which conditions of temperature and pressure would give high yield of products in the following reactions:

$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$ $\Delta H = -198$ kJ

$N_2(g) + O_2(g) \rightleftharpoons 2\,NO(g)$ $\Delta H = 175$ kJ2 (2)

(iii) 60 ml of 6.0×10^{-3} M $CaCl_2$ is mixed with 40 ml of 0.04 M NaF_2. Will precipitation of CaF_2 occur? K_{sp} is 4.0×10^{-11}. (2)

(iv) Explain the ionic product of water. (2)

(b) What is meant by the term Hydrolysis and drive the relation for salts of strong acid & weak base.

P.T.O.

$$h = (K_w / C. K_b)^{1/2}$$

where, h = degree of hydrolysis (4.5)

2. (a) Calculate how many grams of ammonium chloride must be added to one litre of 0.20 M NH_3 to make a buffer of pH 9.00? pK_b value of ammonia is 4.75 in the equation.

$$NH_3 + H_2O \rightleftharpoons NH_4^+ + OH^-$$ (4)

(b) Derive thermodynamically the Law of Chemical equilibrium for a general reaction.

$$aA + bB \rightleftharpoons C + dD$$ (4)

(c) State Hess's Law of constant heat summation.

Calculate the heat of formation of benzene, Given that those for carbon & hydrogen are -94.05 kcal & -68.32 kcal respectively at 25°C. (4.5)

3. (a) Explain the following terms

(i) Integral heat of solution

(ii) Third law of thermodynamics (4)

(b) What is buffer solution? Give examples. Explain the buffer action of an acidic buffer. (4)

(c) Define Bond energies. Bond energies of F_2 & Cl_2 are 36.6 & 580 kcal/mol respectively.

Heat liberated in the reaction $F_2 + Cl_2 \longrightarrow 2FCl$ is 26.6 kcal. Find the bond energy of F-Cl bond. (4.5)

4. (a) Discuss the variation of heat of reaction with temperature. (4)

(b) State the principle of solubility product. How is the solubility of a salt is affected by the presence of a common ion? (4)

(c) (i) Calculate heat of formation of potassium hydroxide from the following data

$$K\,(s) + H_2O\,(aq) \longrightarrow KOH + \frac{1}{2}H_2\,(g) \qquad \Delta H = -48.0 \text{ kcal}$$

$$H_2\,(g) + \frac{1}{2}O_2\,(g) \longrightarrow H_2O\,(l) \qquad \Delta H = -68.5 \text{ kcal}$$

$$KOH\,(s) \longrightarrow KOH\,(aq) \qquad \Delta H = -14.0 \text{ kcal}$$

(2)

(ii) Calculate ΔG° & K_p for the following reaction at 298 K.

$$CO(g) + H_2O\,(g) \longrightarrow CO_2\,(g) + H_2\,(g)$$

Given that ΔG° for CO (g), CO_2 (g) & H_2O (g) are -32·807, -97·26 & -54·64 kcal/mol respectively. (2.5)

SECTION B

(ORGANIC CHEMISTRY)

pt any *three* questions in this section. All questions carry equal marks.

ccount for the following statements:

Alkyl halides are insoluble in water.

) Boiling point of an alcohol is higher than that of isomeric ether and a carbonyl compound.

i) Nucleophilic displacement of a halogen directly attached to the benzene nucleus requires vigorous conditions.

) Phenol is more acidic than alcohols but less acidic than carboxylic acid.

) Hydrogen bromide adds to propylene to give isopropyl bromide. (2.5×5)

) Write short notes (including mechanism) on any three of the following:

(i) Nitration of benzene

(ii) Benzoin condensation

(iii) Schotten- Baumann reaction

(iv) Pinacol- Pinacolone rearrangement (3×3)

(b) Describe Lucas test to distinguish between a primary, secondary & tertiary alcohol. (3.5)

7. (a) Identify the reaction and predict the products formed.

(i) $CH_3COCH_3 + I_2 + NaOH \longrightarrow$

(ii) $C_6H_5N_2^+Cl^- + Cu_2Br_2 + HCl \longrightarrow$

(iii) $CH_3CHO \xrightarrow{NH_2NH_2} A \xrightarrow[\Delta]{C_2H_5O^-Na^+} B$

(iv) $CH_3CH_2OH + CH_3Br \xrightarrow{NaOET}$

(b) Write down key difference between the SN^2 and SN^1 mechanism by taking example of alkyl halides. (2)

(c) Convert::Phenol to *p*-bromo-phenol

8. (a) Discuss

(i) The acid catalysed mechanism for the dehydration of alcohol.

(ii) Meerwein-Pronndorf-Verley Reduction (5)

(b) Explain

(i) Nitration of methyl benzene takes place more readily as compared to nitration of benzene.

(ii) Chlorobenzene acts as an ortho and para director for electrophilic substitution reactions but is a weak ring deactivator explain. (5)

(c) Convert: Chlorobenzene to Aniline. (2.5)

[This question paper contains 5 printed pages.]

Sr. No. of Question Paper : 2545 **GC-3** **Your Roll No.....**

Unique Paper Code : 32175902

Name of the Paper : GE-2 Chemical Energetics, Functional Group Organic Chem-I

Name of the Course : **B.Sc. (Other Hons. Courses) CBCS**

Semester : I / III

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt six questions in all, three questions from each section.
3. Use **separate sheet** for section A and section B.
4. Use of scientific calculators and log tables is allowed.

SECTION A

(PHYSICAL CHEMISTRY)

Attempt any three questions in this section.
All questions carry equal marks.

1. (a) Drive the relation between the equilibrium constants K_p, K_c & K_x. Under what conditions $K_p=K_c=K_x$ where p, c, x stand for partial pressure, molar concentration & mole fraction respectively? (4)

(b) Explain the following:

(i) Absolute entropies of substances.

(ii) Integral heat of Dilution. (4)

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(c) A litre of solution containing 0.1 mole CH_3COOH & 0.1 mole of CH_3COONa provides a buffer of pH 4.74. Calculate the pH of solution after the addition of 0.02 mole NaOH. K_a is 1.8×10^{-5}. (4.5)

2. (a) The heat of reaction $N_2 + 3H_2 \longrightarrow 2NH_3$ at 27°C was found to be – 21.976 kcal. What will be the heat of reaction at 50°C? The molar capacities at constant pressure & at 27°C for nitrogen, hydrogen & ammonia are 6.8, 6.77 & 8.66 cal mol^{-1} $degree^{-1}$. (4)

(b) Consider the reaction

$$PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$$

How would the equilibrium be affected by (i) The addition of Cl_2 (ii) Decrease in the volume of the container. (4)

(c) (i) Explain state function & path function.

(ii) Drive the relation between Hydrolysis constant & Degree of hydrolysis for weak acid & strong base. (2, 2.5)

3. (a) Calculate ΔH for

(i) The formation of sucrose from carbon, hydrogen & oxygen

(ii) The decomposition of sucrose into carbon & water

$$C_{12}H_{22}O_{11}(s) \longrightarrow 12C + 11H_2O \quad (l)$$

Using: $H_2(g) + \frac{1}{2}O_2(g) \longrightarrow H_2O\ (l)$ $\Delta H = -285.8$ kJ

C (graphite) $+ O_2(g) \longrightarrow CO_2(g)$ $\Delta H = -393.5$ kJ

$C_{12}H_{22}O_{11}(s) + 12O_2(g) \longrightarrow 12\ CO_2(g) + 11H_2O\ (l)$

$\Delta H = -5665.0$ kJ

(4)

(b) (i) Calculate the solubility of silver chromate in a 0.100 M solution of $AgNO_3$ & K_{sp} for $Ag_2CrO_4 = 9.0 \times 10^{-12}$.

(ii) The equilibrium constant, K_p for the reaction

$$C_2H_4\,(g) + H_2\,(g) \rightleftharpoons C_2H_6\,(g)$$

Is 5.04×10^{17} atm^{-1} at 25°C. Calculate ΔG°. (4)

(c) Define degree of dissociation. Explain what are the factors which influence the degree of dissociation? (4.5)

4. (a) Drive Kirchoff's equation for variation enthalpy of reaction with temperature. (4)

(b) What is the pH of a 0.2M solution of NaCN? K_a for HCN is 4.0×10^{-10}. (4)

(c) What is buffer capacity? Explain the buffer action of a basic buffer. (4.5)

SECTION B

(ORGANIC CHEMISTRY)

Attempt any three questions in this section.
All questions carry equal marks.

5. (a) State the difference between S_N^1 and S_N^2 reaction mechanisms by taking example of reactions of alkyl halide. (4)

(b) Complete the following reaction and give mechanism involved:

$$2CH_3CHO \xrightarrow[\Delta]{OH^-}$$ (4)

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(c) Mention the electrophiles and show their formation in each of the following reactions on benzene:

(i) Nitration

(ii) Sulphonation

(iii) Chlorination

(4.5)

6. (a) How would you prepare the following compounds using a Williamson synthesis?

(i) Methyl propyl ether

(ii) t-Butyl methyl ether

(4)

(b) Write down elimination-addition (benzyne) mechanism for nucleophilic aromatic substitution by taking the example of formation of aniline from chlorobenzene.

(4)

(c) Give steps involved in the formation of phenol from benzene by Cumene method and give its mechanism.

(4.5)

7. (a) Write notes on the following:

(i) Cannizzaro's reaction

(ii) Gattermann Koch reaction

(4)

(b) Explain

(4)

(i) Vinyl chloride is less reactive than ethyl chloride.

(ii) Alkyl chloride is more reactive than vinyl chloride.

(c) What is Lucas reagent? Give its utility. Why are 3° alcohols more reactive than 2° and 1° alcohol towards Lucas reagent.

(4.5)

8. (a) Complete the following reactions:

(i) $C_6H_5OH \xrightarrow[CH_3COOH]{Br_2}$

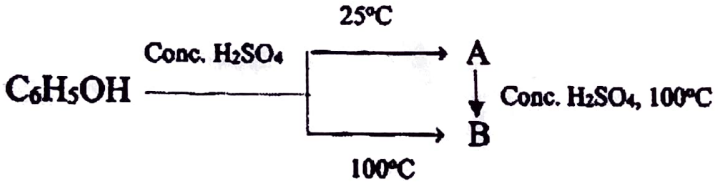
(ii) $RCH_2CHO \xrightarrow{LiAlH_4}$

(iii) $C_6H_6 + CH_3COCl \xrightarrow{AlCl_3}$

(iv) $C_6H_5OCH_3 \xrightarrow{HI}$

(4)

(b) (i) Convert a secondary alcohol to ketone by Oppenauer oxidation.

(ii) 

Identify A and B which is more stable and why? (4)

(c) What products are likely to be obtained when a primary alcohol is oxidised with PCC and alk. $KMnO_4$ respectively? Explain with the help of example. (4.5)

This question paper contains 4+2 printed pages]

Roll No. | | | | | | | | | | |

S. No. of Question Paper : **61**

Unique Paper Code : **217161**

G

Name of the Paper : **Chemistry-I (CHPT-101)**

Name of the Course : **B.Sc. (Prog.) Physical Science/Life Science/Applied Life Science**

Semester : **I**

Duration : **3 Hours**

Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt any *three* questions.

Question No. **1** carries **13.5** marks and Q. No. **2**,

Q. No. **3**, Q. No. **4** carries **12** marks each.

Use separate answer sheet for Section A and Section B.

Section A

1. (*a*) Write short notes on (any *three*) : 3×2.5

(*i*) Quantum numbers

(*ii*) Dipole moment

(*iii*) LCAO

(*iv*) Resonance energy.

(*b*) Arrange the following in order of increasing melting point giving reason : 2×1.5

(*i*) LiI, LiBr, LiCl, LiF

(*ii*) NaCl, CuCl.

P.T.O.

(*c*) Give reasons :

(*i*) KI is soluble in ethyl alcohol, whereas KCl is insoluble.

(*ii*) $ZnCl_2$ is more soluble in organic solvents than $MgCl_2$.

2. (*a*) Write Schrodinger wave equation and define each term involved in it.

(*b*) Give physical significance of ψ and ψ^2.

(*c*) What are Eigen values ?

(*d*) Why 1*s* orbital is spherically symmetrical ?

(*e*) Normalization of wave function.

3. (*a*) Write Born-Lande equation. Give the significance of terms involved in it.

(*b*) Calculate the heat of formation of KF from its elements from the following data b use of Born-Haber cycle :

Sublimation energy of potassium (S) = 87.8 kJ mol^{-1}

Dissociation energy of F_2 (D) = 158.9 kJ mol^{-1}

Ionization energy of K(g) (I) = 414.2 kJ mol^{-1}

Electronic affinity for F(g) (E) = –334.7 kJ mol^{-1}

Lattice energy of KF (U_0) = –807.5 kJ mol^{-1}

(*c*) Draw radial probability distribution curve for 3*s*, 3*p* and 3*d* orbitals.

4. (*a*) Draw molecular orbital diagram of CO or N_2. Write its configuration and find its bond order. 4

(*b*) Write the molecular orbital configuration of O_2, O_2^+, O_2^- and O_2^{2-} and arrange them in increasing order of their bond lengths. 3

(*c*) Predict the shapes of the following molecules using hybridization : 4

(*i*) CH_4

(*ii*) $SnCl_2$

(*iii*) ClF_3

(*iv*) XeF_2

(*d*) Calculate the % ionic character of HF (Given EN of H = 2.1, F = 4.0). 1

Section B

(Inorganic Chemistry/Organic Chemistry)

Attempt any *three* questions.

