

question paper contains 6 printed pages.]

Your Roll No.....

No. of Question Paper : 125

G

Question Paper Code : 216251

Name of the Paper : Biology - 11 (LSPT-202)

Name of the Course : B.Sc. (Prog.) / B.Sc. (Hons.)

Semester : II / IV

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

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

Attempt any **Five** questions including the Question No. 1 which is compulsory.

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

(i) GERL

(ii) SEM

(iii) Cp DNA

(iv) SER

P.T.O.

(v) ATP

(vi) tRNA

(b) Fill in the blanks (any five) :

(1×5=5)

- (i) 70 S ribosomes are found in
cell.
- (ii) The organelle, which is known as the power house
of a cell is
- (iii) The name 'cell' was given by
- (iv) The distinct region in the prokaryotes containing
the genetic material is
- (v) Thylakoids are presents in the cell organelle
known as
- (vi) Mitotic spindle is made up of
protein.
- (vii) are cytoplasmic channels
or bridges that connect adjacent plant cells.

(c) Describe the contribution of the following (any five) :

(1×5=5)

(i) Matithias Schleiden and Theodor Schwann

- (ii) Benda
- (iii) Singer and Nicolson
- (iv) Robert Brown
- (v) Camillo Golgi
- (vi) Christian de Duve

2. Answer any **three** from the following : (5×3=15)

- (a) Write short note on x-ray diffraction techniques.
- (b) Write down the functions of mitochondria and chloroplast.
- (c) Give an account on the polymorphic forms of lysosome.
- (d) Write a short note on phase contrast microscopy

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

- (a) Euchromatin and Heterochromatin
- (b) Prokaryotic cell and Eukaryotic cell

(c) Active transport and passive transport

(d) SEM and TEM

(e) Primary and secondary Cell wall

(f) Primary and secondary lysosome

(g) Centromere and kinetochore

4. Write short notes on any **three**: (5×3=15)

(a) Cell cycle check points

(b) Fluid mosaic model

(c) N-linked glycosylation

(d) Chloroplast DNA

5. Draw well labeled diagram (any **three**): (5×3=15)

(a) Mitochondria

(b) Stages of mitosis

(c) Chloroplast

(d) Golgi Bodies

(e) Nuclear pore complex

6. Answer the following : (3×5=15)

(a) What is vesicle-mediated transport and how does endocytosis differ from exocytosis ?

(b) What is meant by the cell theory and what is the significance of this theory for biology ?

(c) What three features of plant cell distinguish them from animal cell ?

(d) Why are mitochondria and chloroplast known as semiautonomous organelles ?

(e) Write down the functions of plant cell wall.

7. (a) What is the endosymbiotic hypothesis regarding the origin of mitochondria ? What molecular facts support this hypothesis ? To which other cellular organelles can the hypothesis also be applied ? (5)

(b) What are marker enzymes ? Give two examples. (3)

(c) Write down the function of peroxisomes and glyoxisomes in animals and plants. (3)

(d) What are the factors effecting fluidity of the cell membrane ? (4)

[This question paper contains 2 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 2874

GC-4

Unique Paper Code : 32173910

Name of the Paper : Chemistry of cosmetics and
Perfumes

Name of the Course : B.Sc. (H) B.Sc. (P) : SEC

Semester : IV

Duration : 2 Hours

Maximum Marks : 37

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **Three** questions in all.
3. Question No. 1 is compulsory. Attempt any **two** other questions.

1. (a) Write the names of the main ingredients of talcum powder and their functions.

(b) (i) What is the importance of conditioners in shampoo ?

(ii) Why is ammonia or any amine required for permanent hair dyes ?

P.T.O.

- (iii) What are the ideal properties of a sun screen agent ?
- (iv) How do antiperspirants function ?
- (v) Describe the uses of rose oil and sandal wood oil in cosmetics. (3,10)
2. (a) Write the essential requirements of a good nail enamel.
- (b) Describe the method for preparation of cold cream and mention the functions of the various ingredients.
- (c) List the main ingredients of shampoo and explain the cleansing action of shampoo. (4,4,4)
3. (a) What are the main ingredients of lipstick ? Discuss the method for the preparation of lipstick.
- (b) Mention the constituents of face powder with their importance.
- (c) What are the various categories of hair dyes ? Discuss semi-permanent hair dye in detail. (4,4,4)
4. Write short notes on any **THREE** of the following :
- (i) Hair sprays
- (ii) Extraction of essential oils from natural sources
- (iii) Vanishing cream
- (v) Sun screen lotion (4,4,4)

This question paper contains 5 printed pages.

Your Roll No.

Sl. No. of Ques. Paper: 110

G

Unique Paper Code : 217261

*Name of Paper : CHPT-202: Physical Chemistry /
Organic Chemistry (Chemistry II)*

Name of Course : B.Sc. (Prog.)

Semester : II

Duration : 3 hours

Maximum Marks : 75

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

*Use separate answer sheets for Sections A and B.
Use of Scientific Calculator is permitted.*

SECTION A
(Physical Chemistry)

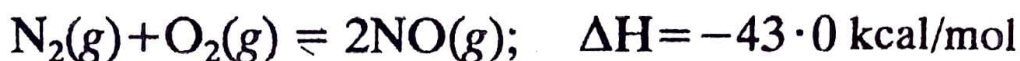
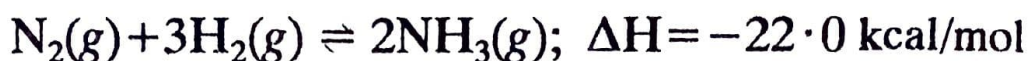
*Attempt any three questions.
All questions carry equal marks.*

1. (a) Derive the Kirchoff's equation showing the variation of ΔH with temperature. 5
- (b) Derive the Gibbs Helmholtz equation in terms of:
 - (i) Free energy and enthalpy
 - (ii) Internal energy and work function. 5
- (c) How is ΔG of a chemical reaction related with ΔS and ΔH ? 2 1/2

P. T. O.

2. (a) Deduce and give the significance of the Henderson Hasselbach equation for acidic and basic buffer solutions. 5

(b) State the Le Chatelier's principle and predict the effect of temperature and pressure on the following:



5

(c) The pH of a solution of HCl is 2.0. Find out the amount of acid present in a litre of the solution.

2 1/2

3. (a) Derive the integrated form of Clapeyron-Clausius equation for liquid-gas equilibria. 5

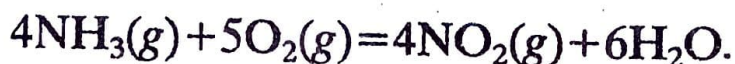
(b) One mole of an ideal gas is expanded isothermally and reversibly at 27°C from a volume of 2.28 dm³ to 4.56 dm³. Calculate Q, W, ΔE and ΔH. 5

(c) Explain the criteria of spontaneity. 2 1/2

4. (a) Derive the concept of entropy from the second law of thermodynamics. Show that entropy is a state function. 5

(b) Explain the principle of solubility product with derivation. How is the solubility of a salt affected by the presence of a common ion? 5

(c) Write down the expression for the equilibrium constant for the reaction:



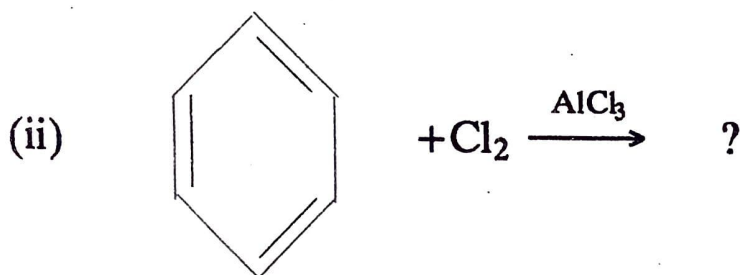
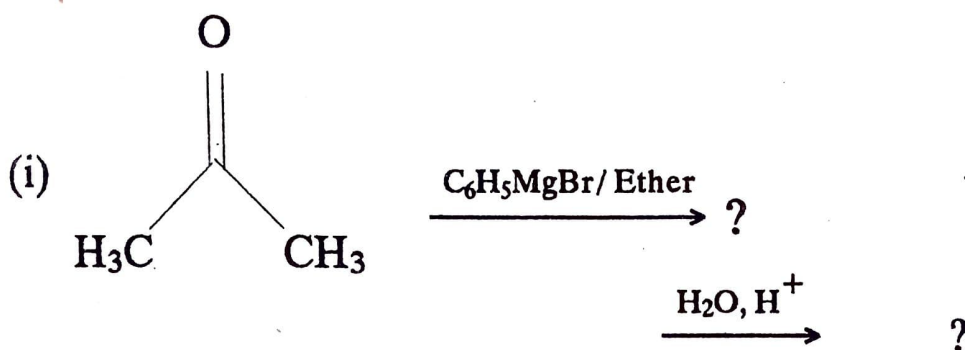
2 1/2

SECTION B
(Organic Chemistry)

Attempt any three questions.

5. (a) Explain Friedel-Craft acylation with mechanism by taking a suitable example.

(b) Complete the following reactions:



(c) Highlight the differences between S_N^1 and S_N^2 mechanism followed by alkyl halide.

(d) Explain nitration of benzene with mechanism.