Question No. **1** carries **13.5** marks and Q. No. **2**,

Q. No. **3**, Q. No. **4** carries **12** marks each.

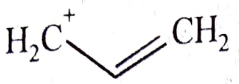
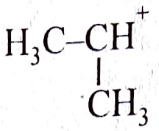
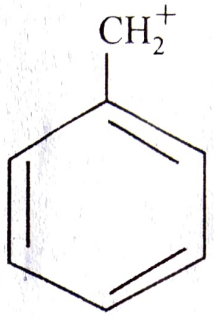
1. (*a*) The rate of nitration of toluene is greater than that of benzene. Explain giving reasons.

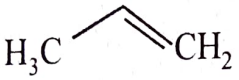
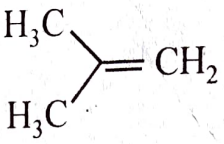
(*b*) Which is more basic Pyrrole or Pyridine ? Explain.

(*c*) Classify the following species as electrophiles or nucleophiles :

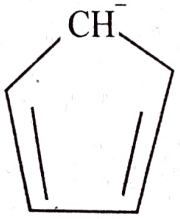
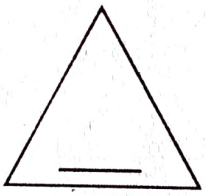
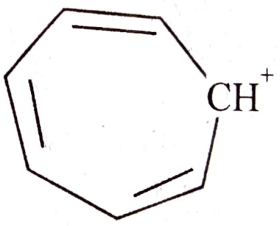
$(CH_3)_2CH^+$, CH_3O^-, $AlCl_3$, NH_3

(*d*) Arrange the following in the order of increasing stability. (Give reasons) :

(*i*)   

(*ii*)   $H_2C = CH_2$

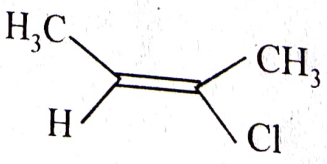
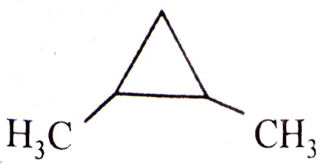
(*e*) What are the conditions for a compound to be aromatic. On this basis explain wh of the following compounds are aromatic ? 2,2,2,4,

2. (*a*) Draw the various conformations of 1,2-ethanediol ($HO–CH_2–CH_2–OH$) in Newm projection formulae and explain their relative order of stability.

(*b*) Write the most stable conformation of Methyl cyclohexane. Explain.

(*c*) Which of the following compounds exhibit geometrical isomerism. Assign E/Z configurat to them ?

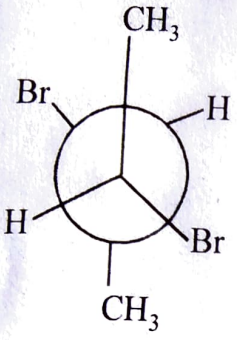
(*d*) Write the tautomers of the following :

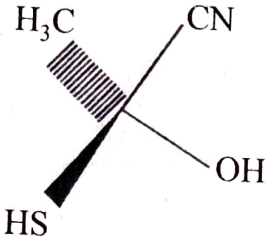
(*i*) CH_3CHO

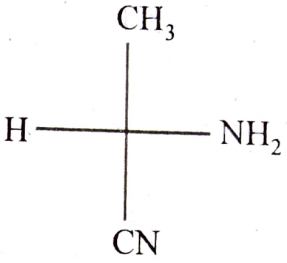
(*ii*) $CH_3CH_2NO_2$

3,4,3,2

3. (*a*) Convert the following in Fischer projection and assign R/S configuration :







(*b*) Differentiate between meso compound and racemic mixture.

(*c*) Give the mechanism of bromination of cis 2-butene. Give the stereochemistry of the product formed.

6,2,4

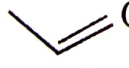
4. (*a*) Write the reactions involved when 1-butene is made to undergo the following reactions :

(1) Hydroboration-oxidation

(2) Oxymercuration-Demercuration

(3) Acid catalysed hydration

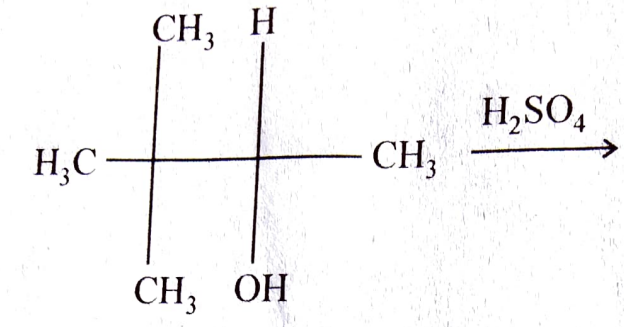
(*b*) Complete the reactions :

(*i*) H_3C  $CH_2 + O_3 \xrightarrow{CH_2Cl_2} ? \xrightarrow{Zn/H_2O} ?$

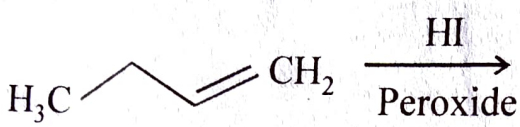
P.T.O.

though both are

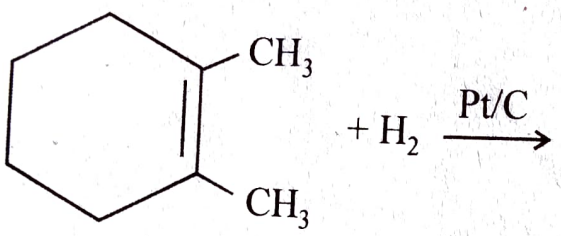
(*ii*)



(*iii*)



(*iv*)



(*c*) Give the chemical method to distinguish between ethane and ethyne. (Reaction also).

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[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 1883 **GC-3** **Your Roll No.....**

Unique Paper Code : 42171103

Name of the Paper : Chemistry (Atomic Structure, Bonding, General Organic Chemistry and Aliphatic Hydrocarbons)

Name of the Course : **B.Sc. (Prog.) CBCS**

Semester : I

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **six** questions in all, three questions from each section.
3. Question No. **1** and Q. **5** are compulsory.
4. Use separate answer sheets for **Section A** and **Section B.**

SECTION – A

1. Account for the following statements :

   (a) Chair conformation of cyclohexane is more stable than the boat conformation.

   (b) Meso compounds are optically inactive.

   (c) Boiling points of branched alkanes are lower than of straight chain isomeric alkanes.

   (d) 2-Methylbut-2-ene is more stable than 3-Methylbut-1-ene.

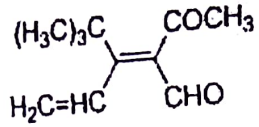
   (e) Methoxy methyl carbocation is more stable than propyl carbocation even though both are primary carbocations.

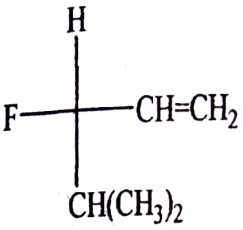
1883

(f) Anti Markovnikov addition in alkenes is not observed in case of HI and HCl in presence of peroxide. (2.5,2,2,2,2,3)

2. (a) How many optical isomers are possible for 2,3-Dicholoropentane ? Draw their fischer projections and give the relationship between them. Also assign absolute configuration (R/S) at each chiral center. (2,2,3,2)

(b) Explaining the priority order, assign E/Z or R/S configuration to the following :

(i) 

(ii) 

(3)

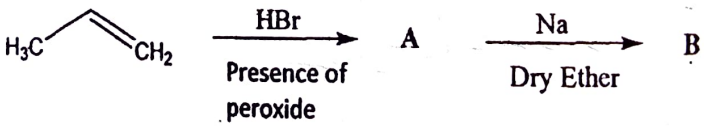
3. (a) Carry out the following conversions :

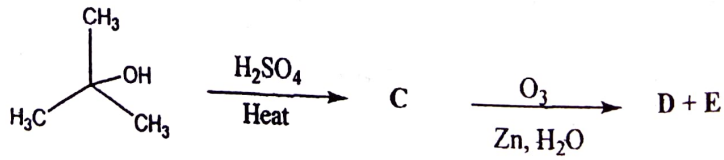
(i) Propene to Propan-1-ol

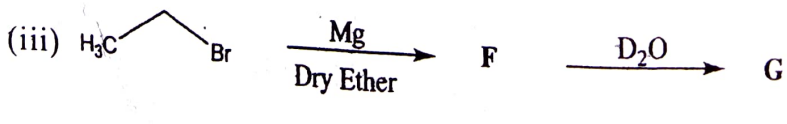
(ii) Propene to 2,3-Dimethylbutane

(iii) But-1-yne to trans-2-Butene (2,2,2)

(b) Predict the products of the following reactions :

(i) 

(ii) 

(iii) 

(2,2,2)

4. Write short notes on any **four** of the following :

   (a) Aromaticity

   (b) Structure and stability of Carbocations

   (c) Acidity of Alkynes

   (d) Mechanism of Halogenation of Alkanes

   (e) Absolute and Relative Configuration (3×4)

SECTION B

5. Answer the following briefly :

   (a) What do you mean by normalisation and orthogonality of a wave function ?

   (b) Why is the melting point of NaCl higher than that of $AlCl_3$?

   (c) Which is more covalent CaF_2 or $CaCl_2$ and why ?

   (d) Why does 2p orbital exist, but 2d does not ?

   (e) Why is the dipole moment of NH_3 greater than that of NF_3 ?

   (f) Why are lattice energy values and electron affinity values negative whereas ionisation energy, $\Delta H_{sublimation}$ and $\Delta H_{dissociation}$ positive ?

   (2,2,2,2,2.5,3)

6. (a) Draw and explain the MO Diagram for NO^+ molecule. (3)

   (b) Define lattice energy. State the Born-Lande equation for calculation of lattice energy. Define the terms involved. (3)

   (c) Describe the Born-Haber cycle for calculating lattice energy in the formation of NaCl (s). (3)

   (d) Draw the resonance structures of O_3 and NO_2 ? (3)

1883

7. (a) What is the minimum uncertainty in the velocity of a bullet weighing 0.02 Kg whose position is known with $\pm 1 \times 10^5$ m accuracy. (3)

(b) The solutions to the Schrodinger wave equation which are possible must have four special properties. What are these ? (3)

(c) Write the expression for Schrodinger wave equation in Cartesian Coordinates. (3)

(d) Show how the LCAO approximation gives rise to bonding and antibonding orbitals. What orbitals are formed by the lateral overlap of p orbitals ? (3)

8. (a) What are the differences between the VBT and MOT ? (3)

(b) Explain Hund's rule. Explain the arrangement of electrons in Cu atom. (3)

(c) Draw and explain the structure of I_3^- according to VSEPR theory. (3)

(d) Draw the radial distribution function curves for 2s, 2p and 3s orbitals of H-atom. (3)

This question paper contains 4 printed pages]

Roll No. | | | | | | | | | | |

S. No. of Question Paper : **81**

Unique Paper Code : **217361**

G

Name of the Paper : **Paper : 9-CHPT-303-Chemistry-III (Solutions, Conductance, Electrochemistry and Functional Group Chemistry-2)**

Name of the Course : **B.Sc. (Programme) (Physical Sciences and Life Sciences)**

Semester : **III**

Duration : **3 Hours**

Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Use of scientific calculators and log tables is allowed.

Use separate answer sheets for Sections A and B.

Section A

Attempt any *three* questions in this section.

Question No. **1** is compulsory.

1. Attempt any *five* questions : 2.5×5

(*a*) What is meant by transport number of an ion ? Explain.

(*b*) What are azeotropes ? Explain giving suitable examples.

(*c*) State and explain Kohlraushch's Law of independent migration of ions.

(*d*) Define critical solution temperature (CST) and give *one* example each of systems having upper CST and Lower CST.

(*e*) What are concentration cells ? Explain.

(*f*) How can conductometric titrations help in determining degree of ionization of a weak electrolyte ?

P.T.O.

(*g*) Explain the variation of molar conductivity with dilution for weak and strong electro

(*h*) What is the triple point of water ? What is the effect of changing pressure and temper at the triple point ?

2. (*a*) Draw the phase diagram of Sulphur and explain its salient features.

(*b*) Explain :

(*i*) Congruent melting point;

(*ii*) Incongruent melting point.

(*c*) Derive the relationship between degrees of freedom (F), number of Components (C number of phases (P).

3. (*a*) Derive the relation $\Delta G_{mix} = RT \Sigma n_i \ln x_i$.

(*b*) Explain in detail the Hittorf's method for the determination of transport number.

(*c*) Explain the conductometric titration of a strong acid with a strong base.

4. (*a*) Define equivalent conductivity. A solution of salt (1.0 N) surrounding two platinum trodes 4.2 cm apart and 8.4 cm^2 in area was found to offer a resistance of 50 o Calculate the equivalent conductivity of the solution.

(*b*) Explain in detail the process of steam distillation.

(*c*) Describe the Calomel electrode in detail giving the electrode reactions also.

Section B

Attempt any *three* questions. Each question carries **12.5** marks.

1. (*a*) Give and explain the order of reactivity of the following compounds towards a nucleop

Acid chloride, acid amide, acid anhydride, ester.

Also give the order of leaving group tendency of the respective leaving groups. reasons for your answer.

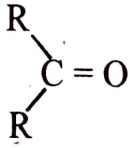
(*b*) What happens when aqueous solution of α-D-glucose is kept for some time ? Name the phenomenon and discuss the mechanism. 4

(*c*) Give the products in the following reactions. Also, give the name reactions involved, if any : 4.5

(*i*) $\underset{(1\ mol)}{CH_3CH_2COOH} + \underset{(1\ mol)}{Br_2/Red\ P} \longrightarrow$

(*ii*) $CH_3COOH + CH_3OH \xrightarrow{H^+}$

(*iii*) $BrCH_2COOEt + Zn \longrightarrow ? \longrightarrow ? \xrightarrow{Hydrolysis/Dil.\ Acid} ?$



2. (*a*) Write a mechanism to show low Claisen Condensation is used in the preparation of ethylacetoacetate. 3.5

(*b*) Predict the products (structures) of the following reactions : 3

(*i*) Benzene diazonium chloride + alkaline β-naphthol ⟶ ?

(*ii*) N-Methylaniline + HNO_2 ⟶ ?

(*iii*) Aniline + Benzoyl chloride $\xrightarrow{NaOH}$?

(*c*) Write short notes on : 6

(*i*) Carbylamine test

(*ii*) Hinsberg method.

3. (*a*) An organic compound A with molecular formula $C_3H_6O_2$ turns blue litmus red and gives a positive $NaHCO_3$ test. On treatment with PCl_5, the compound A gives the compound B. B when treated with NH_3 forms C :

(*i*) Giving reactions identify A, B and C.

(*ii*) How can compound C be converted to compound A ? Give the reaction. 4

(*b*) Give the keto and enol forms of ethylacetoacetate. Give an evidence for the existe of either of the two forms.

(*c*) Explain, with structure, why sucrose is a non-reducing sugar.

(*d*) Write the products (structures) in the following reactions :

(*i*) D-Glucose $\xrightarrow{\text{conc. } HNO_3}$?

(*ii*) D-Glucose $\xrightarrow[(1:1)]{PhNHNH_2}$?

(*iii*) D-Glucose $\xrightarrow{\text{acetic anhydride/pyridine}}$?

4. (*a*) Name the reaction involved in the conversion of acetamide into methylamine. Explain mechanism.

(*b*) How would you convert D-Arabinose to D-Glucose ?

(*c*) How is ethylacetoacetate used to prepare the following compounds (any *three*) :

(*i*) Adipic acid

(*ii*) 2-butanone

(*iii*) Propionic acid

(*iv*) Crotonic acid.

This question paper contains 3 printed pages.

Your Roll No. .....

Sl. No. of Ques. Paper : **1912**

GC-3

Unique Paper Code : **42174304**

Name of Paper : **C-VIII, DSC-2C- Solutions, Phase Equilibria, Conductance Electrochemistry and Functional Group Organic Chemistry – II**

Name of Course : **B.Sc. Industrial Chemistry / Analytical Chemistry (CBCS)**

Semester : **III**

Duration : : **3 hours**

Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt six questions in all, three questions from each Section.
Use of scientific calculator is allowed.

SECTION A

Attempt 3 questions in all.
Question No. 1 is compulsory.
All questions carry equal marks.

1. Explain (any five):
   (a) In alkali metal increasing order of conductivity is $Na^+ < K^+ < Rb^+ < Cs^+$ and not the reverse.
   (b) Azeotropic mixtures cannot be separated into pure components by simple distillation.
   (c) Role of salt bridge in an electrochemical cell.
   (d) CST is an invariant point.
   (e) Slope of sublimation curve is more than vaporization curve.
   (f) $NH_4Cl(s)$-$NH_3(g)$-$HCl(g)$ is a one component system if $p_{NH3} = p_{HCl}$
   (g) Difference between reversible and irreversible cells
   (h) Conductivity of an electrolyte solution decreases with dilution while the molar conductivity increases.

(2½ X 5=12½)

2. (a) Explain any four different types of half cells.
   (b) Explain briefly the principle underlying potentiometric titration and its advantages over volumetric titration. Draw the potentiometric titration curve involving a strong acid and strong base.
   (c) Given the E^0 values for the electrodes $Fe^{2+}(aq) \mid Fe(s)$ and $Pt(s)|Fe^{3+}(aq),Fe^{2+}(aq)$ as -0.44V and 0.77V respectively, calculate the E^0 value for the electrode $Fe^{3+}(aq) \mid Fe(s)$.

(4, 4, 4½)

3. (a) Derive the Clausis–Clapeyron equation for the variation of the vapour pressure of liquid with Temperature.
   (b) Draw and discuss the well labelled phase diagram of water or lead silver system.
   (c) Prove mathematically that multistage extraction is advantageous over single stage extraction.

(4, 4, 4½)

P. T. O.

4. (a) Define ionic mobility. Explain moving boundary method to determine the transference number.

(b) Write short note on any two:

(i) Kohlarusch's Law of independent migration of ion

(ii) Conductometric titration

(iii) Steam distillation

(iv) Calomel electrode

(c) The resistance of 0.5 N solution of an electrolyte in a cell was found to be 45 ohms. Calculate the equivalent conductance of the solution if the electrodes in the cell are 2.2 cm apart and have an area of 3.8 cm^2.

(4, 4, 4½)

SECTION B

Attempt three questions in all.

All questions carry equal marks.

5. (a) Write short note any two of the following:

(i) Merrifield solid phase synthesis

(ii) Electrophoresis

(iii) Secondary structure of protein (α-helix & β-sheets)

(b) Give the full name of "DCC" and "*t*-Boc" and highlight their use in peptide synthesis.

(c) Outline the synthesis of Alanine using Strecker synthesis.

(d) What are essential and non-essential amino acids? Give one example of each.

(5, 2, 3½, 2)

6. (a) Predict the structure of products A to E in the following reactions:

$$C_6H_5NH_2 + C_6H_5COCl \xrightarrow{NaOH} A$$

$$CH_3NH_2 \xrightarrow{CHCl_3/KOH} B$$

$$(CH_3)_2NCH_2CH_2CH_3 \xrightarrow{CH_3CH_2Cl} C \xrightarrow{NaOH/Br} D \text{ (major)} + E \text{ (minor)}$$

(b) Write short note on any two of the following:

(i) Gabriel's Phthalimide Synthesis

(ii) Hofmann Bromamide reaction

(iii) Schotten – Baumann Reaction

(c) How will you chemically distinguish between Aniline and N-methylaniline?

(5, 5, 2½)

7. (a) How will you synthesize carboxylic acid by alkaline hydrolysis of esters and give its advantage over acidic hydrolysis?

(b) Which of the following is a stronger acid and why?

$CH_3CHBrCOOH$, $BrCH_2CH_2COOH$

(c) Discuss HVZ reaction with mechanism.

(d) Explain the following:

(i) Acyl chloride undergoes nucleophilic attack more readily than alkyl chloride.

(ii) Esters have lower boiling point than Acids of comparable molecular weights.

(3, 2, 3½, 4)

8. (a) Sucrose and maltose both are disaccharides but sucrose is a non reducing while maltose is reducing sugar? Explain.

(b) Write the structure of the products in the following reactions:

(i) D-Glucose + $CH_3OH/HCl \rightarrow A$

(ii) Fructose + Tollen's Solution $\rightarrow$ B

(iii) Glucose + $NaBH_4 \rightarrow C$

(c) What happens when an aqueous solution of D-glucose is kept for some time? Name the phenomenon and discuss the mechanism involved.

(d) How will you Convert D-glucose to D-Arabinose by Ruff's degradation?

(e) Draw the Haworth projection for: β-D-Glucopyranose and α-D-Fructofuranose.

(2, 3, 3, 2½, 2)

[This question paper contains 6 printed pages.]

Sr. No. of Question Paper : 86 **G** **Your Roll No.....**

Unique Paper Code : 217561

Name of the Paper : CHPT – 505 : CHEMISTRY – V Chemistry of d block Elements Quantum Chemistry & Spectroscopy

Name of the Course : **B.Sc. Programme Life Science / Physical Science / Applied Life Science (Agrochemical & Pest Management) / Applied Physical Science (Analytical Chemistry / Industrial Chemistry)**

Semester : V

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on the receipt of this question paper.
2. Attempt **3** questions from **Section A** and 3 questions from **Section B.**
3. Sections A and **B** are to be attempted in separate portions of the same answer sheet.
4. Please indicate the section you are attempting at the appropriate place and do not intermix the sections. The questions should be numbered in accordance to the number in the question paper.
5. Calculators and log tables may be used.

SECTION A

Attempt any **3** *questions.*

1. (a) Give brief reasons for **any 3** of the following :

   (i) Ti(III) compounds are coloured while Ti(IV) compounds are colourless

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(ii) Octahedral complexes of Fe(II) may be of inner and outer orbital types but those of Ni(II) are only outer orbital.

(iii) The densities of the elements of the third transition series are much higher than those of the corresponding elements of the second transition series.

(iv) Transition metals form a large number of complexes.

(v) Strong field ligands prefer Co(III) to Co(II).

(b) $[Co\ Br(NH_3)_5]^{2+}$ undergoes ligand substitution reaction when treated with $NaNO_2$ to give two isomeric pentaammine ions depending upon the experimental conditions. Deduce the structures of these. What is this type of isomerism called ? How can you distinguish between the two isomers ? (9,3½)

2. (a) An octahedral complex of Cu(II) is generally distorted and two bonds are longer than the other four. Explain and draw the splitting diagram. What is the driving force towards this distortion ?

(b) Give the IUPAC names of **any 3** of the following :

(i) $K_3[Ag(S_2O_3)_2]$

(ii) $[Cr(NH_3)_6][Cu(CN)_5]$

(iii) $Li[Mn(CO)_5]$

(iv) $[(en)_2Co(O_2)Co(en)_2](OH)_4$

(c) Using VBT predict the hybridisation, geometry and magnetic behaviour of **any 2** of the following :

(i) $[Ni(CO)_4]$

(ii) $Ca_2[Fe(CN)_6]$

(iii) $K_2[NiCl_4]$

(5,4½,3)

3. (a) Write the formulae of **any 3** of the following :

(i) Caesium tetrafluorooxochromate (III)

(ii) Pentaamminesulphatorhodium(III) perchlorate

(iii) Zinc tetrabromoiodate(III)

(iv) Tetraaquapalladium(II) amminetrichloropalladate(II)

(b) Calculate the CFSE of Fe^{2+} ion placed in an octahedral weak field environment. Draw the splitting diagram. What will be the CFSE in a tetrahedral field ? Comment on the difference in splitting pattern in both the fields.

(c) Indicate the type of isomerism in the following pairs :

(i) $[Co\ Cl(NH_3)_5]\ SO_4$ and $[CoSO_4(NH_3)_5]\ Cl$

(ii) $[Co(NH_3)_6]\ [Cr(ox)_3]$ and $[Cr(NH_3)_6]\ [Co(ox)_3]$

(iii) $[Fe(NH_3)_3(NO_2)_3]$ and $[Fe(NH_3)_6]\ [Fe(NO_2)_6]$

(d) What phenomenon is responsible for the intense colour of potassium permanganate and potassium dichromate ? (4½,4,3,1)

4. (a) Changing the ligand may alter the geometry and magnetic behaviour of a four coordinate Ni(II) complex. Explain using VBT.

(b) Indicate the appropriate choice and give brief reasons :

(i) Greater value of Δ_0 $[Co(NH_3)_6]^{3+}$ or $[Co(H_2O)_6]^{3+}$

(ii) Good oxidizing agent Sm(II) or Ce(IV)

(iii) Optically active cis or trans $[CrCl_2(en)_2]^+$

(c) Construct the Latimer diagram of iron in acidic medium from the following data :

$FeO_4^{2-} \longrightarrow Fe^{3+}$ $\quad E^0 = 2.20V$

$Fe^{3+} \longrightarrow Fe^{2+}$ $\quad E^0 = 0.77\ V$

$Fe^{2+} \longrightarrow Fe$ $\quad E^0 = -0.47\ V$

Calculate E^0 for $FeO_4^{2-} | Fe^{2+}$. Identify the species which is highly oxidizing and give reasons for your choice. Will any Species undergo disproportionation ?

OR

Write short notes on **any 2** of the following :

(i) Lanthanide contraction and 2 consequences.

(ii) Geometrical Isomerism in complexes of coordination number 4.

(iii) Catalytic properties of 3d metals and their compounds. (3,4½,5)

SECTION B

Attempt any 3 questions.

Physical Constants

Planck's constant 6.626×10^{-34} J s

Velocity of light 3×10^8 m s^{-1}

Avogadro's number 6.023×10^{23} mol^1

Atomic mass unit 1.661×10^{-27} kg

Mass of electron 9.109×10^{-31} kg

$\pi = 3.142$

5. (a) Write the mathematical expressions for the position operator x and the kinetic energy operator T_x.

(b) Which of the following are eigenfunction is of the operator d^2/dx^2: ?

(i) sin nx; (ii) 3 exp(–5x)

Give the eigenvalues wherever appropriate.

(c) A molecule XY is studied by microwave spectroscopy under the rigid rotator approximation. Draw the schematic stick line spectrum. What is the structural information that can be obtained from this spectrum ?

(d) The linear N_2O molecule shows three fundamental vibrational frequencies in the IR spectrum. Suggest a molecular structure for this molecule. Justify briefly. (2,3,3½,4)

6. (a) Calculate the percentage change in the energy of a particle of mass m in a one dimensional box of edge length L when, the edge length is decreased by 10%

(b) A diatomic molecule AB undergoes vibrational motion according to the harmonic oscillator model. Write the mathematical expression for the Hamiltonian, Schrodinger's equation and the vibrational energy E_{vib} associated with this system.

(c) The fundamental stretching vibration for $^1H^{35}Cl$ is observed at 2886 cm^{-1}.

(i) Draw an energy diagram indicating the vibrational energy levels.

(ii) Calculate the force constant and the zero point energy. (4,4½,4)

7. (a) Calculate the transmittance, absorbance and the extinction coefficient of a solution which absorbs 90% of a certain wavelength of light when the beam passes through a 1 cm cell which contains a solution of molarity 0.25 M.

(b) Consider the Free Electron Molecular Orbital (FEMO) description of the linear molecule hexatriene. What is the minimum excitation energy, given that the average C-C bond distance is 140 pm ?