3,3,3,3 1/2

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

(i) methyl butyl ether

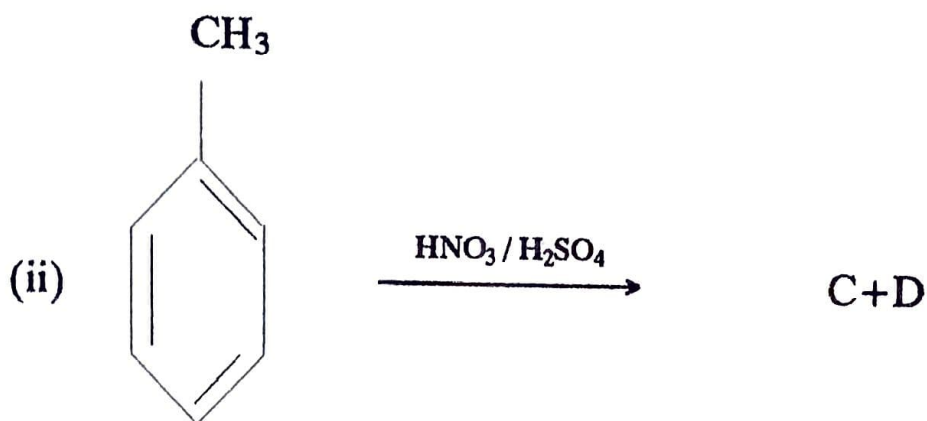
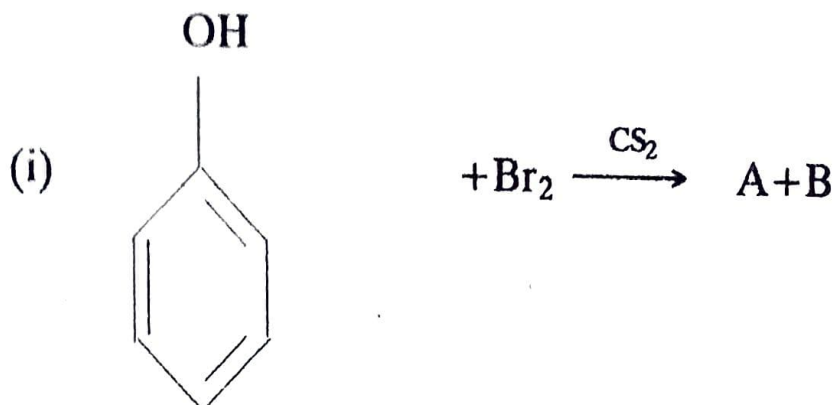
(ii) tert-butyl ethyl ether

(b) With the help of a suitable example, write down

P. T. O.

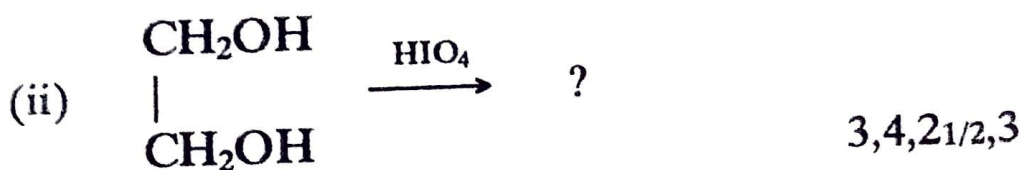
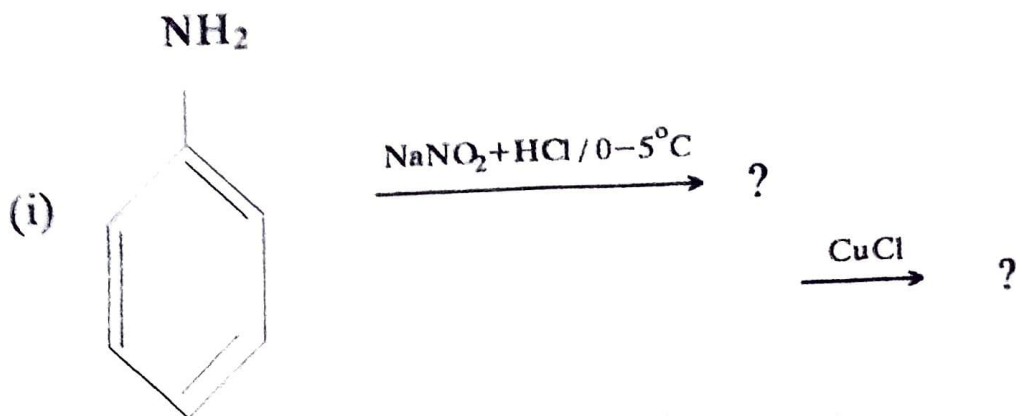
elimination-addition mechanism for nucleophilic aromatic substitution.

(c) Write down the structures of A, B, C, D:



(d) Explain Aldol condensation with mechanism using suitable examples. 2,3,4,3 $\frac{1}{2}$

7. (a) What products are likely to be obtained when ethanol is oxidised with PCC, alk. KMnO_4 and conc. HNO_3
- (b) Describe Clemensen reduction and Wolff-Kishner reduction of carbonyl compounds.
- (c) Why is benzoin condensation catalysed by cyanide ion not by hydroxide ion? Explain.
- (d) Complete the following reactions:



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

- (i) Wittig reaction
- (ii) Benzoin condensation
- (iii) Oppenauer oxidation
- (iv) Pinacol-Pinacolone rearrangement.

(b) What do you understand by kinetically favoured and thermodynamically favoured product? Explain using sulphonation of phenol. 9,3 $\frac{1}{2}$

[This question paper contains 6 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1896

GC-4

Unique Paper Code : 42171205

Name of the Paper : Chemistry (Chemical Energetics,
Equilibria and Functional Organic
Chemistry – I)

Name of the Course : **B.Sc. Programme**

Semester : II

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. Use of Scientific calculators and log tables is allowed.
3. Use separate sheets for **Section A** and **Section B**.

SECTION A
(PHYSICAL CHEMISTRY)

Attempt any three questions in this section.

All questions carry equal marks.

1. (a) Define the following :

(i) Integral enthalpy of dilution

P.T.O.

(ii) Differential enthalpy of solution

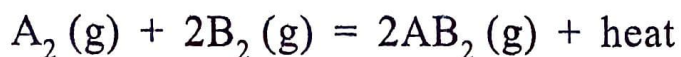
- (b) (i) In a calorimeter, NH_2CN (Cyanamide) was subjected to combustion at constant volume and the heat evolved (q_v or ΔE) was found to be 742.7 kJ at 25°C . Calculate ΔH or q_p for the reaction.
- (ii) The $\Delta_f H^\circ$ of CO_2 (g), CO (g), H_2O (l) are -393.5 , -110.5 , -241.8 kJ/mol respectively. What would be the standard enthalpy change (in kJ mol^{-1}) for the reaction ?



- (c) Derive the Kirchoff's equation to explain the variation of enthalpy of a reaction with temperature. (4,4,4.5)
2. (a) Find out the relationship between K_p , K_x , and K_c . What is the condition for following relation to be valid

$$K_p = K_x = K_c$$

- (b) Calculate the equilibrium constant for the given reaction if 5 moles of A_2 , 3 moles of B_2 and 2 moles of AB_2 are present at equilibrium at 8.21 atm and 300K



(c) State the Le Chatelier's principle. Explain how Le Chatelier's principle helps in understanding the effect of change of concentration, pressure and temperature on chemical equilibrium. (4,4,4.5)

3. (a) What are buffer solutions? Explain the mechanism of buffer action in a solution prepared by mixing equimolar solutions of acetic acid and sodium acetate.

(b) The solubility product of $\text{Pb}_3(\text{PO}_4)_2$ is 1.5×10^{-32} . Determine its solubility in g/litre. Molar mass of $\text{Pb}_3(\text{PO}_4)_2 = 811 \text{ g}$.

(c) Explain the following :

(i) pH Scale

(ii) Common ion effect

(iii) Third Law of thermodynamics (4,4,4.5)

4. (a) Why is the standard enthalpy of neutralization of one mole of a strong acid with one mole of a strong base a constant i.e. -57.3 kJ/mol ? Explain giving reasons what will happen to the enthalpy change whether it will increase, decrease or remain same compared to the above case if :

(i) 100 mL of 1M strong acid and 100 mL of 2 M strong base are mixed.

P.T.O.

- (ii) 100 mL of 1M weak acid and 100 mL of 2 M strong base are mixed.
- (b) Derive the relationship between degree of ionization and ionization constant. Explain at least two factors affecting degree of ionization.
- (c) (i) Why salts of strong acids and strong bases do not undergo hydrolysis ?
- (ii) Calculate the degree of hydrolysis of a 0.10 M solution of sodium acetate at 25°C.

$$K_a = 1.75 \times 10^{-5} \quad K_w = 1.008 \times 10^{-14}$$

(4,4,4.5)

SECTION B
(ORGANIC CHEMISTRY)

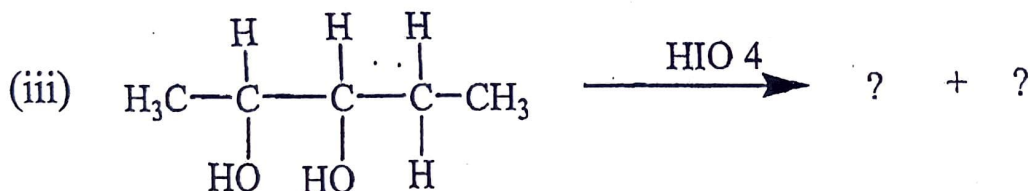
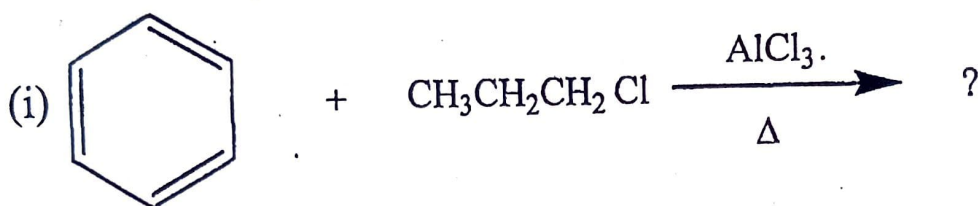
Attempt any three questions.

All questions carry equal marks.

5. (a) Draw the contributing resonance structures for the arenium ion produced when chloronium ion (generated by $\text{Cl}_2/\text{FeCl}_3$) reacts with Benzene ?
- (b) Give the reason why phenol cannot be nitrated by $\text{HNO}_3 + \text{H}_2\text{SO}_4$ mixture directly. How p-Nitrophenol can be prepared starting from phenol ?