(c) Define quantum yield. What are the reasons for high and low values of quantum yield ? (4½,4,4)

8. (a) Write short notes on **any three** of the following :

(i) Effect of hydrogen bonding on vibrational frequencies

(ii) Laws of photochemistry

(iii) Fluorescence and phosphorescence

(iv) Born Oppenheimer approximation

(b) Define the unit "Einstein". (3½×3,2)

is question paper contains 4 printed pages]

Roll No. | | | | | | | | | | |

No. of Question Paper : 97

nique Paper Code : 217586 G

me of the Paper : CHCT-501 : Chemistry—I

me of the Course : B.Sc. (Prog.) Physical Sciences, Part III (Concurrent Course)

mester : V

ration : 3 Hours Maximum Marks : 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

Question No. **1** is compulsory.

Both Section A and Section B are compulsory.

Attempt *three* questions from Section A and *three* questions from Section B.

Attempt any *five* parts from the following :

(*a*) Write down the Schrodinger wave equation of Hydrogen atom. Describe the various terms involved. 3

(*b*) What do you understand by Aufbau's principle. State the $(n+1)$ rule. 3

(*c*) Explain why melting point of NaCl is higher than that of $AlCl_3$. 3

(*d*) State the second law of thermodynamics and justify the statement qualitatively. 3

(*e*) Explain why C_P is always greater than C_V. 3

(*f*) What is Common Ion Effect ? Explain with the help of an example. 3

Section A

Attempt any *three* questions.

(*a*) Show the Born-Haber Cycle for the formulation of ionic KF. Give the meaning of each and every term used in the cycle. 5

P.T.O.

(*b*) Calculate the lattice energy of NaCl crystal from the following data by the Born-Haber Cycle. Sublimation energy = 108.7 kJ/mol, Dissociation Energy of Cl_2 = 225.9 kJ/mol, Ionization Energy for Na(g) = 489.5 kJ/mol, Electron affinity of Cl(g) = –351.4 kJ/mol, Heat of formation of NaCl = –414.2 kJ/mol.

(*c*) What is the physical significance of the Madelung's constant in the Born-Lande equation ?

3. Give reasons for any *four* of the following : 4×2

(*a*) $BaSO_4$ is insoluble in water

(*b*) Noble gases do not form ionic halides

(*c*) LiCl has a higher boiling point than HCl

(*d*) AgF, AgCl and AgBr have similar structures but the order of hardness differs.

(*e*) Silver halides have lattice energies similar to alkali halides but still insoluble in water.

4. (*a*) Give the quantum mechanical expression and the physical significance of normalization principle.

(*b*) Explain the importance of the radial probability distribution curves and plot the same for 1*s*, 2*s* and 2*p* orbitals of H atom.

(*c*) Why are 2*d* and 3*f* orbitals not possible ?

5. (*a*) Predict the shape and the type of hybridization in each of the following molecules :

$$BeF_2,\ H_2O,\ SF_6,\ ClF_3,\ XeF_4.$$

(*b*) Draw the MO diagram for CO molecule and calculate its bond order.

(*c*) State the limitations of the Valence Bond Theory.

Section B

Attempt any *three* questions.

6. (*a*) Calculate q, w, ΔU and ΔH for an isothermal reversible and isothermal irreversible expansion of an ideal gas. 6

(*b*) Calculate the heat of formation of KCl from the following data : 4

(*i*) $KOH(aq) + HCl(aq) \rightarrow KCl(aq) + H_2O(l)$ $\Delta H = -57.3$ kJ/mol

(*ii*) $H_2(g) + \frac{1}{2} O_2(g) \rightarrow H_2O(l)$ $\Delta H = -286.2$ kJ/mol

(*iii*) $\frac{1}{2} H_2(g) + \frac{1}{2} Cl_2 \rightarrow HCl(aq)$ $\Delta H = -164.4$ kJ/mol

(*iv*) $K(s) + \frac{1}{2} O_2(g) + \frac{1}{2} H_2(g) + aq \rightarrow KOH(aq)$ $\Delta H = -487.4$ kJ/mol

(*v*) $KCl(s) + aq \rightarrow KCl(aq)$ $\Delta H = +18.4$ kJ/mol

7. (*a*) Derive the following relation for a salt of strong acid and weak base : 6

$$pH = \frac{1}{2} [pKa + pKw - pK_b]$$

(*b*) Calculate the solubility in grams per litre of $Al(OH)_3$ in water at 25°C if the value of $K_{sp} = 8.5 \times 10^{-32}$. 4

8. (*a*) Derive the following Thermodynamic expression :

$$\Delta G = \Delta H + T\left[\frac{\partial \Delta G}{\partial T}\right]P$$

and give the name of this equation. 5

(*b*) Calculate the entropy change for the fusion of 1 mole of a solid which melts at 300 The latent heat of fusion is 2.51 kJ/mol.

(*c*) Show that :

$$\left(\frac{\partial P}{\partial S}\right)_V = \left(\frac{\partial T}{\partial V}\right)_S .$$

9. Write short notes on any *four* : 4×2.5=

(*i*) Carnot cycle for an ideal gas

(*ii*) Ostwald's dilution law

(*iii*) Arrhenius Theory of Electrolytic Dissociation

(*iv*) Buffer Action of Acidic Buffer (qualitative explanation)

(*v*) Henderson-Hasselbalch equation for Basic Buffer.

[This question paper contains 6 printed pages.]

Sr. No. of Question Paper : 2544 **GC-3** **Your Roll No.....**

Unique Paper Code : 32175901

Name of the Paper : CHEMISTRY (Atomic Structure, Chemical Bonding, Fundamentals of Organic Chemistry)

Name of the Course : **B.Sc. (CBCS) GE**

Semester : I / III

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **3** questions from **Section A** and **3** questions from **Section B.**
3. Please indicate the section you are attempting by putting a heading and do not intermix the sections.
4. The questions should be numbered in accordance to the number in the question paper.
5. Calculators may be used.

SECTION A

Attempt **three** *questions from this section.*

1. (a) KI is soluble in alcohol but KCl is insoluble. Explain.

   (b) What is significance of Ψ and Ψ^2 ?

   (c) LiCl and SrO have same NaCl structure. Which one of them according to you would be harder and why ?

2544

(d) Write Born Lande equation and explain all the terms involved in it.

(e) Justify why 3f and 4g orbitals are not possible ?

(2,3,3,1.5,3)

2. (a) Draw the resonating structures of (a) CO_3^{2-} (b) SCN^-.

(b) Lattice energy of AgCl is of order of NaCl even then it is insoluble in water. Explain.

(c) Draw the MO diagram of N_2 and calculate its bond order.

(d) What conditions should be followed by a wave function in order to give permissible results of Schrodinger wave equation.

(e) Why is s orbital spherically symmetrical ?

(3,1.5,3,4,1)

3. (a) Write time independent Schrodinger Wave equation for Hydrogen atom and explain all the terms involved in it.

(b) The expected electronic configuration of Cr and Cu is different from observed electronic configuration. Explain.

(c) Bond angle of NH_3 is 107^0 while that of H_2O is 104^0. Explain.

(d) Draw the radial probability distribution curves for 3p and 3d orbitals.

(e) What is Madelung constant ? On what factor does it depend ?

(3,3,2,3,1.5)

4. (a) Write short notes on any two of the following :

(i) Resonance

(ii) Heisenberg's Uncertainty Principle

(iii) Hund's rule of Maximum Multiplicity

(b) Arrange the following in increasing order of their ionic character giving reasons for the same.

HF, HCl, HBr, HI.

(c) Calculate the heat of formation (ΔH_f) of KF from its elements from the following data using Born – Haber Cycle.

Sublimation Energy of K = 87.8KJ/mol, Dissociation Energy of F_2 = 158.9 KJ/mol,

Ionization Energy of K (g) = 414.2 KJ/mol,

Electron Affinity of F (g) = –334.7 KJ/mol, Lattice Energy of KF = –807.5 KJ/mol

(6,3,3.5)

SECTION B

Attempt **three** *questions from this section.*

5. Explain the following :

(a) Ammonia is less basic than aliphatic amine.

(b) Homolytic and heterolytic cleavage with example.

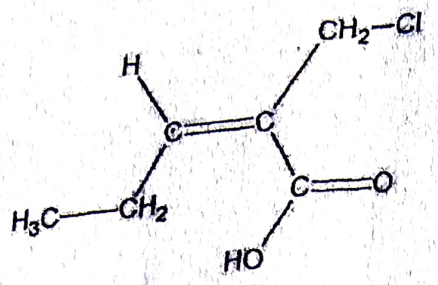
(c) Ethyne is more acidic than ethene.

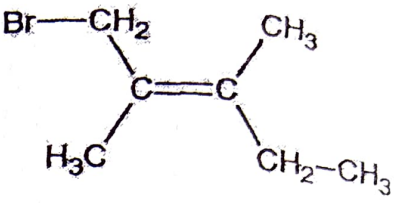
(d) Vinyl chloride is less reactive than allyl chloride

(e) Three isomeric pentanes (C_5H_{12}) have boiling points 9.5°C, 28°C and 36°C. Comment on the structures giving reasons. (2.5×5=12.5)

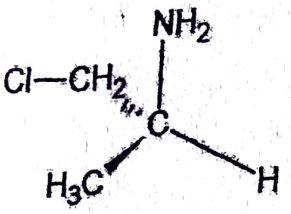
6. (a) Draw Newman projection for different conformations of butane. Which of the conformation is most stable and why ?

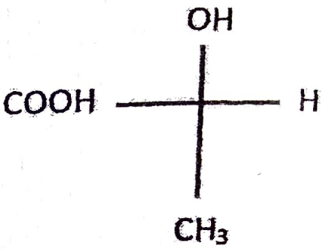
(b) Assign priority order; designate E/Z to the following:

(i) 

(ii) 

(c) Assign priority order, designate R/S configuration of the following :

(i) 

(ii) 

(4.5,4,4)

7. (a) Distinguish between the following using chemical test :

(i) But-1-yne and But-2-yne

(ii) Propane and Propene

(b) Write short note on any **three** :

(i) Wurtz reaction

(ii) Enantiomers and Diastereoisomers

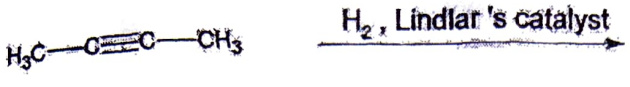
(iii) Ozonolysis

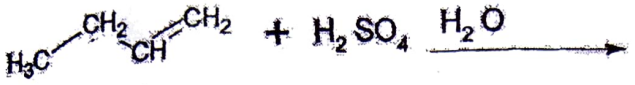
(iv) Meso compounds

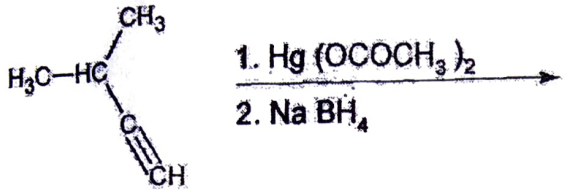
(c) Increasing acid strength of HCOOH, CH_3COOH and CH_3OH.

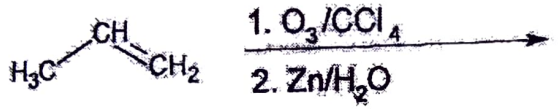
2544

8. (a) Complete the following reactions :

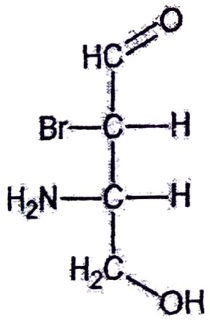
(i) 

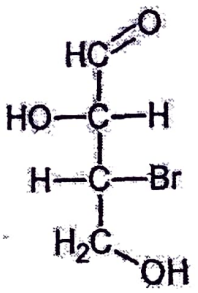
(ii) 

(iii) 

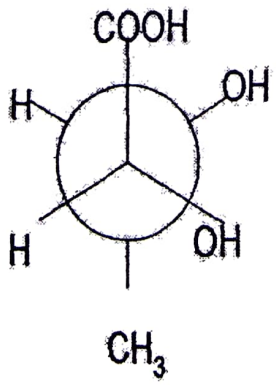
(iv) 

(b) Assign Erythro and Threo :

(i) 

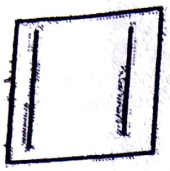
(ii) 

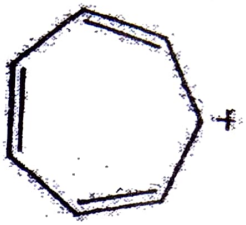
(c) Convert the following Newman projection into Sawhorse and Fischer projection

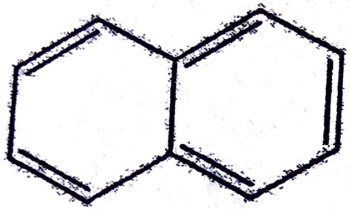


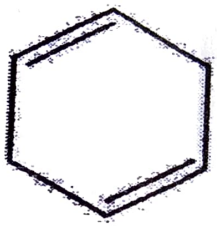
2544

(d) Which of the following compounds are aromatic & why ?

(i) 

(ii) 

(iii) 

(iv) 

(4,2,2.5)

[This question paper contains 6 printed pages.]

Sr. No. of Question Paper : 25 **G** **Your Roll No.....**

Unique Paper Code : 217153/217181

Name of the Paper : CHEMISTRY, CHCT-101

Name of the Course : **B.Sc. Mathematical Sciences/B.Sc. (H) Mathematics (Credit Course–I)**

Semester : III

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **3** questions from **Section A** and **3** questions from **Section B.**
3. Indicate the section you are attempting by putting a heading and do not intermix the sections.
4. The questions should be numbered in accordance to the number in the question paper
5. Calculators and log tables may be used.

SECTION A

(Attempt **three** *questions in all.)*

1. (a) Calculate the lattice energy of MgF_2 using the following data :

Sublimation energy of Magnesium, Mg(s) (ΔH_{sub}) = 146 KJ/mol

1st ionization energy for Mg (ΔH_{IE1}) = +738 KJ/mol

2nd ionization energy for Mg (ΔH_{IE2}) = +1451 KJ/mol

Bond dissociation energy of Fluorine, F_2 (g) (ΔH_{BD}) = 159 KJ/mol

25

Electron Affinity of F(g) (ΔH_{EA}) = –328 KJ/mol

Enthalpy of formation of MgF_2(s) (ΔH_f) = –1124 KJ/mol (4)

(b) Differentiate between thermodynamic stability and kinetic stability of coordination compounds giving suitable examples. (3.5)

(c) Write down the Born-Lande equation for the lattice energy of an ionic compound and define the terms in it. (3)

(d) What is the name of the intermolecular force caused by instantaneous dipoles in the molecules ? Write its importance. (2)

2. (a) Calculate the limiting radius ratio of an ionic compound (ratio of radius of cation to that of anion) when the cation is in contact with anions and the coordination number of cation is 8. (3)

(b) Using Bent's rule, predict whether Cl-C-Cl angle is greater or smaller than tetrahedral angle (i.e. 109.5°) in CH_2Cl_2. Justify you answer. (3)

(c) Explain why H_2O is bent whereas CO_2 is linear using the concept of hybridisation ? (3)

(d) What mechanism will you suggest for the reduction of $[Co(NH_3)_5Cl]^{2+}$ by $[Cr(H_20)_6]^{2+}$? Can you apply the same mechanism for the reduction of $[Co(NH_3)_6]^{3+}$ by $[Cr(H_2O)_6]^{2+}$? Justify your answer. (3.5)

3. (a) Draw the MO diagram of NO, determine the bond order and predict its magnetic property (whether diamagnetic or paramagnetic). (4.5)

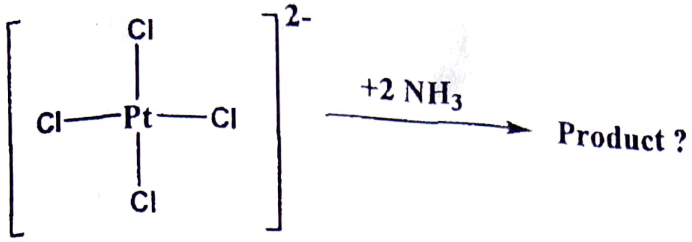
(b) Predict the shapes of the following molecules :

$XeOF_4$, ClF_3, ICl_4^- or IO_4^-. (4)

(c) Calculate the CFSE in terms of Δ and P (pairing energy) for d^6 octahedral low spin complex and d^5 tetrahedral complex. (4)

25

4. (a) What is trans-effect ? Predict the product in the following reaction :



(3)

(b) What is Jahn-Teller effect ? Describe the conditions which lead to strong distortion in octahedral complexes. (4)

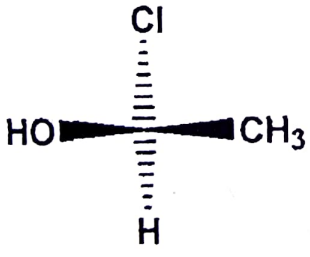
(c) Which out of HF or HCI will have higher boiling point ? Justify your answer. (2)

(d) Draw crystal field splitting diagram for octahedral complexes $[CoCl_6]^{4-}$ and $[Co(CN)_6]^{3-}$. (3.5)

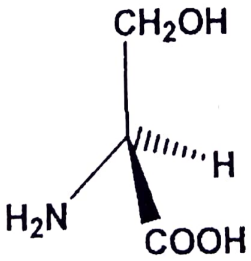
SECTION B

(Attempt **three** *questions in all.)*

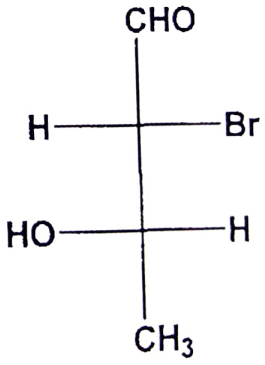
1. (a) Using sequence rules, assign R/S notations to the stereocentres in the following configurations : (4)



(i)



(ii)



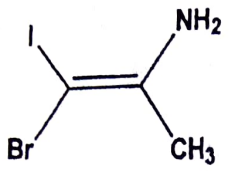
(iii)

(b) Draw the Newman projections for anti, gauche, eclipsed and fully eclipsed conformations of 1,2-dibromoethane and indicate which will be more stable and why ? (4)

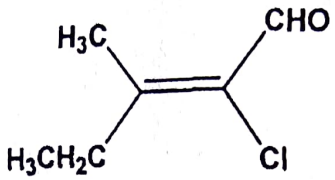
25

(c) Explain why the chair conformation of cyclohexane is more stable than the boat conformation with the help of Newman projections of the two conformations. (4.5)

2. (a) Assign E and Z notations to the following olefins and write the steps :



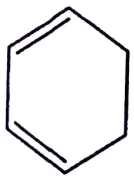
(i)



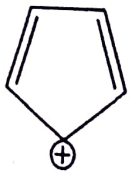
(ii)

(3)

(b) Which of the following cyclic organic compounds are aromatic and why ?



(i)



(ii)

(iii)

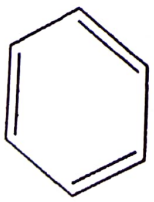
(3)

(c) Arrange the following carbocations in the increasing order of stability, give reason :

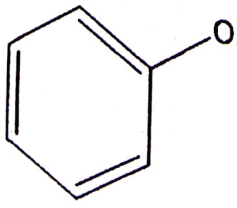
Methyl carbocation (C^+H_3), isopropyl carbocation $(CH_3)_2C^+H$, I-butyl carbocation $(CH_3)_3C^+$.

(3)

(d) Giving reasons, arrange the following compounds in increasing order of reactivity toward *electrophilic substitution reaction*:



(i)



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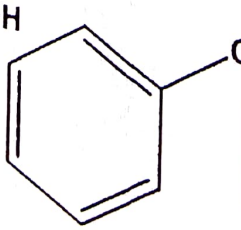
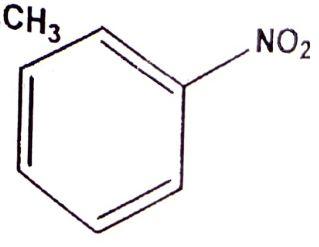


(iii)



(iv)

(3.5)

3. (a) Arrange the following compounds in decreasing order of acidic strength. Give reasons for your arrangement. (4)

$Cl_2CHCOOH$ (i) CH_3COOH (ii) $ClCH_2COOH$ (iii) CH_3CH_2OH (iv)

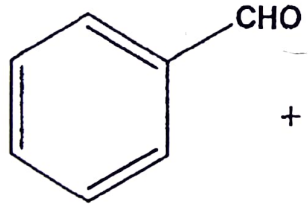
(b) Write the products, name of the reaction and outline the mechanism of following reaction :

$$2C_6H_5CHO \xrightarrow[NaOH]{40\%} A + B$$ (4)

(c) What happens when methyl magnesium bromide reacts with methanal (HCHO) followed by hydrolysis ? Explain. (3)

(d) Explain Saytzeff rule with suitable examples. (1.5)

4. (a) Complete the following reaction and indicate the name reaction involved and write the mechanism of the reaction



$$+ (CH_3CO)_2O \xrightarrow[Heat]{CH_3COONa} ?$$ (4.5)

(b) Write the product and classify the following reactions as addition, elimination or substitution reaction.

$CH_3COCH_3 + HCN \longrightarrow ?$

$CH_3ONa^+ + CH_3Br \longrightarrow ?$

$CH_3CH_3CH_2Br$ + Alcoholic KOH $\longrightarrow ?$ (3)

25

(c) Write the monomeric units present in natural rubber (polymer) and draw its structure. (2)

(d) What do you understand by ring opening polymersation ? Explain with suitable example. (3)

[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 65 **G** **Your Roll No.....**

Unique Paper Code : 216/223/151

Name of the Paper : Biology – I (Introduction to Biology) (LSPT-101)

Name of the Course : **B.Sc. Life Science/Physical Science/B.Sc. (Hons.) Botany/Zoology/Biomedical Science**

Semester : I / III

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **Five** questions in all including Q. No. **1** which is compulsory.
3. Attempt different parts of the same question one after the other, (not necessarily in the same order).

1. (i) Define the following **(any five)** : (5)

(a) Buffer

(b) Renaturation

(c) Reverse genetics

(d) Phylogeny

(e) Dehydration reaction

(f) Chitin

65

(ii) Differentiate between the following : (12)

(a) Starch & Cellulose

(b) Archaea & Eukarya

(c) Saturated & Unsaturated fatty acids

(d) Acid & Base

(e) Cohesion & Adhesion

(f) Nucleoside & Nucleotide

(iii) State whether the following are True or False : (5)

(a) Ribulose is a 6-C Sugar.

(b) Water is a universal solvent.

(c) Carbon forms the backbone of biological molecules.

(d) Starch has 1-4 glycosidic linkage of β-glucose monomers.

(e) Amylopectin is a unbranched polymer.

(iv) Write about contribution of the following scientists :– (5)

(a) Charles Darwin

(b) Watson & Crick

(c) G Mendel

(d) Miller Urey

(e) Marshall Nirenberg

2. Discuss "Proteins include a diversity of structures, resulting in a wide range of functions." (12)

3. (a) Discuss the major components & working of a Pond Ecosystem. (8)

   (b) Draw a well labeled diagram of an Eukaryotic Plant Cell. (4)

4. (a) Discuss the Darwin's theory of Natural Selection. (4)

   (b) Discuss briefly the Emergent properties of water. (8)

5. (a) Outline the flow of genetic information in living organisms. (8)

   (b) Give example of the following : (4)

   (i) Plant storage polysaccharide

   (ii) An enzyme catalyzing unwinding of DNA helix

   (iii) A sulphur containing amino acid

   (iv) A prokaryotic model organism for genetic studies

6. (a) Write short notes on **any four** of the following :– (8)

   (i) Sickle cell disease

   (ii) Model organism

   (iii) Chaperonins

   (iv) Speciation

   (v) Protocells

65

(b) Write short note on Developmental Noise. (4)

7. (a) What are genetic variations. Discuss continuous and discontinuous genetic variation. (6)

(b) Discuss the conditions that were present on early earth that made the origin of life possible. (6)

This question paper contains 4 printed pages]

Roll No. | | | | | | | | | | |

S. No. of Question Paper : 1875

Unique Paper Code : 42161101 GC-3

Name of the Paper : **Biodiversity (Microbes, Algae, Fungi and Archegoniatae)**

Name of the Course : **B.Sc. (Prog.) Life Science (CBCS)**

Semester : **I**

Duration : **3 Hours** Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt *Five* questions in all.

Question Nos. **1** and **6** are compulsory.

All parts of a question must be answered together.

Draw well-labelled diagrams wherever necessary.

1. (*a*) Define the following (any *five*) : 5×1=5

(*i*) Glycocalyx

(*ii*) Zygospore

(*iii*) Capsomere

(*iv*) Heterocyst

(*v*) Dwarf male

(*vi*) Conceptacle

P.T.O.

(*vii*) Calyptra

(*viii*) Megasporophyll

(*ix*) Isidia

(*x*) Cleistothecium.

(*b*) Fill in the blanks (any *five*) : 5×1

(*i*) Bread mold is the common name of ..... .

(*ii*) Nucleic acid in TMV is ..... .

(*iii*) Rhizoids in *Funaria* are branched and septate, and septa are found ..... placed.

(*iv*) *Chlamydomonas* contains ..... shaped chloroplast.

(*v*) ..... are the channel proteins present in the cell wall Gram –ve bacteria.

(*vi*) Winged pollen grains occur in gymnosperm ..... .

(*vii*) Horsetail is the common name of ..... .

(*c*) Match the following : 5×1

(*i*)	*Marchantia*	(*a*)	Resin canals
(*ii*)	*Alternaria*	(*b*)	Reticulate chloroplast
(*iii*)	*Pinus*	(*c*)	Gametophore
(*iv*)	*Selaginella*	(*d*)	Multicellular conidia
(*v*)	*Oedogonium*	(*e*)	Rhizophore

2. Differentiate the following (any *five*) : 5×3=15

(*a*) Homoiomerous and Heteromerous lichen thallus

(*b*) Perithecium and Apothecium

(*c*) Rhizoids of *Marchantia and Funaria*

(*d*) Clamps and crozier formation

(*e*) Mega- and Microsporangium in *Selaginella*

(*f*) Simple conjugation and Hfr conjugation

(*g*) *Ectomycorrhiza* and *Endomycorrhiza*.

3. Draw well-labelled diagrams of the following (any *three*) : 3×5=15

(*a*) V.S. Gill of *Agaricus*

(*b*) L.S. Sporophyte of *Funaria*

(*c*) E.M. Non-photosynthetic Bacterial cell

(*d*) T.S. Needle of *Pinus*

(*e*) L.S. Ovule of *Cycas*.

4. Write short notes on any *three* of the following : 3×5=15

(*a*) Gametangial copulation in *Rhizopus*

(*b*) Generalized transduction in bacteria

(*c*) Spermatisation in *Puccinia*

(*d*) Alternation of generation in bryophytes

(*e*) Heterospory in Pteridophytes.

5. Answer any *three* : 3×5=1

(*a*) Define stele. Describe the stelar evolution in pteridophytes with suitable diagrams.

(*b*) Describe various stages in the life cycle of *Puccinia graminis tritici* found on secondar host with the help of suitable diagrams.

(*c*) Illustrate the life cycle of the macrandrous species of *Oedogonium*.