- (c) Predict the reaction mechanism followed for nucleophilic substitution reaction when a primary alkyl halide reacts with aq. sodium hydroxide. Give the reaction mechanism. Predict the stereochemistry of the product with respect to starting halide. (4,4,4.5)

6. (a) Complete the following reactions :



(b) Give the reactions and structure of the products when acetaldehyde is reacted with



- (c) Give the Benzyne mechanism for reaction of C-14 labelled Chlorobenzene with NaNH_2 . (4,4,4.5)
7. (a) Which compounds give Iodoform test? Give the mechanism of the reaction?
- (b) Explain why Williamson's synthesis of t-Butyl ethyl ether using t-Butyl bromide and sodium ethoxide is not a good synthesis?
- (c) Give steps involved in the formation of phenol from Benzene by cumene hydroperoxide method? (4,4,4.5)
8. Write short notes on any **three** of the following:
- (i) Reimer-Tiemann reaction
 - (ii) Pinacol-Pinacolone rearrangement
 - (iii) Cannizzaro reaction
 - (iv) Benzoin condensation (4,4,4.5)

- (b) What do you know about 3 centre-2 electron bond? Explain with examples. (4)
- (c) Define Electronegativity and explain Pauling's scale of electronegativity. (4)
- (d) H_3PO_3 is a dibasic acid in nature. Explain by giving its structure. (1½)
2. (a) Carbon monoxide is an excellent reducing agent below 983K, but above this temperature, the reverse is true. Explain. (4)
- (b) What is the van Arkel and de Boer's process for the preparation of pure zirconium? What are its limitations? (4)
- (c) Describe any **two** of the following: (4)
- (i) Mond's Process
 - (ii) Kroll's Process
 - (iii) Electrolytic Refining.
3. (a) What is inert pair effect? PbCl_4 is a strong oxidising agent. Explain. (4)

(b) Discuss the different allotropic forms of Phosphorus. (4)

(c) Explain the followings : (4)

(i) Oxygen exists as O_2 while Sulphur exists as S_8 molecule ?

(ii) Diagonal relationship amongst certain elements.

(a) What do you understand by covalent hydrides ?
Give methods of the preparation of $LiAlH_4$ and $NaBH_4$. (4)

(b) Write the formulas of Marshall and Caro's acid and draw their structures. (4)

(c) Write methods of preparation of hydrazine. How does it react with following ?

(i) $AgNO_3$

(ii) HNO_2 (4)

SECTION -B
(Physical Chemistry)

Use of scientific calculator is allowed.

*Attempt **three** questions in all.*

Question No. 1 is compulsory.

$$R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1} \quad k = 1.38 \times 10^{-23} \text{ J K}^{-1} \quad N_A = 6.023 \times 10^{23}$$

Marks: 37½

1. (a) Roughly sketch the Maxwell distribution curve for the gas molecules in terms of molecular speeds. Label both axes and explain the effect of temperature on the distribution curve. (3) 3.
- (b) What are Miller indices? Calculate miller indices for planes having Weiss indices : (a) 2a, 3b, c (b) 2a, -3b, -3c (3)
- (c) Explain the dependence of surface tension on temperature and why the surface tension of a liquid becomes zero at its critical temperature. (3)
- (d) Differentiate between order and molecularity of a reaction giving examples. (3) 4.
- (e) Why the crystals of NaCl appear yellow in colour on heating in sodium vapour ? (1½)

2. (a) Describe the reasons for deviation of gases from ideal behaviour. Derive van der Waals equation of state for a real gas. (4)
- (b) Calculate the collision number, Z_1 and mean free path, λ of oxygen gas at 1 atm pressure and 27°C . The collision cross-section is 0.27 (nm)^2 . (4)
- (c) What do you understand by the term viscosity? What are its units? Describe the Ostwald viscometer method for the measurement of viscosity of a liquid giving expression. (4)
3. (a) Derive expression for Bragg's Law sketching labeled diagram and explain the significance of n in the equation. (4)
- (b) The density of Li metal is 0.53 g cm^{-3} and the separation of (100) planes is 350 pm. Determine whether the lattice is f.c.c. or b.c.c. $M(\text{Li}) = 6.941 \text{ g mol}^{-1}$. (4)
- (c) Explain the concept of activation energy of reaction. Derive expression for its calculation from Arrhenius equation. (4)
4. (a) Derive expressions to determine order of reaction using half-life method and van't Hoff differential method. (4)

(b) The rate constant for a second order reaction is $5.7 \times 10^{-5} \text{ dm}^3 \text{ mol}^{-1} \text{ s}^{-1}$ at 25°C and $1.64 \times 10^{-4} \text{ dm}^3 \text{ mol}^{-1} \text{ s}^{-1}$ at 40°C . Calculate the activation energy of the reaction. (4)

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

- (i) Effect of temperature on viscosity of a liquid using Arrhenius concept
- (ii) Frankel and Schottky defect in crystals
- (iii) Postulates of kinetic theory of gases (2)

[This question paper contains 6 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 2950

GC-4

Unique Paper Code : 42174404

Name of the Paper : Chemistry of s and p block elements, states of matter & Chemical Kinetics (I + P)

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

Semester : IV

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

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

Section A

(Inorganic chemistry)

Attempt any three questions.

1. (a) Many metal oxides are reduced by carbon, if required temperature is provided. Explain it with the help of Ellingham diagram.

P.T.O.

(b) Write short notes on :

(i) Mond's process for extraction of nickel.

(ii) Electrolytic refining with suitable example.

$$(4\frac{1}{2} + 4 + 4 = 12\frac{1}{2})$$

2. (a) Explain the followings (any **three**) :

(i) Ga has smaller size than Al.

(ii) Ionization potential of nitrogen (N) is greater than oxygen (O).

(iii) Chlorine (Cl) has more electron affinity value than fluorine (F), although fluorine (F) is more electronegative.

(iv) PbO_2 is an oxidizing agent.

(b) Calculate the electronegativity value of Pb (Lead) from the following data; $r = 1.53 \text{ \AA}$ and $Z = 82$, $\text{Pb} = 1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^{10}, 4s^2, 4p^6, 4d^{10}, 4f^{14}, 5s^2, 5p^6, 5d^{10}, 6s^2, 6p^2$.

(c) In contrast to diamond, graphite conducts electricity. Explain it.

$$(6 + 3\frac{1}{2} + 3 = 12\frac{1}{2})$$

3. (a) Write the names and structures of four oxoacids of chlorine (Cl).
- (b) Draw and explain the bonding structure of diborane.
- (c) PCl_5 is a Lewis acid while PCl_3 is a Lewis base. Explain. $(6+4\frac{1}{2}+2=12\frac{1}{2})$
4. (a) What is inert pair effect? Explain with suitable example.
- (b) Li resembles Mg in its chemical properties though it is placed in group I. Explain.
- (c) Draw the structures of the following compounds,
- (i) SOCl_2
- (ii) SO_2Cl_2
- (d) Between NH_3 and NH_2OH , which one is more basic? Justify your answer. $(4\frac{1}{2}+3+1\frac{1}{2}\times 2+2=12\frac{1}{2})$

Section B
(Physical Chemistry)

Attempt three questions in all.

Question No. 1 is compulsory.

All questions carry equal marks.

Use of scientific calculator is allowed.

1. Explain (any 5) :
- (a) Drop of a liquid is spherical.
 - (b) Unit cell and space lattice.
 - (c) Viscosity of liquids decreases while viscosity of gas increases with temperature.
 - (d) Effect of temperature on the mean free path.
 - (e) Pseudounimolecular reactions with example.
 - (f) Difference between Schottky and Frenkel Defect.
 - (g) Generally order of the reaction is not more than three.
 - (h) Excluded volume and how it is related to actual volume.
(2.5×5=12.5)
2. (a) Discuss in detail the drop number method of determining the surface tension of a liquid.

- (b) Write short notes (any 2) :
- (i) Law of crystallography
 - (ii) Liquid crystal
 - (iii) Boyle's Temperature
 - (iv) Viscosity
- (c) (i) Derive an expression for Bragg's equation with diagram.
- (ii) When a certain crystal was studied by Bragg's method using X-rays of wavelength 0.229 nm, an X-ray reflection was observed at an angle of $23^{\circ}20'$. What is the corresponding interplanar spacing? [$\sin(23^{\circ}20') = 0.396$]. (4,4,4.5)
- (a) With the help of graph, discuss the Andrew's isotherm of CO_2 gas.
- (b) Derive the equation for collision frequency z , in case of gas.
- (c) Calculate the root mean square speed of CO_2 gas at 27°C . (4,4,4.5)
- (a) Derive an expression for the rate constant for a reaction of first order.

(b) Half life time of 1st order reaction is 60 minutes
Calculate rate constant of reaction. How long will
take for 90% of this reaction to be completed?

(c) Write short notes on :

(i) Arrhenius equation

(ii) Collision theory

(4,4,4.5)

(c) What are essential and non-essential amino acids? Give two examples of each.

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



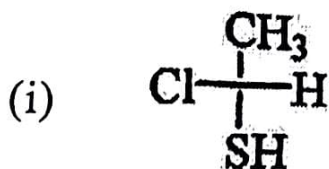
(e) Differentiate between enantiomers and diastereomers giving examples.

(f) Name the two polysaccharides obtained upon hydrolysis of starch. What are the differences between the two?

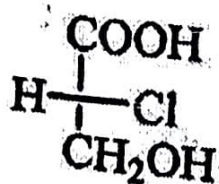
(5×3)

2. (a) Draw the Newman projection formulae for the chair and boat conformations of Cyclohexane and explain, giving reasons, which conformation is more stable.

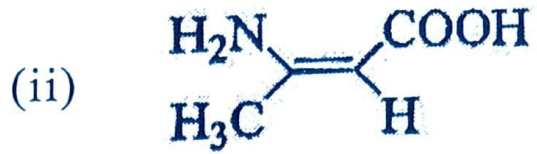
(b) Giving priority order, assign R-/S- configuration of the following:



(ii)



(c) Assigning priority order and designate E-/Z- to the following:



(6,3,3)

3. (a) What happens when a solution of (+) glucose in water (specific rotation, $\alpha=112^{\circ}$) is kept for some time? Name the phenomena involved and discuss its mechanism.

(b) Write the products of the following reactions:



(c) What are anomers? Write the structural formulae of α , and β anomers of glucose. (4,4,4)

4. (a) Suggest a method for preparation of phenylalanine.