(*d*) Describe the adaptations that are acquired by land plants to survive in terrestrial habita

6. Attempt any *five* : 5×3=1

(*a*) Lichens are the pioneers of forest ecosystem. Justify the statement. Give *two* example of saxicolous lichens associated with the forest ecosystem succession.

(*b*) Name the group of bacteria considered to be the producer of majority of the availabl antibiotics. Name any *two* bacteria and antibiotics produced by them belonging to thi group.

(*c*) Name a moss studied by you which is an important source of a fossil fuel. Giv the name of the product and write very briefly about the conditions responsible for it formation.

(*d*) Write a short note on the application of mycorrhizae in agriculture.

(*e*) Write any *three* important uses of *Cycas*.

[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 1876 **FC-3** **Your Roll No.....**

Unique Paper Code : 42231102

Name of the Paper : ANIMAL DIVERSITY

Name of the Course : **B.Sc. Life Science Zoology (CBCS)**

Semester : I

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are **two** sections, **Section A** and **Section B** to be answered on separate answer-books.
3. Answer **three** questions from each section, including Question No. **1** which is compulsory.
4. Draw labelled diagrams wherever necessary.

SECTION A

NONCHORDATA

1. (a) Define the following terms :

   (i) Metamorphosis

   (ii) Protista

   (iii) Pseudocoel

   (iv) Protostomes (4)

(b) Give the scientific name and classify the following upto class :

(i) Venus' flower basket

(ii) Devil fish

(iii) Sea cucumber

(iv) King crab (4)

(c) Differentiate between the following terms :

(i) Radial and bilateral symmetry

(ii) Cilia and flagella

(iii) Juvenile hormone and moulting hormone (6)

2. (a) Define polymorphism and describe the different polymorphic forms in Hydrozoa giving suitable examples.

(b) Discuss metamerism in Annelids. (8,4)

3. (a) Give an illustrated account of the life history of *Taenia solium*. Support your answer with the help of suitable diagrams.

(b) Describe the structure of the flagellum and add a note on its working. (7,5)

4. Write short notes on any **two** of the following :

(a) Canal system in *Sycon*

(b) Torsion in gastropods

(c) Parasitic adaptations in Aschelminthes

(d) Structure of the compound eye (6,6)

SECTION B

CHORDATA

1. (a) Name the animal in which the following structure is present and give the function of each :

   (i) Proboscis

   (ii) Operculum

   (iii) Preen glands

   (iv) Sweat glands (4)

   (b) Define the following terms :

   (i) Ratitae

   (ii) Retrogressive metamorphosis

   (iii) Agnatha (3)

   (c) Differentiate between the following terms :

   (i) Neornithes and archaeornithes

   (ii) Endothermy and ectothermy

   (iii) Osteichthyes and Chondrichthyes (6)

2. (a) How do poisonous snakes differ from non-poisonous snakes ?

   (b) Write a short note on the biting mechanism in snakes. (6,6)

3. Give an account of flight adaptations in birds. (12)

4. Write short notes on any **two** of the following :

(i) Parental care in Amphibia

(ii) Osmoregulation in fishes

(iii) General features of Chordates

(iv) Origin of mammals (6,6)

This question paper contains 2 printed pages.

Your Roll No. .....

Sl. No. of Ques. Paper : **1905**

Unique Paper Code : **42234301**

GC-3

Name of Paper : **Physiology and Biochemistry**

Name of Course : **B.Sc. (Prog.) Life Sciences (CBCS)**

Semester : **III**

Duration : : **3 hours**

Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt five questions in all, two each from Section A and Section B.

Q. No. 1 is compulsory.

Use separate sheets for Section A and Section B.

1.(a) Define the following terms :

(i) Autocrine secretion

(ii) Gluconeogenesis

(iii) Hematocrit

(iv) Induced fit

(v) Compliance (5)

(b) Differentiate between the following pairs of terms:

(i) Somatic and autonomic nervous system

(ii) Glycogenesis and Glycogenolysis

(iii) Chief and Parietal cells

(iv) Oxidative decarboxylation and oxidative phosphorylation

(v) Leakage and ligand-gated channels (10)

(c) Expand the following terms:

(i) FAS

(ii) PTH

(iii) NADPH

(iv) CCK (4)

(d) Give the location and function of the following:

(i) Intercalated cells

P. T. O.

(ii) Carnitine acyltransferase I

(iii) Succinate dehydrogenase

(iv) Tropomyosin. (8)

SECTION A

(Attempt any two questions)

2. (a) Describe various lung volumes and capacities in detail.

(b) Briefly explain the arrangement of filaments within a Sarcomere with the help of a well labe diagram. (7+5)

3. (a) Write in detail about reabsorption and secretion in the Proximal Convoluted Tubule.

(b) Explain the role of bile salts in the digestion and absorption of fats. (8+4)

4. Write short notes on any **three** of the following :

(i) SA node as pacemaker of the heart

(ii) Neuromuscular junction

(iii) Enumerate the various hypothalamic factors that control the release of various pituitary hor

(iv) Renin-Angiotensin-Aldosterone Pathway (4+4+4)

SECTION B

(Attempt any two questions)

5. (a) Give a detailed account of β oxidation of fatty acids.

(b) Diagrammatically represent the Citric Acid Cycle. (7+5)

6. (a) Give an account of electron transport chain in mitochondria and its role in ATP synthesis.

(b) Differentiate between transamination and deamination. (8+4)

7. Write short notes on any **three** of the following :

(i) Urea Cycle

(ii) Acyl Carrier Protein

(iii) Michaelis Menten equation

(iv) Competitive inhibition

(4+4+4)

1600

ion paper contains **4** printed pages]

Roll No. | | | | | | | | | | |

uestion Paper : **1906**

per Code : **42164301**

GC-3

e Paper : **Plant Anatomy and Embryology**

e Course : **B.Sc. (Programme) Life Science CBCS**

: **III**

3 Hours Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt *five* questions in all, including

question number *one* which is compulsory.

All parts of a question must be answered together.

Fill in the blanks : 1×5=5

(*i*) Filiform apparatus is present in ..... cells of embryo sac.

(*ii*) *Areca catechu* has ..... type of endosperm.

(*iii*) The edible third integument in Litchi is called ..... .

(*iv*) Scattered and closed bundles are present in ..... stem.

(*v*) ..... in roots gives rise to lateral roots.

P.T.O.

(*b*) Give well labelled diagrams of any *two* of the following : 2.5×2

(*i*) V.S. of *Nerium leaf*

(*ii*) L.S. of anatropous, bitegmic, crassinucellate ovule showing Polygonum type of embryo sac.

(*iii*) T.S. of tetrasporangiate anther showing pollen tetrads.

(*iv*) T.S. of *Helianthus* root

(*c*) Give *one* word answer for the following : 1×5=

(*i*) The wall layer that brings about anther dehiscence

(*ii*) Outermost layer of endosperm in cereals

(*iii*) Persistent nucellus in black pepper

(*iv*) Vascular bundle with phloem on either side of xylem

(*v*) The bundles of needle like crystals of calcium oxalate in some plants.

2. Write short notes on any *five* : 3×5=

(*i*) Bulliform cells

(*ii*) Caruncle

(*iii*) Apical meristems

(*iv*) Transfer cells

(*v*) Cambium

(*vi*) Somatic embryogenesis

1906

3. Explain any *five* of the following : 3×5=15

(*i*) Anatomical features of xerophytes

(*ii*) Functions of parenchyma tissue

(*iii*) Relationship between sieve elements and companion cells

(*iv*) Application of apomixis

(*v*) Artificial seeds

(*vi*) Porogamy.

4. (*a*) Describe different types of stomata with well-labelled diagrams. 6

(*b*) Explain cross pollination due to heterostyly with the help of suitable diagrams. 6

(*c*) What is the role of callose in sporogenesis ? 3

5. Differentiate between any *five* : 3×5=15

(*i*) Amoeboid and secretory tapetum

(*ii*) Bisporic and tetrasporic embryo sacs

(*iii*) Nuclear and cellular endosperm

(*iv*) Collenchyma and sclerenchyma

(*v*) Sapwood and heartwood

(*vi*) Cork and vascular cambium.

6. (*a*) What is entomophily ? Explain with at least *two* suitable examples. 4

(*b*) Define polyembryony and give its classification. Write a note on its applications. 7

(*c*) Justify the statement that phloem is a dynamic tissue. 4

7. (*a*) Explain Tunica Corpus theory in detail. 5

(*b*) Describe pollen wall structure with well labelled diagrams. 5

(*c*) Discuss the formation and functions of periderm. 5

This question paper contains 4 printed pages]

S. No. of Question Paper : 73

Roll No. | | | | | | | | | | |

Unique Paper Code : 223353

G

Name of the Paper : **Biodiversity II (Animal)–LSPT-305**

Name of the Course : **B.Sc. Life Sciences**

Semester : **III**

Duration : **3 Hours**

Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Sections A and B to be answered on separate answer books.

Question No. **1** is compulsory in each Section and

answer any *two* more questions from each Section.

Draw neat and labelled diagrams wherever necessary.

Section A

1. (*a*) Define the following : 3

(*i*) Binary fission

(*ii*) Torsion

(*iii*) Deuterostomes

(*b*) Differentiate between the following : 8

(*i*) Bilateral symmetry and radial symmetry

P.T.O.

(*ii*) Schizogony and sporogony

(*iii*) Monogenetic and digenetic parasite

(*iv*) Isogamy and Anisogamy.

(*c*) Match the following :

(1) Choanocyte	(*i*) *Pila*
(2) Radula	(*ii*) *Obelia*
(3) Metagenesis	(*iii*) *Sycon*

2. Describe the life cycle of *Plasmodium* with the help of suitable diagrams.

3. (*a*) Explain the various adaptations of parasitic nematodes.

(*b*) Discuss in detail the characteristics of phylum Echinodermata.

4. Write short notes on any *three* of the following :

(*i*) Polymorphism in Cnidaria

(*ii*) Metamerism in Annelida

(*iii*) Social life in termites

(*iv*) Syconoid canal system.

Section B

1. (*a*) Define the following :

(*i*) Bipedal

(*ii*) Synsacrum

(*b*) Fill in the blanks with suitable terms/words : 3

(*i*) A protochordate showing retrogressive metamorphosis is ..... .

(*ii*) The reptilian skull without temporal vacuity is called ..... .

(*iii*) The flightless birds are classified as ..... .

(*iv*) The hoofed mammals are called ..... .

(*v*) ..... is the connecting link between birds and reptiles.

(*vi*) The anterior part of *Balanoglossus* is called ..... .

(*c*) Match the following : 2

(*i*)	Monotremata	(*a*)	*Lepidosiren*
(*ii*)	Lungfish	(*b*)	*Echidna*
(*iii*)	Marsupial	(*c*)	*Macropus*
(*iv*)	Jawfish	(*d*)	*Petromyzon*

(*d*) Differentiate between the following terms : 6

(*i*) Amniote and anamniote

(*ii*) Catadromous and anadromous migration

(*iii*) Prototheria and Eutheria

2. Describe the various morphological and anatomical adaptations for flight in birds. 12

3. (*a*) What is osmoregulation ? Compare the mechanism of osmoregulation in a marine fish with that in a cartilaginous fish.

(*b*) Differentiate between the characteristics of Lacertilia and Ophidia.

4. Write short notes on any *three* of the following :

(*a*) Anura

(*b*) Origin of tetrapod

(*c*) *Australopithecus*

(*d*) Protochordates.

[This question paper contains 7 printed pages]

Roll No. | | | | | | | | | | |

S. No. of Question Paper : 77

Unique Paper Code : 223355

G

Name of the Paper : **Introduction to Medical Diagnostics (LSPT-306)**

Name of the Course : **B.Sc. (Life Sciences)**

Semester : **III**

Duration : **3 Hours**

Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt *Five* questions in all,

including question No. **1** which is compulsory.

1. (*a*) Define the following terms :

(*i*) Hematuria

(*ii*) Oligospermia

(*iii*) Polycythemia

(*iv*) Extra pulmonary Tuberculosis

(*v*) Pyrexia. 5

(*b*) Expand the following terms :

(*i*) ESR

P.T.O.

(*ii*) DOT

(*iii*) LFT

(*iv*) EDTA

(*v*) ECG.

(*c*) Distinguish between the following :

(*i*) Hyperglycemia and Hypoglycemia

(*ii*) Hypertrophy and Hyperplasia

(*iii*) Diabetes mellitus and Diabetes insipidus

(*iv*) Carcinoma and Sarcoma

(*v*) Bleeding time and Clotting time.

(*d*) Name the following :

(*i*) X-ray used to detect tumours within the breast.

(*ii*) W.B.C. diluting fluid.

(*iii*) Instrument used to measure Haemoglobin level in blood.

(*iv*) Instrument used to measure blood pressure.

(*e*) Name any *three* national health programmes currently undertaken by W.H.O.

2. Name the causes and epidemiology of Tuberculosis. Describe the clinical features of Tubercu and methods of prevention.

(a) Describe the principle and significance of Thin layer chromatography.

(b) What is affinity chromatography ? Explain how it differs from ion-exchange Chromatography.

(c) Discuss a chromatography technique which can be used to separate the proteins of different molecular weight. 3,6,3

(a) What is viral hepatitis ? Explain the differences between Hepatitis A and Hepatitis B. Write their major symptoms and mode of transmission.

(b) What is Autoimmune haemolytic anaemia ? 8,4

(a) Describe the steps involved in preparation of tissues for microscopic examination. 4

(b) Define Electrocardiograph and Electrocardiogram. Describe the components of ECG waves in detail. 8

(a) Using *t*-test, statistically compare the data obtained from experimental and control groups. Calculate the means and standard error of means of the data.