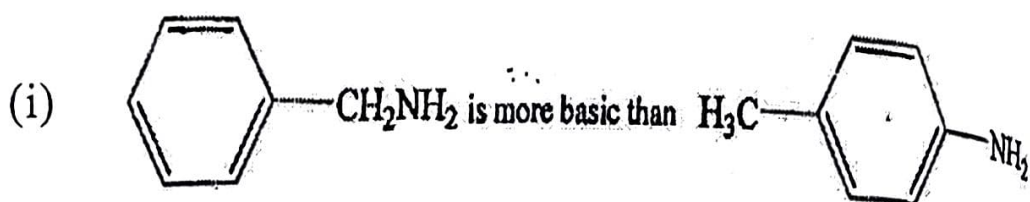
(b) What are D.C.C and t-BOC? Discuss their use in peptide synthesis.

(c) Write a short note on primary and secondary structure of proteins. (4,4,4)

5. (a) Out of *ortho*-nitrophenol and *para*-nitrophenol which one is more volatile and why?

(b) Account for the following observations:

P.T.O.



(ii) Allyl free radical is more stable than propyl free radical. Explain.

(c) Dipole moment of CCl_4 is $\mu = 0$ D whereas that of CH_3Cl is $\mu = 1.86$ D. Justify. (3,6,3)

6. (a) How is electrophoresis used as a method for separation of amino acids.

(b) Write the structure of sucrose and explain why it is a non reducing sugar.

(c) Write the Fischer projection formulae for all the possible stereoisomers of 2,3-dichlorobutane $[\text{CH}_3\text{CH}(\text{Cl})\text{CH}(\text{Cl})\text{CH}_3]$ and give their relationship amongst each other. (4,4,4)

7. (a) Explain giving chemistry of the test, how ninhydrin is used in the detection of amino acids.

(b) How will you convert:

(i) D-Arabinose to D-Glucose

(ii) D-Glucose to D-Mannose

(c) Explain why CH_3^+ is planar while CH_3^- is pyramidal. (3,6,3)

This question paper contains 6 printed pages.

Your Roll No.

Sl. No. of Ques. Paper : 136 G
Unique Paper Code : 217661
Name of Paper : CHPT-606 Chemistry – VI
(Organometallics, Bio-inorganic
Chemistry, Proteins & UV-IR
Spectroscopy)
Name of Course : B.Sc. (Prog.) Life Sc. / Physical
Sc. / Industrial Chemistry /
Analytical Chemistry / Agro-
chemicals & Pest Management
Semester : VI
Duration : 3 hours
Maximum Marks : 75

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

*Attempt three questions each from Section A and Section
B. Sections A and B are to be attempted in separate
answer-sheets. The questions should be numbered in
accordance to the number in the question paper.*

SECTION A

1. (a) Compound (A) when heated with a soluble chloride and concentrated H_2SO_4 gives orange red vapours of compound (B). When passed through NaOH these vapours give coloured solution (C). Addition of lead acetate to acidified solution of (C) gives yellow coloured precipitate of

P.T.O.

compound (D). On addition of H_2O_2 to an acidified aqueous solution of compound (A), a blue colour of compound (E) develops in solution which can be extracted in ether. Identify (A) to (E) and also give chemical reactions involved.

(b) What happens when (Give balanced chemical equation):

- (i) Alkaline solution of CrO_5 is treated with H_2O_2
- (ii) Sodium nitroprusside is treated with sodium sulphide
- (iii) CoCl_2 is treated with NaNO_2 in the presence of acetic acid.
- (iv) A vigorous stream of air is drawn through a solution of COCl_2 containing ammonia, ammonium chloride and activated charcoal
- (v) KMnO_4 reacts with a ferrous salt in acidic medium? 7.5,5

2. (a) What are organometallic compounds? Which of the following are not organometallic compounds and why?

- (i) $[\text{K}_2\text{Zn}(\text{CN})_4]$
- (ii) $(\text{C}_2\text{H}_5)_2\text{Zn}$
- (iii) $\text{B}(\text{OCH}_3)_3$
- (iv) $\text{K}[\text{Pt}(\text{C}_2\text{H}_4)\text{Cl}_3]$

(b) CO has two lone pairs of electrons, one on carbon and the other on oxygen, but, it is always the lone

pair on carbon which is used for bonding and not the one on oxygen. Why?

- (c) Explain the term Synergic effect. How does it help in explaining that CO, which has negligible donor properties towards Lewis acids like BF_3 , forms stable transition metal carbonyls even with low coordination state of metal.
- (d) Draw the structure of Ferrocene. 4,3·5,3,2
3. (a) The symmetric CO stretching frequencies in $[\text{Ti}(\text{CO})_6]^{2-}$, $[\text{V}(\text{CO})_6]^-$ and $[\text{Cr}(\text{CO})_6]$ are 1748, 1859, and 2000 cm^{-1} respectively while the symmetric CO stretching frequency for $\text{CO}(\text{g})$ is 2143 cm^{-1} . Explain the observations.
- (b) Draw the structure of $\text{CO}_2(\text{CO})_8$ in solid state and in hexane. Write down one method for its preparation.
- (c) Using the $18e^-$ rule as a guide, find (any two):
- The number of M–M bonds in $\text{Co}_4(\text{CO})_{12}$
 - The 3d metal in $\text{M}(\text{CO})_6$
 - The value of x in $\text{Mn}_2(\text{CO})_x$
- (d) Both $\text{Mn}(\text{CO})_5$ and $\text{V}(\text{CO})_6$ do not follow the $18e^-$ rule. While $\text{Mn}(\text{CO})_5$ dimerizes to form more stable $\text{Mn}_2(\text{CO})_{10}$, $\text{V}(\text{CO})_6$ does not. Why? 4,3·5,3,2
4. (a) Explain the term 'active transport' with reference to the working of the sodium potassium pump in the animal cells. What is the source of energy for

P.T.O.

the functioning of the pump? Give a diagrammatic representation of the Na - K pump.

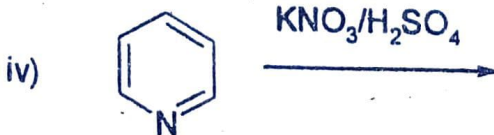
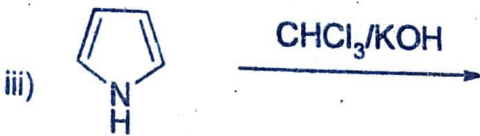
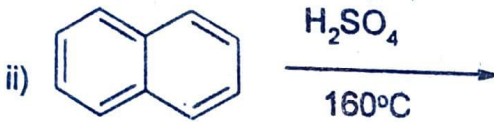
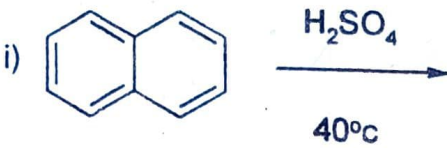
- (b) Which metal is responsible for blood clotting? How does it help in clotting of blood?
- (c) What do you understand by the term bulk elements and trace elements in biological systems? Give suitable examples. 6,3·5,3

SECTION B

Attempt any three questions.

5. (a) (i) Explain why the C_1-C_2 bond length in naphthalene is shorter than the C_2-C_3 bond length?
- (ii) How will you prepare alanine using Strecker synthesis?
- (b) What are essential amino acids? Give two examples.
- (c) How will you separate a mixture of amino acids using electrophoresis?
- (d) (i) Explain the fingerprint region in IR spectroscopy.
- (ii) Why are absorption bands formed in UV spectrum instead of sharp peaks? 5,1,2·5,4
6. (a) Explain briefly the Lambert-Beer law.
- (b) What is the effect of steric strain on λ_{max} ?
- (c) Write short notes on (any two):

- (i) Merrifield solid phase synthesis
 (ii) Edman degradation
 (iii) Secondary structure of proteins.
 (d) Complete the following reactions:—



2,1·5,5,4

7. (a) (i) Draw the resonating structures of anthracene.
 (ii) Explain why pyridine is more basic than pyrrole.
 (b) Write down the structure of the complex formed when an amino acid reacts with ninhydrin solution.

P.T.O.

(c) (i) How many peptide bonds are there in a tripeptide?

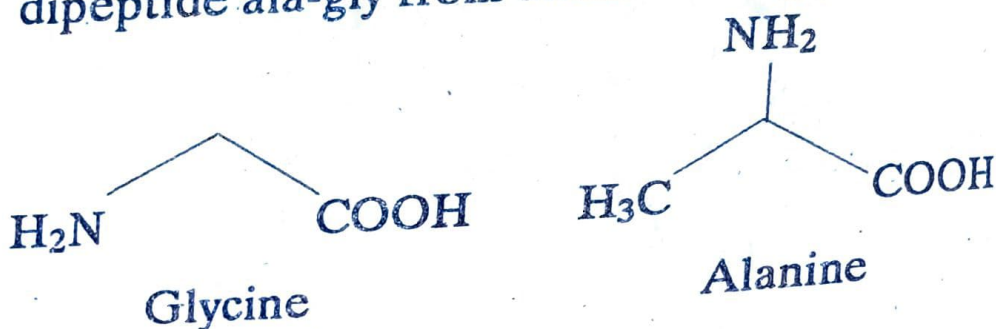
(ii) Define isoelectric point.

(d) How will you distinguish between the following pairs of compounds using IR spectroscopy?

(i) CH_3COOH and $\text{CH}_3\text{COOCH}_2\text{CH}_3$

(ii) CH_3COCH_3 and $\text{CH}_3\text{CH}_2\text{OCH}_3$ 4,2·5,2,4

8. (a) Write the steps required for the synthesis of the dipeptide ala-gly from alanine and glycine.



(b) Explain why:

(i) The electrophilic substitution occurs preferentially at 2-position in Furan.

(ii) Pyridine undergoes nucleophilic substitution at 2-position.

(c) Explain:—

(i) Chromophore

(ii) Auxochrome.

(d) Explain how hydrogen bonding changes the position of absorption in IR spectroscopy. 4,4,2,2·5

This question paper contains 7 printed pages]

Roll No.

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S. No. of Question Paper : 2386

Unique Paper Code : 32175901

GC-4

Name of the Paper : Chemistry [Atomic Structure, Bonding,
General Organic Chemistry and
Aliphatic Hydrocarbons]

Name of the Course : GE : Chemistry for Honours

Semester : II

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 from each

Section A and Section B respectively.

Please Indicate the section and do not intermix

the questions from two Sections A and B.

The questions should be numbered in accordance

to the number in the question paper.

Section A

Attempt any *three* questions.

1. (a) Define de-Broglie hypothesis and derive de-Broglie equation.

P.T.O.

- (b) Using VSEPR theory, state the geometry of any four of the following species :



- (c) Is 5g sub-shell permissible ? Give reason.
- (d) Explain BeF_2 is linear but SF_2 is angular although both are triatomic. Justify your answer. 3,6,1,2,5
2. (a) Draw the Born-Haber cycle for the determination of lattice energy of NaCl and state the significance of each energy term involved.
- (b) Using Molecular Orbital Theory, explain why N_2 has greater dissociation energy than N_2^+ , whereas O_2 has lower dissociation energy than O_2^- .
- (c) Define radial and angular wave function.
- (d) Write molecular orbital configuration for O_2 , O_2^+ , O_2^- , O_2^{2-} and arrange them in increasing order of their bond length. 3,2,3,4,5

3. (a) What is the relation between Cartesian and polar coordinates ?
- (b) Define resonance energy and draw the possible resonance structures for CO_3^{2-} .
- (c) Explain why CO_2 has zero dipole moment though each C-O bond is polar.
- (d) Write electronic configuration for Cu, Cu^+ , Cu^{2+} and show which oxidation state is more stable and why ?
- 3,3,2,4.5
4. (a) Write Schrodinger wave equation for a single electron system and explain various terms involved in it.
- (b) Arrange the electron represented by the following set of the quantum numbers in the increasing order of energy :
- (i) $n = 4, l = 0, m = 0$ and $s = +\frac{1}{2}$
- (ii) $n = 3, l = 2, m = 0$ and $s = +\frac{1}{2}$
- (iii) $n = 3, l = 0, m = 0$ and $s = +\frac{1}{2}$
- (iv) $n = 3, l = 1, m = 1$ and $s = -\frac{1}{2}$

- (c) State Heisenberg uncertainty principle.
- (d) Explain the following :
- (i) In SF_6 all the S-F bonds are equal while in PF_5 all the P-F bonds are not equal.
- (ii) Lattice energy of alkali metal fluoride decreases from LiF to CsF.

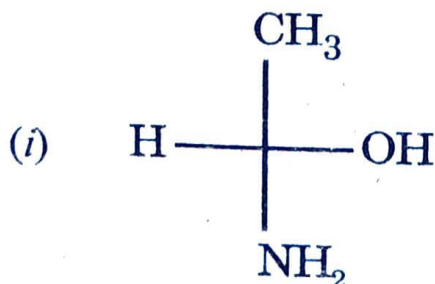
3,4,1,5,4

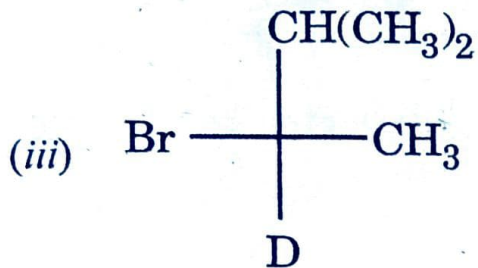
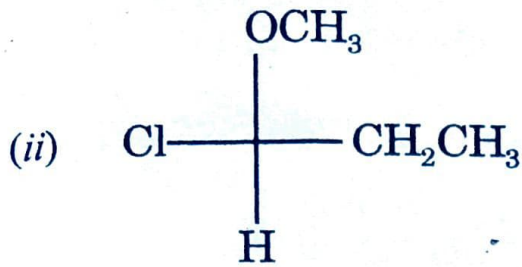
Section B

Attempt any *three* questions.

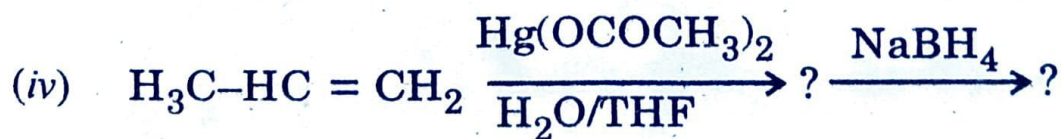
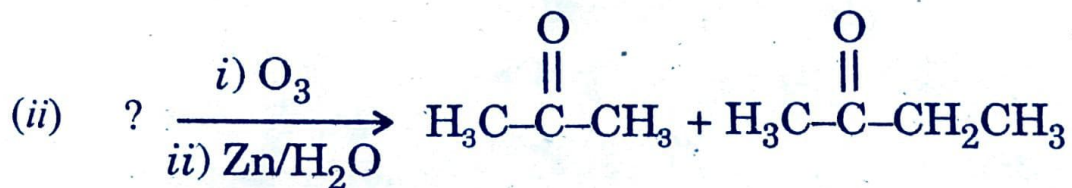
5. (a) Dehydrohalogenation of 2-bromobutane in presence of alcoholic KOH yields two alkenes. What are their structures ? Explain with mechanism.
- (b) What is Huckel's rule ? With the help of Huckel's rule indicate the following compounds as aromatic and non-aromatic.
- (c) Draw the resonating structure of phenol.
- (d) Assign priority order and designate R/S to the following compounds :

3,4,5, 2,3





6. (a) Complete the following reactions :



(b) Draw different Newman conformations of 1, 2-dichloroethane. Explain which conformation is the most stable and why ?

(c) Arrange the following compounds in decreasing order of acidity and explain :



(d) Peroxide effect is observed only in HBr but not in HF, HCl and HI in electrophilic addition reaction of unsymmetrical alkenes. Explain it.

(e) Distinguish between enantiomers and diastereomers taking suitable example.

4, 2.5, 2,2,2

7. (a) Write short notes on (any *three*) :

(i) Kolbe's electrolysis reaction

(ii) Hyperconjugation

(iii) Hydroboration-oxidation in alkene

(iv) Ozonolysis

(b) Explain why allylic cation is more stable than n-propyl cation.

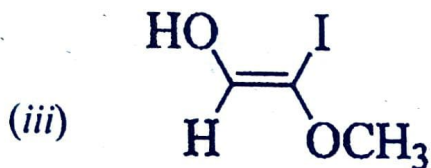
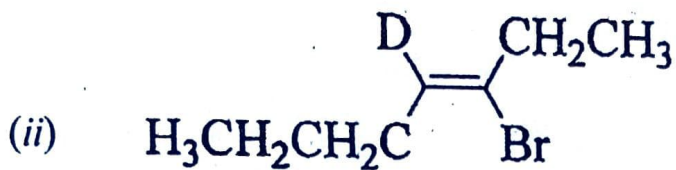
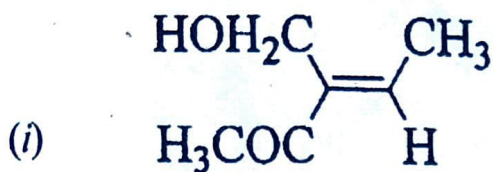
10.5,2

8. (a) Complete the reaction and give its mechanism :



(b) Draw the Fischer projection for all possible stereoisomers of 2, 3-dihydroxybutanedioic acid. Describe the correlation among the stereoisomers.

(c) Assign E/Z to the following compounds :



(d) Write the major and minor products of dehydration of 3-methyl-butan-2-ol with conc. H₂SO₄. Explain with mechanism.

(e) Write the products A and B : 3,3,3,2,5,1



This question paper contains 7 printed pages]

Roll No.

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S. No. of Question Paper : 2387

Unique Paper Code : 32175902 GC-4

Name of the Paper : Chemical Energetics, Equilibria and
Functional Group Organic Chemistry-I

Name of the Course : Generic Elective : Chemistry for
Honours

Semester : II

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.

Question No. 5 is compulsory in Section B.

Use separate answer sheets for Section A and Section B.

Use of scientific calculators is allowed.

Section A : Physical Chemistry—1

Attempt any three questions.

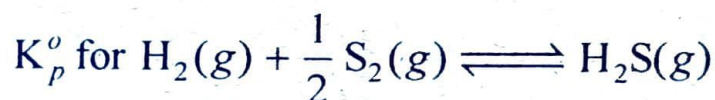
All questions carry equal marks.

P.T.O.

1. (a) What is meant by salt hydrolysis ? Derive expressions for hydrolysis constant, degree of hydrolysis and pH of a salt of strong acid and weak base in terms of dissociation constant of weak acid and ionic product of water.

Calculate pH of a solution of 0.01 M NH_4Cl , given that K_b for $\text{NH}_4\text{OH} = 1.8 \times 10^{-5}$ and ionic product of water = $1 \times 10^{-14} \text{ M}^2$.

- (b) If



is 0.80, determine the value of :



- (c) State and explain the two laws of thermochemistry. 4
2. (a) The thermite reaction used for welding of metals involves the reaction :



What is ΔH° at 25°C for this reaction ? Given that the standard heats of formation of Al_2O_3 and Fe_2O_3 are $-1675.7 \text{ kJ mol}^{-1}$ and $-828.4 \text{ kJ mol}^{-1}$ respectively. 4

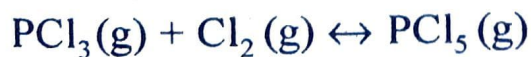
(b) At 25°C, a solution containing hydroxide ions is added to 10^{-4} M solution of $\text{Mg}(\text{NO}_3)_2$ and the pH is adjusted to 9.01. Given, K_{sp} for $\text{Mg}(\text{OH})_2$ is $8.9 \times 10^{-12} \text{ M}^3$ would a precipitate of $\text{Mg}(\text{OH})_2$ form? If not, then at what minimum value of pH would precipitation occur? 4.5

(c) ΔG° at 25°C for the ionization of acetic acid in aqueous solution is 427 kJ mol^{-1} . Calculate the ionization constant of acetic acid at 298 K. 2

(d) State the first and second laws of thermodynamics. 2

3. (a) Calculate the pH of 1×10^{-3} M HCl solution. What will happen to the pH if the solution is diluted such that the new concentration of HCl solution becomes 10^{-8} M? 6

(b) At a particular temperature, the following reaction has an equilibrium constant K_{eq} of 0.18. 2.5



More PCl_3 is added to the system. Will the value of K_{eq} increase or decrease?