S. No.	Control	Experimental
1	3.5	6.3
2	3.6	6.0
3	3.8	4.8

Table-1 for Q.6 (a)

Degrees of Freedom	p=0.05	p=0.025	p=0.01	p=0.005
1	12.71	25.45	63.66	127.32
2	4.30	6.20	9.92	14.09
3	3.18	4.17	5.84	7.45
4	2.78	3.50	4.50	5.60
5	2.57	3.16	4.03	4.77
6	2.45	2.97	3.71	4.32
7	2.36	2.84	3.50	4.03
8	2.31	2.75	3.36	3.83
9	2.26	2.68	3.25	3.69
10	2.23	2.63	3.17	3.58
11	2.20	2.59	3.11	3.50
12	2.18	2.56	3.05	3.43
13	2.16	2.53	3.01	3.37
14	2.14	2.51	2.98	3.33
15	2.13	2.49	2.95	3.29
16	2.12	2.47	2.92	3.25
17	2.11	2.46	2.90	3.22
18	2.10	2.44	2.88	3.20
19	2.09	2.43	2.86	3.17
20	2.09	2.42	2.84	3.15
21	2.08	2.41	2.83	3.14
22	2.07	2.41	2.82	3.12
23	2.07	2.40	2.81	3.10
24	2.06	2.39	2.80	3.09
25	2.06	2.38	2.79	3.08
26	2.06	2.38	2.78	3.07
27	2.05	2.37	2.77	3.06
28	2.05	2.37	2.76	3.05
29	2.04	2.36	2.76	3.04
30	2.04	2.36	2.75	3.03
40	2.02	2.33	2.70	2.97
60	2.00	2.30	2.66	2.92
120	1.98	2.27	2.62	2.86
infinity	1.96	2.24	2.58	2.81

Table 2 for Q6 (b)

Percentage Points of the Chi-Square Distribution

Degrees of Freedom	Probability of a larger value of x^2								
	0.99	0.95	0.90	0.75	0.50	0.25	0.10	0.05	0.01
1	0.000	0.004	0.016	0.102	0.455	1.32	2.71	3.84	6.63
2	0.020	0.103	0.211	0.575	1.386	2.77	4.61	5.99	9.21
3	0.115	0.352	0.584	1.212	2.366	4.11	6.25	7.81	11.34
4	0.297	0.711	1.064	1.923	3.357	5.39	7.78	9.49	13.28
5	0.554	1.145	1.610	2.675	4.351	6.63	9.24	11.07	15.09
6	0.872	1.635	2.204	3.455	5.348	7.84	10.64	12.59	16.81
7	1.239	2.167	2.833	4.255	6.346	9.04	12.02	14.07	18.48
8	1.647	2.733	3.490	5.071	7.344	10.22	13.36	15.51	20.09
9	2.088	3.325	4.168	5.899	8.343	11.39	14.68	16.92	21.67
10	2.558	3.940	4.865	6.737	9.342	12.55	15.99	18.31	23.21
11	3.053	4.575	5.578	7.584	10.341	13.70	17.28	19.68	24.72
12	3.571	5.226	6.304	8.438	11.340	14.85	18.55	21.03	26.22
13	4.107	5.892	7.042	9.299	12.340	15.98	19.81	22.36	27.69
14	4.660	6.571	7.790	10.165	13.339	17.12	21.06	23.68	29.14
15	5.229	7.261	8.547	11.037	14.339	18.25	22.31	25.00	30.58
16	5.812	7.962	9.312	11.912	15.338	19.37	23.54	26.30	32.00
17	6.408	8.672	10.085	12.792	16.338	20.49	24.77	27.59	33.41
18	7.015	9.390	10.865	13.675	17.338	21.60	25.99	28.87	34.80
19	7.633	10.117	11.651	14.562	18.338	22.72	27.20	30.14	36.19
20	8.260	10.851	12.443	15.452	19.337	23.83	28.41	31.41	37.57
22	9.542	12.338	14.041	17.240	21.337	26.04	30.81	33.92	40.29
24	10.856	13.848	15.659	19.037	23.337	28.24	33.20	36.42	42.98
26	12.198	15.379	17.292	20.843	25.336	30.43	35.56	38.89	45.64
28	13.565	16.928	18.939	22.657	27.336	32.62	37.92	41.34	48.28
30	14.953	18.493	20.599	24.478	29.336	34.80	40.26	43.77	50.89
40	22.164	26.509	29.051	33.660	39.335	45.62	51.80	55.76	63.69
50	27.707	34.764	37.689	42.942	49.335	56.33	63.17	67.50	76.15
60	37.485	43.188	46.459	52.294	59.335	66.98	74.40	79.08	88.38

This question paper contains 4 printed pages]

Roll No. | | | | | | | | | | | |

S. No. of Question Paper : 90

Unique Paper Code : 223551

G

Name of the Paper : LSPT-510 : Biochemistry and Immunology

Name of the Course : B.Sc. (Prog.) Life Sciences

Semester : V

Duration : 3 Hours

Maximum Marks : 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

Answer *six* questions in all.

Section A : Answer *three* questions including Q. No. **1** which is compulsory. Write structural formulae where specified.

Section B : Answer *three* questions including Q. No. **5** which is compulsory.

Section A

(Biochemistry)

1. (*a*) Differentiate between the following : 4

(*i*) Reversible and irreversible enzyme inhibition.

(*ii*) Oxidative decarboxylation and Oxidative Deamination.

(*b*) Define : 2

(*i*) Transamination

(*ii*) Coenzyme.

(*c*) State the functions of : 2

(*i*) Aldolase

(*ii*) Glucose-6-phosphatase.

P.T.O.

(*d*) Name and draw the structural formulae of the following :

(*i*) A disaccharide having glucose and fructose as their units.

(*ii*) A four carbon dicarboxylic acid which is a initiator of TCA cycle.

(*e*) Give the reactions involving the following enzymes :

(*i*) Pyruvate kinase

(*ii*) α-Ketoglutarate dehydrogenase.

(*f*) Mention the contributions of the following scientists :

(*i*) Eugene Knoop

(*ii*) Koshland.

2. (*a*) List the key enzymes of gluconeogenesis and explain how they help to by-pass the irreversibl steps of glycolysis.

(*b*) Describe the process of glycogenolysis. How is it regulated ?

3. (*a*) Give reactions carried out by dehydrogenases in the process of β-oxidation of fatt acids.

(*b*) What are enzymes ? Explain the mechanism of enzyme action.

(*c*) What is the relation between V_{max} and K_m ? Discuss it briefly.

4. Write short notes on any *three* of the following : 3×4=1

(*i*) Electron transport chain

(*ii*) HMP pathway

(*iii*) Enzyme inhibition and its significance.

(*iv*) Urea cycle.

90

Section B

(Immunology)

1. (*a*) Expand : 3

(*i*) APC

(*ii*) CD

(*iii*) PAMP

(*iv*) HLA

(*v*) TCR

(*vi*) MALT.

(*b*) Define : 4

(*i*) Epitope

(*ii*) MHC restriction

(*iii*) Anaphylatoxin

(*iv*) Adjuvant.

(*c*) Differentiate between : 3

(*i*) Primary and Secondary lymphoid organs

(*ii*) Innate and Acquired immunity

(*iii*) Active and Passive immunity.

(*d*) Write the contribution of these scientists : 3

(*i*) Edward Jenner

(*ii*) Kohler and Milstein

(*iii*) Carl Landsteiner.

2. (*a*) Draw a typical IgG molecule showing antigen binding and cell binding doma
Also show the site of Pepsin and Papain digestion and describe the prod
formed.

(*b*) Describe the primary and secondary humoral response to an antigenic stimulus.

3. (*a*) How are exogenous and endogenous antigens processed and presented ?

(*b*) Differentiate between Class I and Class II MHC molecules on the basis of t
structure.

4. Write short notes on any *three* of the following : 3×4

(*i*) New approaches in Vaccine Design

(*ii*) Hybridoma technology

(*iii*) Properties of Antigens

(*iv*) Cell Mediated Immunity.

This question paper contains 3 printed pages]

Roll No. | | | | | | | | | | |

S. No. of Question Paper : 95

Unique Paper Code : 216553 G

Name of the Paper : **Developmental Biology and Physiology-Plant (LSPT-511)**

Name of the Course : **B.Sc. (Life Science)**

Semester : **V**

Duration : **3 Hours** Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt *Five* questions in all.

Question No. **1** is compulsory.

All questions carry equal marks.

1. (*a*) Define (any *five*) : 5

Protandry, triple fusion, vernalization, water potential, symplast, transpiration.

(*b*) Match the following : 5

Plant embryology	P. Maheshwari
Mitchell	Cell division
Cytokinin	Cohesion theory
H. Dixon	Stephen Hales
Plant physiology	Chemiosmotic Theory

(*c*) True and False : 5

(*i*) Polination by bat is known as Anemophily.

(*ii*) Seven celled and eight nucleate stage in embryo sac is known as Monosporic.

(*iii*) G_{19} is the active form of Gibberellin.

(*iv*) Auxins are non-polar in their movement.

(*v*) The water potential of pure water is zero.

2. (*a*) Write down the functions of Tapetum.

(*b*) Draw well-labelled structure of most common ovule type among angiosperms and wr the functions of various parts.

(*c*) Write a short note on pollen wall.

3. Differentiate (any *five*) with diagram :

(*i*) Amoeboid and secretory tapetum

(*ii*) Vegetative and generative cell

(*iii*) Hypostase and epistase

(*iv*) Egg cell and synergid

(*v*) Endothecium and endothelium

(*vi*) Porogamy and chalazogamy.

4. Write short notes on (any *three*) :

(*i*) Biological clock

(*ii*) Cohesion and adhesion theory

(*iii*) Source and sink theory

(*iv*) C_4 cycle

(*v*) Mechanism of stomatal opening and closing.

5. Differentiate between (any *three*) :

(*i*) Cyclic and non-cyclic photophosphorylation

(*ii*) Action and absorption spectrum

(iii) Hydroponics and aeroponics

(iv) Phosphorescence of fluorescence

(v) Long day and short day plants.

6. (a) Discuss about the Phytochrome mediated plant responses. 5

(b) Briefly describe the experiment that led to the discovery of photoperiodism. 5

(c) Commercial applications of Auxins. 5

7. (a) Discuss the physiological roles of cytokinins in plants. 5

(b) Describe the deficiency symptoms of any *two* macronutrients. 5

(c) Discuss about Photorespiration. 5

This question paper contains 4 printed pages]

Roll No. | | | | | | | | | | | |

S. No. of Question Paper : 97

Unique Paper Code : 217586

G

Name of the Paper : **CHCT-501 : Chemistry—I**

Name of the Course : **B.Sc. (Prog.) Physical Sciences, Part III (Concurrent Course)**

Semester : **V**

Duration : **3 Hours**

Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Question No. **1** is compulsory.

Both Section A and Section B are compulsory.

Attempt *three* questions from Section A and *three* questions from Section B.

1. Attempt any *five* parts from the following :

(*a*) Write down the Schrodinger wave equation of Hydrogen atom. Describe the various terms involved. 3

(*b*) What do you understand by Aufbau's principle. State the $(n+1)$ rule. 3

(*c*) Explain why melting point of NaCl is higher than that of $AlCl_3$. 3

(*d*) State the second law of thermodynamics and justify the statement qualitatively. 3

(*e*) Explain why C_P is always greater than C_V. 3

(*f*) What is Common Ion Effect ? Explain with the help of an example. 3

Section A

Attempt any *three* questions.

2. (*a*) Show the Born-Haber Cycle for the formulation of ionic KF. Give the meaning of each and every term used in the cycle. 5

P.T.O.

(*b*) Calculate the lattice energy of NaCl crystal from the following data by the use of Born-Haber Cycle. Sublimation energy = 108.7 kJ/mol, Dissociation Energy for Cl_2 = 225.9 kJ/mol, Ionization Energy for Na(g) = 489.5 kJ/mol, Electron affinity for Cl(g) = –351.4 kJ/mol, Heat of formation of NaCl = –414.2 kJ/mol. 3

(*c*) What is the physical significance of the Madelung's constant in the Born-Lande equation ? 2

3. Give reasons for any *four* of the following : 4×2.5=10

(*a*) $BaSO_4$ is insoluble in water

(*b*) Noble gases do not form ionic halides

(*c*) LiCl has a higher boiling point than HCl

(*d*) AgF, AgCl and AgBr have similar structures but the order of hardness differs.

(*e*) Silver halides have lattice energies similar to alkali halides but still insoluble in water.

4. (*a*) Give the quantum mechanical expression and the physical significance of normalization principle. 3

(*b*) Explain the importance of the radial probability distribution curves and plot the same for 1*s*, 2*s* and 2*p* orbitals of H atom. 5

(*c*) Why are 2*d* and 3*f* orbitals not possible ? 2

5. (*a*) Predict the shape and the type of hybridization in each of the following molecules : 5

BeF_2, H_2O, SF_6, ClF_3, XeF_4.

(*b*) Draw the MO diagram for CO molecule and calculate its bond order. 3

(*c*) State the limitations of the Valence Bond Theory. 2

Section B

Attempt any *three* questions.

6. (*a*) Calculate q, w, ΔU and ΔH for an isothermal reversible and isothermal irreversible expansion of an ideal gas.