- (c) The enthalpy of combustion of ethyl alcohol is $-1380.7 \text{ kJ mol}^{-1}$. If the enthalpies of formation of CO_2 and H_2O are -394.5 and $-286.6 \text{ kJ mol}^{-1}$ respectively, calculate the enthalpy of formation of ethyl alcohol. 4
4. (a) Derive Henderson Hasselbalch equation for an acidic buffer. Calculate the pH of a solution made by adding 0.001 mole of NaOH to 1 dm^3 of a solution which is 0.5 M in CH_3COOH and 0.5 M in CH_3COONa . 6.5
- (b) Calculate the standard free energy for the reaction :
- $$\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightarrow 2\text{HI}(\text{g}), \Delta H^0 = +51.83 \text{ kJ.}$$
- Given that the standard entropies (S°) of $\text{H}_2(\text{g})$, $\text{I}_2(\text{g})$ and $\text{HI}(\text{g})$ are 130.4, 116.6, 206.1 joules respectively. Predict whether the reaction is feasible at the standard state or not. 3
- (c) Derive Kirchoff's equation. 3

Section B : Organic Chemistry—2

Attempt *three* questions in all.

Question No. 5 is compulsory.

5. Account for the following statements :
- (i) Williamson's synthesis of *t*-butyl methyl ether using *t*-butyl bromide and sodium ethoxide is not a good synthesis. 3

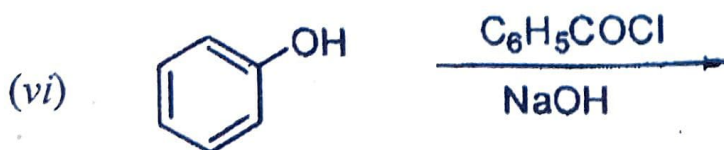
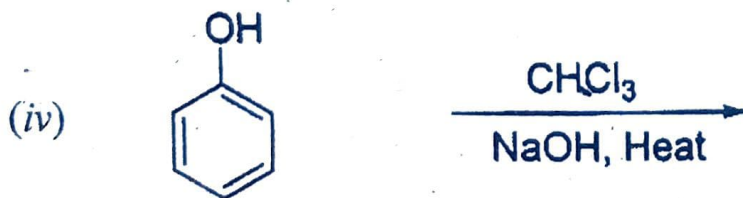
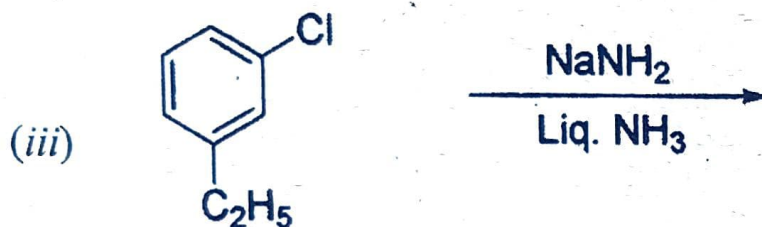
- (ii) *n*-Propylbenzene cannot be prepared by Friedal-Craft's alkylation of benzene with propyl chloride. 2.5
- (iii) Alcohols are less acidic than phenols. 2
- (iv) *p*-Nitrochlorobenzene is readily hydrolysed by hot aqueous NaOH while chlorobenzene is unreactive under same conditions. 2
- (v) Bromination of phenol in polar and non-polar solvent give different products. 2
- (vi) Addition of ammonia derivatives to carbonyl compounds is carried out at optimum pH 5.5-6.0. 2

6. Write short notes (including mechanism) on any *four* of the following : 4×3

- (i) Pinacol-Pinacolone rearrangement
- (ii) Cannizzaro reaction
- (iii) Alkaline hydrolysis of ester
- (iv) Benzoin Condensation
- (v) Nucleophilic substitution (SN_1 and SN_2)

7. Complete the following reactions indicating the name of reaction involved :

6×2



8. (i) An organic compound (A) having molecular formula (C_3H_6O) reacts with 2, 4-DNP reagent and also responds to iodoform test. A on treatment with dilute alkali gives B which on heating form C. Give all the chemical reactions involved including the name and mechanism of the reaction in the conversion of A to B. 6
- (ii) Carry out the following conversions (not more than two steps) : 3×2
- (a) Nitrobenzene from phenol
 - (b) P-Nitrophenol from Benzene diazonium chloride
 - (c) Acetaldehyde from ethyl chloride.

[This question paper contains 7 printed pages]

Your Roll No. :

Sl. No. of Q. Paper : **2677** **GC-4**

Unique Paper Code : 32175902

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

Chemistry : GE

Name of the Paper : Chemical Energetic,

Equilibria and

Functional Group

Organic Chemistry-I

Semester : II/IV

Time : 3 Hours

Maximum Marks : 75

Instructions for Candidates :

- (a) Write your Roll No. on the top immediately on receipt of this question paper.
- (b) Attempt **three** questions from **Section A** and **three** questions from **Section B**.
- (c) Questions No. **5** is compulsory.

- (d) Use Separate answersheets for **Section A** and **Section B**.
- (e) Scientific Calculators and log tables may be used.

SECTION - A

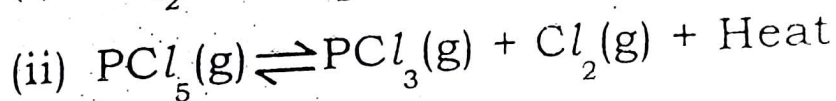
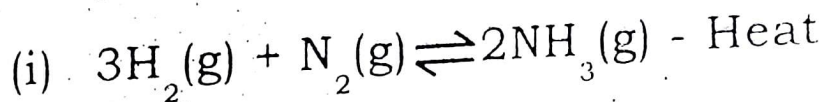
1. (a) Distinguish between bond enthalpy and bond dissociation enthalpy. Calculate the bond enthalpy of the C-H bond, given that the heat of formation of CH₄, heat of sublimation of carbon and heat of dissociation of H₂ are -74.8, +719.6 and 435.4 kJ mol⁻¹ respectively. 4
- (b) State third law of thermodynamics. Explain how it can be applied to determine the absolute entropy of a substance. 4
- (c) Derive thermodynamically Kirchhoff's equation of variation of enthalpy with temperature. The heat of reaction for burning of rhombic sulphur (S₈) in oxygen at 25°C to produce SO₂ gas is -70,960 cal mol⁻¹. The heat capacities at constant pressure for rhombic sulphur, oxygen and sulphur dioxide are 5.67, 6.97 and 19.0 cal mol⁻¹ deg⁻¹ respectively. Calculate the heat of reaction at 85°C. 4.5

2677

2. (a) For the reaction: $N_2O_4(g) \rightleftharpoons 2NO_2(g)$, derive the expression $\alpha = \left(\frac{K_p}{K_p + 4P} \right)^{1/2}$, where α is the degree of dissociation and P is the total pressure. 4

(b) Give the condition under which $K_p = K_c = K_x$ for a reaction at equilibrium. Calculate K_c and K_x for the reaction, $2SO_3(g) \rightleftharpoons 2SO_2(g) + O_2(g)$ (Given $K_p = 3.5 \times 10^{-23}$ atm at $27^\circ C$ and $R = 0.082 \text{ LatmK}^{-1}\text{mol}^{-1}$). 4

(c) State and explain Le-Chatelier's principle and predict the effect of temperature and pressure on the following reactions: 4.5



3. (a) Discuss the plot of Gibbs function G, as a function of the advancement or extent of a reaction. 4

(b) What are buffer solutions? Explain why ammonium acetate solution behaves as buffer, whereas potassium chloride solution does not? 4

- (c) Define the term "pH" of a solution. A monobasic acid has a dissociation constant $= 1.8 \times 10^{-5}$ at 25°C . Calculate its degree of dissociation at a concentration of 0.20 M at 25°C . Also, calculate the pH of the solution. 4.5
4. (a) Derive the expressions of hydrolysis constant (K_h), degree of hydrolysis (h) and pH for a solution of a salt of a weak acid and strong base. 4
- (b) The solubility product of magnesium hydroxide at 25°C is $1.4 \times 10^{-11} \text{ M}^2$. Calculate the solubility of magnesium hydroxide in g/L. (Given atomic mass of $\text{Mg} = 24 \text{ gmol}^{-1}$, $\text{O} = 16 \text{ gmol}^{-1}$ & $\text{H} = 1 \text{ gmol}^{-1}$) 4
- (c) What is the difference between ionic product and solubility product? Discuss the applications of the solubility product principle. 4.5

SECTION - B

5. Give reasons for the following :
- (i) In nucleophilic substitution of $\text{S}_\text{N}2$ type, the product is obtained with inversion of configuration.

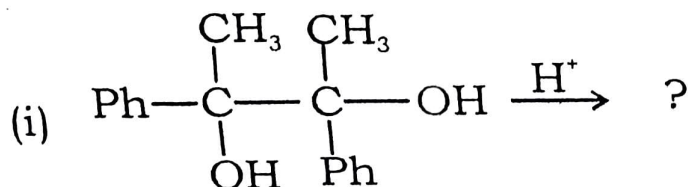
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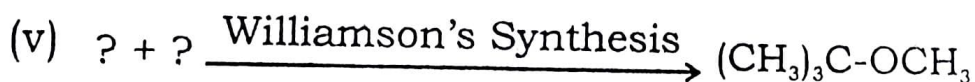
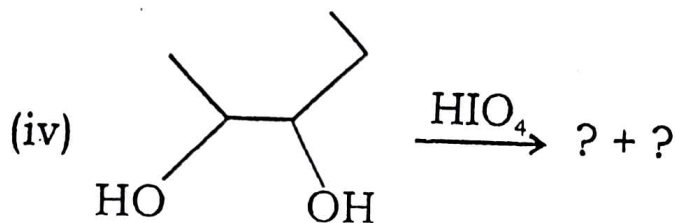
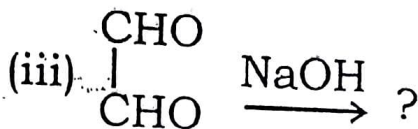
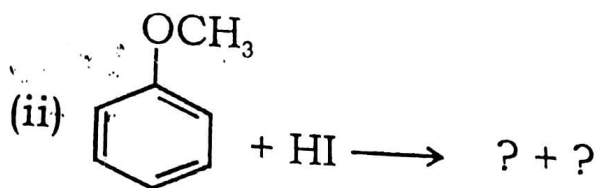
- (ii) Reactivity of the following towards nucleophilic substitution reaction is in the following order: 1.5



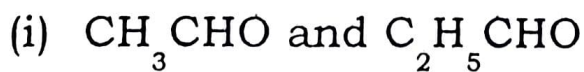
- (iii) Phenol is more acidic than most of the aliphatic alcohols. 2
- (iv) Acylium ion is more stable than the corresponding ethyl carbocation. 2
- (v) Different products are formed when phenol is nitrated with dil. nitric acid and conc. nitric acid. 2
- (vi) Benzaldehyde and acetone can be distinguished by Tollen's reagent. 2
- (vii) Different reactivity of Lucas reagent is observed with primary, secondary and tertiary alcohol. 2

6. (a) Explain $\text{S}_{\text{N}}1$ mechanism with a suitable example. 4
- (b) Complete the following reactions: 5





(c) Distinguish the following pairs with suitable chemical tests 3

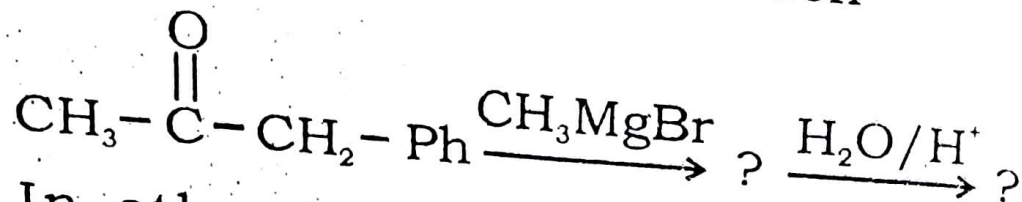


(ii) methanol and phenol

7. (a) Differentiate between Aldol and Cannizzaro reaction by suitable examples and mechanism. 5

(b) Complete the following reaction

2



(c) In ethanolic KOH, alkyl halides give elimination as the major product whereas in aqueous KOH, substitution product is the major one. Explain with reason. 2

(d) Carry out the following conversions: 3

(i) benzaldehyde from acetylene

(ii) p-bromophenol from phenol

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

(3×4)

(a) Gattermann-Koch Reaction

(b) Benzoin condensation

(c) Sulphonation of benzene

(d) Benzyne Mechanism

(e) Oppeneauer Oxidation

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[This question paper contains 4 printed pages]

Your Roll No. :.....

Sl. No. of Q. Paper :1544 F-8

Unique Paper Code :2161401

Name of the Course : B.Sc. (Hons.) Botany

Name of the Paper : Concept of Genetics

Semester : IV

Time : 3 Hours Maximum Marks : 75

Instructions for Candidates :

- (a) Write your Roll No. on the top immediately on receipt of this question paper.
- (b) Attempt **five** question in **all**.
- (c) Question No. **1** is compulsory.
- (d) Attempt any **four** questions from the rest.
- (e) **All** questions carry equal marks.

1. (a) Define the followings (any **five**). (5×1=5)
- (i) Tautomerism
 - (ii) Penetrance
 - (iii) Recombination
 - (iv) Polyploidy
 - (v) Mutton
 - (vi) Inversion
 - (vii) Co-dominance

P.T.O.

(b) Expand the following (any **five**).

- (i) 2AP
- (ii) QTL
- (iii) MMS
- (iv) cM
- (v) F_1
- (vi) PKU

(c) Write major contribution of any **five**:

- (i) T.H. Morgan
- (ii) B. McClintock
- (iii) Sutton Boveri
- (iv) A.H. Sturtevant
- (v) R.C. Punnett
- (vi) Boris Ephrussi

2. Differentiate between any **five** :

- (i) Ionizing and Non ionizing radiations
- (ii) Complementary and Suppressor genes
- (iii) Autopolyploidy and Allopolyploidy
- (iv) Epistasis and Dominance
- (v) Somatic and Germinal mutations
- (vi) Qualitative and Quantitative Inheritance

3. Write short notes on any **three** :

- (i) Position effect
- (ii) Chromosomal theory of Inheritance
- (iii) ABO Blood Group
- (iv) Complementation test

4. (a) In the Chinese primrose, slate-colored flower (s) is recessive to blue flower (S), red stigma (r) is recessive to green stigma (G), and long style (l) is recessive to short style (L). All three genes involved are on the same chromosome. The F_1 of a cross between true-breeding strains, when testcrossed, gave the following progeny :
(10)

Phenotype	Number of Progeny
slate flower, green stigma, short style	27
slate flower, red stigma, short style	85
blue flower, red stigma, short style	402
slate flower, red stigma, long style	977
slate flower, green stigma, long style	427
blue flower, green stigma, long style	95
blue flower, green stigma, short style	960
blue flower, red stigma, long style	27
Total	3000

- (i) Are the genes linked ? Give reasons for your answer. (1)

- (ii) Diagram the cross giving the genotypes of P and F_1
 - (iii) Determine the order of the three genes
 - (iv) Calculate the distances between the genes and construct the linkage map?
 - (v) Calculate the coefficient of coincidence
 - (vi) Calculate the interference and comment on its significance.
 - (b) Discuss the inheritance of shell color pattern in snails.
5. (a) Discuss causes and consequences of Turner syndrome.
- (b) Explain the C/B method for detecting mutations in *Drosophilla*.
6. (a) Briefly explain one gene – one enzyme hypothesis.
- (b) Give experimental evidence to prove that crossing over involves exchange of genetic material.
7. (a) What are lethal genes? Explain in detail with an example.
- (b) Explain mutations in mitochondrial DNA and its significance in yeast.

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 2862

GC-4

Unique Paper Code : 32163404

Name of the Paper : Medicinal Botany

Name of the Course : Botany : SEC for B.Sc. (Hons.)/
B.Sc. Prog.

Semester : IV

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 Question No. 1, which is compulsory.
3. Write botanical names wherever applicable.

1. (a) Write suitable answers for the following : (5×1=5)

(i) A plant used for memory enhancement

(ii) An anti-cancer drug yielding plant

(iii) Father of Indian Ethnobotany

P.T.O.

(iv) A plant whose fruits are rich in vitamin C

(v) A plant known in India as the 'Divine Tree'

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

(i) AYUSH

(ii) NBPGR

(iii) NMPB

(iv) CIMAP

(v) BGCI

(vi) IUCN

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

(i) Endemic species

(ii) Biopiracy

(iii) Secondary metabolites

(iv) Palaeoethnobotany

(v) Ethnomedicine

(vi) Antitussive drug

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Write short notes on the following (any five) : (5×3=15)

- (i) Sacred Groves
 - (ii) Botanical Gardens
 - (iii) Importance and scope of medicinal plants
 - (iv) Aloe vera
 - (v) Withania somnifera
 - (vi) Role of herbaria in ethnobotanical study
- (a) Discuss the origin, concepts and the fundamental doctrine of the Ayurveda system of medicine. (6)
- (b) What is a polyherbal formulation? What are its advantages? Name any one polyherbal medicinal formulation used in the Ayurveda system and mention its ingredients and medicinal uses. (6)
- (c) Write the botanical name and the family of any two medicinal plants used for the treatment of diabetes. (3)

(a) Differentiate between the following (any two) :
(2×5=10)

- (i) Unani and Siddha system of medicine
- (ii) *In-situ* and *Ex-situ* Conservation

(iii) Propagation by Layering and Grafting

- (b) Write the importance of any two plants used for treatment of jaundice.
5. Write the botanical name, family, plant part used, active constituents and uses for the following (any three) (3×3)
- (a) Brahmi
 - (b) Neem
 - (c) Turmeric
 - (d) Arjuna
6. (a) Explain the IUCN Red List Categories and importance in conservation of biodiversity. Name four endangered medicinal plants of India.
- (b) What is a greenhouse? What are the applications of greenhouse technology?
- (c) Write a short note on the ethnic communities and their traditional medicines of India.

No. of Q.P.: 1655
Question paper code: 2161601
Name of the paper: Plant Metabolism
Name of the Course: B.Sc. (H) Botany (FYPP)
Semester: 6th VI

~~Set A~~ 200

F-8

Time: 3 Hours

Maximum Marks: 75

Instruction for Candidates

(Write your Roll No. on the top immediately on receipt of this question paper)
Answer five questions in all, including Q.No. 1 which is compulsory.

1. Define the following (any ten):

1.5x10=15

- (i) Kranz Anatomy
- (ii) Redox Potential
- (iii) Action Spectrum
- (iv) Uncouplers
- (v) Essential Fatty Acids
- (vi) Anaplerotic reactions
- (vii) Desaturases
- (viii) Gluconeogenesis
- (ix) Nitrite Reductase
- (x) Allosteric Enzymes
- (xi) Transamination
- (xii) Substrate Level Phosphorylation

2. Differentiate between the following (any three):

5x3=15

- (i) C3 plants and C4 Plants
- (ii) Anabolic and Catabolic Pathways
- (iii) Cyclic phosphorylation and Non-cyclic phosphorylation
- (iv) Respiration and photorespiration
- (v) Symbiotic and non-symbiotic nitrogen fixation

3. Write short notes (any five):

3x5=15

- (i) Nitrogenase
- (ii) α -oxidation of fatty acids
- (iii) Cyanide-resistant respiration
- (iv) CAM plants
- (v) Racker's experiment
- (vi) ATP synthase
- (vii) Regulatory enzymes

4. (i) Briefly discuss the organization and structure of the four major protein complexes of the thylakoid membrane. (8)

(ii) Explain β oxidation of fatty acids. (7)

5. (i) Write the chemiosmotic mechanism of ATP synthesis. (8)

(ii) Discuss glyoxylate cycle and its role in mobilization of lipids during seed germination. (7)

6. (i) Write the contribution of following scientists (any four):

2x4=8

- a) Van Niel
- b) A.T. Jagendorf
- c) Robin Hill
- d) Robert Emerson
- e) Peter Mitchell