(*b*) Calculate the heat of formation of KCl from the following data :

(*i*) $KOH(aq) + HCl(aq) \rightarrow KCl(aq) + H_2O(l)$ $\Delta H = -57.3$ kJ/mol

(*ii*) $H_2(g) + \frac{1}{2} O_2(g) \rightarrow H_2O(l)$ $\Delta H = -286.2$ kJ/mol

(*iii*) $\frac{1}{2} H_2(g) + \frac{1}{2} Cl_2 \rightarrow HCl(aq)$ $\Delta H = -164.4$ kJ/mol

(*iv*) $K(s) + \frac{1}{2} O_2(g) + \frac{1}{2} H_2(g) + aq \rightarrow KOH(aq)$ $\Delta H = -487.4$ kJ/mol

(*v*) $KCl(s) + aq \rightarrow KCl(aq)$ $\Delta H = +18.4$ kJ/mol

7. (*a*) Derive the following relation for a salt of strong acid and weak base :

$$pH = \frac{1}{2} [pKa + pKw - pK_b]$$

(*b*) Calculate the solubility in grams per litre of $Al(OH)_3$ in water at 25°C if the value of $K_{sp} = 8.5 \times 10^{-32}$.

8. (*a*) Derive the following Thermodynamic expression :

$$\Delta G = \Delta H + T\left[\frac{\partial \Delta G}{\partial T}\right]P$$

and give the name of this equation.

(*b*) Calculate the entropy change for the fusion of 1 mole of a solid which melts at 300K. 2

The latent heat of fusion is 2.51 kJ/mol. 3

(*c*) Show that :

$$\left(\frac{\partial P}{\partial S}\right)_V = \left(\frac{\partial T}{\partial V}\right)_S .$$

4×2.5=10

. Write short notes on any *four* :

(*i*) Carnot cycle for an ideal gas

(*ii*) Ostwald's dilution law

(*iii*) Arrhenius Theory of Electrolytic Dissociation

(*iv*) Buffer Action of Acidic Buffer (qualitative explanation)

(*v*) Henderson-Hasselbalch equation for Basic Buffer.

7

[This question paper contains 3 printed pages]

Roll No. | | | | | | | | | | | |

S. No. of Question Paper : 99

Unique Paper Code : 216555

G

Name of the Paper : **Genetics and Genomics (LSPT-512)**

Name of the Course : **B.Sc. (Prog.) Life Sciences**

Semester : **V**

Duration : **3 Hours**

Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt *Five* questions in all including

Question No. **1** which is compulsory.

All questions carry equal marks.

1. (*a*) Define any *five* of the following : 5×1=5

(*i*) Back mutation

(*ii*) Auxotroph

(*iii*) Map unit

(*iv*) Pleiotropy

(*v*) Trisomy

(*vi*) Synteny.

(*b*) Give *one* contribution of each of the following scientists : 5×1=5

(*i*) T. Fairchild

(*ii*) C. Ventor

(*iii*) M. Lyon

(*iv*) C. Stern

(*v*) C. Correns.

P.T.O.

5×1

(*c*) Fill in the blanks :

(*i*) The karyotype of a person suffering from Turner's syndrome is .....

(*ii*) Colour blindness is an example of ..... inheritance.

(*iii*) ..... is a cross of F_1 hybrid with homozygous recessive paren

(*iv*) When purine is replaced by purine it is called ..... .

(*v*) Genetic exchange between non-sister chromatids is called ..... .

3×5=

2. Differentiate between any *three* of the following :

(*i*) Paracentric and Pericentric inversion

(*ii*) Physical and Chemical mutagen

(*iii*) Coupling and Repulsion

(*iv*) Dominant and Recessive epistasis.

5×3=

3. Write notes on any *five* :

(*i*) Human Genome Project

(*ii*) Deletion and its significance

(*iii*) Sex determination in *Melandrium*

(*iv*) Barr body

(*v*) Induced Polyploidy

(*vi*) Tautomerism.

4. (*a*) In plant red flower colour (R) is dominant over white (r) and smooth seed (S) is domina over wrinkled seed(s). When a red flowered and smooth seeded plant is crossed a red flowered and wrinkled seeded plant, one of the phenotypes in the progeny bree true for white flowers and wrinkled seeds.

(*i*) Determine the genotype of the parents.

(*ii*) Determine what gametes may be formed by the P1 parents.

(*iii*) What are the genotypes and phenotypes of F_1 generation ?

(*iv*) Explain the genetic basis of the cross. 99

(*b*) This question has multiple options as correct answers. This needs to be factored while marking the answers : 10

In a family, there are four children. One child has blood group A and the other has B.

(*i*) What are the 'possible' genotypes of the parents ?

(*ii*) Draw a pedigree chart. 5

5. (*a*) Describe Morgan's discovery of linkage in *Drosophila* and explain its significance. 10

(*b*) What is Frame-shift mutation ? Explain its mechanism. 5

6. (*a*) What is reciprocal translocation ? Illustrate with the help of diagrams. Explain the significance. 10

(*b*) How can we use recombination frequencies in generating linkage maps. 5

7. (*a*) Describe Cytoplasmic inheritance in plants citing *two* examples. 10

(*b*) Describe *E.coli* as a model organism. 5

[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 2096 **GC-3** **Your Roll No.....**

Unique Paper Code : 32163302

Name of the Paper : Intellectual Property Rights (SEC)

Name of the Course : **B.Sc. (H) Botany (CBCS)**
Skill Enhancement Course

Semester : III

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on the receipt of this question paper.
2. Attempt any **five** questions.
3. Question **1** is compulsory.
4. **All** questions carry equal marks.
5. Attempt all parts of a question together.

1. (a) Define **(Any Five)** : (1×5=5)

(i) Patents

(ii) Copyrights

(iii) Trademarks

(iv) Industrial design

(v) *Sui-Generis*

(vi) Biological Database

(b) Expand the following abbreviations **(any five)** : (1×5=5)

(i) TRIPS

(ii) WIPO

(iii) TKDL

(iv) WTO

(v) NBPGR

(vi) BDA

(vii) UPOV

(c) State True or False : (1×5=5)

(i) Banarasi saree is a GI.

(ii) Musical compositions are entitled to copyright protection.

(iii) Descriptive trademarks cannot be registered.

(iv) Published research work cannot be patented.

(v) Jewellery design cannot be protected by IPR.

2. Write short notes on any **three** of the following : (3×5=15)

(a) Rights of Breeders under the Plant Varieties and Farmers Act in India

(b) Types of Trademarks

(c) Works protected under Copyright Law

(d) Conditions for registration of Designs

(e) Procedure for obtaining Patents

3. Differentiate between any **three** of the following : (

(a) Infringement and Passing off

(b) Absolute and Relative grounds of refusal of registration of traden

(c) Bio-piracy and Bio-prospecting

(d) Traditional varieties and GM crops

(e) Process Patent and Product Patent

4. Attempt any **two** of the following : (2

(a) What are the objectives of the Protection of Plant Varieties and Act, 2001 ? Write a brief note on National Gene Bank.

(b) What is a database ? List the different types of Biological D What are the provisions for protecting biological databases u Law ?

(c) Discuss the importance of patenting Biotech Inventions. What are issues involved in the same ?

5. Attempt any **two** of the following : (2

(a) Explain any three applications of IPR in biotechnology. What is the of concept of novelty in biotech inventions ?

(b) What is the justification for protection of Geographical Indication explain the TRIPS agreement (1994) in relation to GI.

(c) Write briefly about copyright, patents and industrial design infring

(2×7.5=15)

npt any **two** :

Write a note on TKDL set up by the Government of India.

Define GI. Discuss the criteria for granting GI to a product. Give two examples.

What is a domain name ? Explain its importance and the need for its protection under IPR.

This question paper contains 3 printed pages.

Your Roll No. .....

Sl. No. of Ques. Paper : **2201**

Unique Paper Code : **3217590**

GC-3

Name of Paper : **Atomic Structure, Bonding, General Organic Chemistry & Aliphatic Hydrocarbons**

Name of Course : **Generic Elective – I for Hons. Courses**

Semester : **I**

Duration : : **3 hours**

Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Use of Calculator is permitted.

Section A (37½)

(Inorganic Chemistry)

Attempt any three questions.

Q. No. 1 is compulsory.

1.

a) What are Normalized and Orthogonal wavefunctions? Write mathematical expression for these wave functions. (2½)

b) Draw Radial Probability Distribution Curves for 3s, 3p and 3d subshells. (2½)

c) What is Madelung Constant? Why do NaCl and MgO have same value of it? (2½)

d) The dipole moment of the molecule HX is 1.92D and bond distance is 1.20Å. Calculate the percentage ionic character of HX. (2½)

e) All P-Cl bonds in PCl_5 are not equivalent. Explain (2½)

2.

a) Write down the Schrodinger wave equation for an electron in Hydrogen atom and explain various terms involved in it. (4½)

b) Define Exchange energy, how it is correlated with extra stability of half-filled and fully filled orbital systems? (4)

c) What are the conditions which should be fulfilled by a wavefunction to become an eigen function? (4)

P. T. O.

3. a) Calculate the lattice energy of Calcium Fluoride (CaF_2) from the following data: Madelung's constant, (A) for CaF_2 = 2.519, Internuclear distance = 2.35 Å, Born Exponent n = 7, Electronic charge (e) = 4.8×10^{-10} e.s.u. (4½)

b) Explain Fajan's Rule and on the basis of this rule compare the solubility of NaCl and CuCl in water. (4)

c) Define Solvation energy. How is it useful in deciding the solubility of ionic solids? (4)

4. a) Which of the following combinations are allowed in LCAO (considering z-axis to be molecular axis) and sketch the shapes of molecular orbitals formed by their addition and subtraction (4½)

(i) s and p_z (ii) p_x and p_x (iii) p_y and p_z

b) How does Molecular Orbital Theory account for the following? (4)

i. Bond order of O_2^+ is more than O_2 molecule

ii. Paramagnetic character in NO molecule

c) Give the hybridization of the central atom and shape of the following molecules:

$XeOF_4$, NO_3^-, ClO_4^-, SF_4 (4)

Section B
(Attempt any three questions)

5 a) What is hyperconjugation effect? Explain the stability of benzyl radical over methyl free radical. (3)

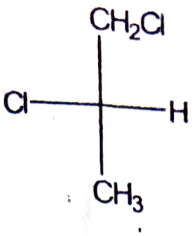
b) What are carbocations? Discuss their structures and stability. (3)

c) What are carbocations? Discuss their structures and stability. (3.5)

d) Explain Huckel's rule of aromaticity. Explain why 1,3,5-cycloheptatrienyl cation is aromatic but 1,3,5-cycloheptatriene is not aromatic. (3)

a) Which among Gauche or Anti is more stable conformation of 1,2-Ethandiol and why? (3)

b) i) Assign R or S configuration to following isomers



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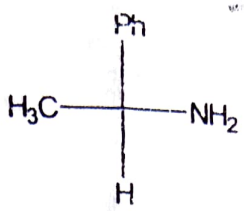

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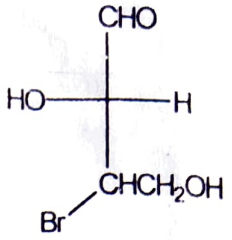
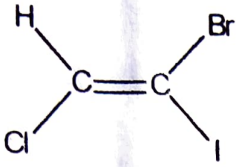


ii) Assign E or Z to the following geometrical isomers (3)



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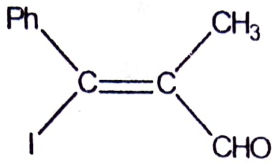

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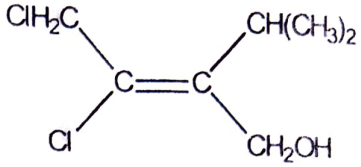

(3)

c) Write down all the possible stereoisomers of 2,3- dichlorobutane and give their relation amongst each other. (3.5)

7 a) Why Alkynes are less reactive than alkenes towards electrophilic addition reaction? (3)

b) Carry out the following conversions (**any three**).

i) Ethane to n-butane
ii) Propyne to pent-2-yne
iii) Propene to Isopropylalcohol
iv) But-1-yne to but-2-one (6)

c) i) Give and explain the order of basicity for following aromatic amines:

$C_6H_5NH_2$, p-$NO_2C_6H_5NH_2$, p-$CH_3C_6H_5NH_2$ (3.5)

8 a) Draw the energy diagram of the conformations of n-butane and discuss their stability.

(2.5)

b) Write short notes on following (**any four**).

i) Homolytic and Heterolytic fission
ii) Oxemercuration and demercuration reaction
iii) Hydroboration oxidation reaction
iv) Meso compounds
v) Markonikov's rule (10)

2200

[This question paper contains 2 printed pages.]

Sr. No. of Question Paper : 1927 **GC-3** **Your Roll No.....**

Unique Paper Code : 42163302

Name of the Paper : Biofertilisers

Name of the Course : **B.Sc. Life Science CBCS**
Skill Enhancement Course

Semester : III

Duration : 3 Hours Maximum Marks : 37.5

Instructions for Candidates

1. Write your Roll No. on the top immediately on the receipt of this question paper.
2. **All** questions are compulsory.

1. (a) Define the followings and elaborate in one two sentences **(any five)** : (5)

(i) Biological control

(ii) Vesicle

(iii) Vermicomposting

(iv) Mass multiplication

(v) Inoculum

(vi) Phosphorus mobilisers

(vii) AMF

1927

(b) Match the followings : (2.5)

1. Organisms which associates symbiotically to form root nodules	a. *Glomus*
2. Organisms which form arbuscules	b. *Eisenia foetida*
3. Free living nitrogen fixers	c. *Trichoderma*
4. Earthworm having a role in vermicomposting	d. *Azospirillum*
5. Example of a biological control agent	e. *Actinomycetes*

2. Write short notes on the followings **(any three)** : (15)

(a) Algae as a biofertiliser

(b) Organic farming

(c) Types of mycorrhiza

(d) Carrier based inoculant

3. Attempt any **two** : (15)

(i) Justify *Rhizobium* as wonder biofertiliser. Explain its association with leguminous plants.

(ii) Explain agricultural and industrial waste management emphasizing on various composting methods.

(iii) Explain the role of arbuscular mycorrhizal fungi in plant nutrition. Elaborate on any five roles.