(ii) Discuss briefly the interaction of carbohydrate metabolism with lipid and protein metabolism (with suitable examples). (7)

7. (i) Describe oxidative decarboxylation of Pyruvate. (8)

(ii) Discuss briefly covalent modulation of enzymes and its role in the regulation of metabolism. (7)

Sl. No. of Q.P. : 1596
Unique Paper Code : 2231401
Name of the Paper : Physiology : Life Sustaining Systems
Name of the course : B.Sc. (Hons) Zoology
Semester : IV

Duration : 3 Hours

Maximum Marks : 75

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

Attempt *five* questions in all

Question No. 1 is compulsory

Q.1 (a) Define the following:

- (i) Anatomical Dead Space
 - (ii) Deglutition
 - (iii) Bohr's effect
 - (iv) Pericardium
 - (v) Thrombus
- (5)

(b) Expand the following:

- (i) PCT
 - (ii) ERV
 - (iii) ADH
 - (iv) ESR
 - (v) LDL
 - (vi) JGA
- (3)

(c) Differentiate between the following:

- (i) Tidal Volume and Vital Capacity
 - (ii) SA node and AV node
 - (iii) Cortical nephron and Juxtamedullary nephron
 - (iv) Myogenic heart and Neurogenic Heart
 - (v) Renin and Rennin
- (10)

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

- (i) Parietal cells
 - (ii) Kupffer cells
 - (iii) Macula densa
- (6)

(e) Fill in the blanks:

- (i) Heart wall is made up of epicardium, myocardium and _____
 - (ii) _____ enzyme in RBC helps in transportation of CO₂
 - (iii) The capillary network supplying the loop of Henle is _____
- (3)

- Q.2 (a) Describe the digestion of carbohydrates in the gastro intestinal tract. (3)
(9) (b) Give a brief account of control of salivary secretions. (3)
- Q.3 (a) Discuss the transport of CO₂ in blood at pulmonary and tissue level. (9)
(3) (b) What is carbon monoxide poisoning? (3)
- Q.4 (a) Explain the mechanism of urine formation. (9)
(3) (b) What is Renin-Angiotensin System? (3)
- Q.5 Draw a well labelled histological diagram of the following :
(a) T.S. Liver
(b) T.S. Lung (4 x 3)
(c) T.S. Kidney (9)
- Q.6 (a) Describe the events of the cardiac cycle. (3)
(b) What is the significance of Sphygmomanometer? (3)
- Q.7 Write short notes on any *three* of the following
(a) Spirogram
(b) Pancreas
(c) Valves of the heart
(d) Ultrafiltration (3x4)

(This question paper contains 2 printed pages)

Roll No.....

Sl. No. of Q.P. 1598

Unique Paper Code : 2231403

Name of the Paper : Biochemistry of Metabolic Processes

Name of the Course : B.Sc. (Hons.) Zoology

Semester : IV (Erstwhile FYUP)

Duration : 3 Hours

Maximum Marks : 75 Marks

F-8

Instructions for candidates:

- 1. Write your Roll No. on the top immediately on receipt of this question paper
- 2. Attempt FIVE questions in all
- 3. Question No. 1 is compulsory

Q.1 (i) Define the following:

5

- (a) Coupled reactions
- (b) Antioxidants
- (c) Oxygen Debt
- (d) Transamination
- (e) Chylomicrons

(ii) Differentiate between:

10

- (a) Glucogenic and Ketogenic amino acid
- (c) Glycogenesis and Glycogenolysis
- (e) Thiolyase and Thiokinase
- (f) Synthase and Synthetase
- (g) Anabolism and Catabolism

(iii) Fill in the blanks:

3

- (a) Malate-aspartate shuttle operates in.....
- (b) Nitrogen of Urea molecule comes from.....and
- (c) The product of glycolysis which enters TCA cycle is.....

- (d) Pentose phosphate pathway occurs in
- (e)..... is a primer molecule required during glycogenesis.

(iv) State whether following statement is true (T) or false (F)

- (a) Cytochrome b of ETS accepts only one electron. 4
- (b) Rotenone is responsible for inhibition of Complex II of ETS.
- (c) Palmitate cannot contribute to net gluconeogenesis.
- (d) Lysine is a ketogenic amino acid.

(v) Expand the following:

- (a) UDPG 2
- (b) NADP
- (c) SGOT
- (d) HMG-CoA

(vi) Write structure of substrate, product and name of the enzyme for the following reactions:

- (a) Fumarate $\xrightarrow{\quad? \quad}$ Malate 3
- (b) Glucose 6 Phosphate $\xrightarrow{\quad? \quad}$ Glucose
- (c) Pyruvate $\xrightarrow{\quad? \quad}$ Lactate

Q.2 (a) Explain EMP pathway in detail. What is the site of its occurrence 10

(b) How many ATPs are yielded during anaerobic conditions? 2

Q.3 (a) Discuss Chemiosmotic theory in detail in reference to ATP synthesis through ETS. 9

(b) Add a short note on respiratory control. 3

Q.4 Explain in detail the β oxidation of 16 carbon fatty acid. Add a note on bioenergetics of the reactions involved. 12

Q.5 (a) Elaborate the pathway of gluconeogenesis. How it is different in ruminants? 10+2

(b) What is the significance of carboxylation/decarboxylation reactions in the above context?

Q.6 (a) Describe the process of urea formation with the help of structures and diagrams. 9

(b) Add a note on regulation of ketogenesis. 3

Q.7 Write short notes on following: (any three) 4,4,4

(a) Intermediary metabolism

(c) Cori cycle

(b) TCA cycle (only diagram)

(d) Transamination

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 115

G

Unique Paper Code : 107261

Name of the Paper : Food Nutrition and Health [LSPT-203]

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

Semester : II

Duration : 3 Hours

Maximum Marks : 75

Instruction for Candidates

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

Attempt **five** questions in all.

Question No. 1 is compulsory.

(a) Define the following :

(5×1=5)

(i) Goitre

(ii) Food Spoilage

(iii) Co-enzymes

P.T.O.

(iv) Essential Fatty Acids

(v) Hypoglycemia

(b) Differentiate between the following pairs of terms :

(i) Fat soluble and water soluble vitamins

(ii) Obesity and overweight

(iii) Reducing and Non Reducing Sugars

(iv) Active Smoking and Passive Smoking

(v) Primary and Secondary Structure of Protein

(vi) Saturated and Unsaturated Fatty Acids

(c) Expand the following :

(5×1=

(i) PUFA

(ii) NAD

(iii) BMI

(iv) AIDS

(v) ORT

(d) Fill in the blanks :

(i) Blood pressure above _____
categorized as hypertension.

(ii) Vitamin D is a soluble vitamin.

(iii) Bitot's spot results due to deficiency of

(iv) Obese persons are recommended diet.

(v) Scurvy is caused due to deficiency of

(a) Describe the causes, symptoms and treatment of Iron deficiency disorder. (8)

(b) Explain various national programs to control the Iron deficiency disorders. (4)

Give nutritional needs and recommended dietary patterns for the given groups – (8+4=12)

(a) Pregnant and nursing mothers.

(b) School going children.

(a) Give the functional classification of proteins along with suitable examples. (8)

(b) Summarise the relevance of minerals in balanced diet. (4)

(a) What are the various factors causing hypertension? (5)

- (b) Suggest various dietary and life style modifications for management of hypertension.
6. Write a detailed account of protein energy malnutrition. (7)
7. Write short notes on **ANY THREE** of the following: (12)
- (4×3=12)
- (a) Food adulteration
 - (b) Methods of water purification
 - (c) Drug dependence
 - (d) Vit A deficiency
 - (e) AIDS

[This question paper contains 6 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1891 GC-4
Unique Paper Code : 42161201
Name of the Paper : Plant Ecology and Taxonomy
Name of the Course : B.Sc. (Prog.)
Semester : II
Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates:

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

Attempt Section A and B on **SEPARATE SHEETS**.

Question No. 1 of both sections is **COMPULSORY**.

Attempt **three** questions from Section A and **three** questions from Section B including question number 1 of both sections.

Attempt all parts of the question together.

SECTION-A

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

(i) Ecosystem

P.T.O.

(ii) Population

(iii) Thermocline

(iv) Pioneer community

(v) Phytogeography

(vi) Food web

(vii) Edge effect

(b) Fill in **any five** of the blanks; (5×0.5=2.5)

(i) Instrument used to measure relative humidity is

_____.

(ii) Pyramids of _____ are always upright.

(iii) Partially decomposed finely divided amorphous dark
coloured organic matter in the soil is known as

_____.

(iv) _____ is an example of hydrophyte.

(v) The introduction of a plant into new place is known
as _____.

(vi) The diameter of a clay particle is less than _____ mm.

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

- (i) Primary and Secondary succession
- (ii) Grazing and Detritus food chain
- (iii) Soil structure and Soil texture
- (iv) Net productivity and Gross productivity
- (v) Heliophytes and Sciophytes
- (vi) Vegetation and Flora

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

- (i) Hydrosere succession
- (ii) Shelford's law of tolerance
- (iii) Raunkier's life form
- (iv) Cation Exchange Capacity

4. (a) What are biogeochemical cycles? Explain the cycling of Nitrogen with the help of a flow chart. (8)

- (b) List the various botanical provinces of India. Explain any one province in detail. (7)

SECTION - B

1. (a) Fill in **any four** of the blanks: (4)
- (i) _____ is specimen or illustration selected from original material when no type was indicated or is missing.
 - (ii) Lal Bagh Botanical Garden is situated in _____ city.
 - (iii) _____ is regarded as the Father of Botany.
 - (iv) *Pinax theatri botanici* is written by _____ taxonomists.
 - (v) _____ is the author of book "*Theorie elementaire de la botanique*".
 - (vi) _____ is appended to the left side of an original label of herbarium which bears corrections.
 - (vii) _____ is the species name in which the genus and specific epithet are identical.
 - (viii) Bubble diagram to show phylogenetic relationship was given by _____.

(b) Match the following: (3.5)

- | | |
|--|----------------------|
| (i) Phylogenetic Classification | (a) J. K. Maheshwari |
| (ii) Father of Taxonomy | (b) Linnaeus |
| (iii) Binomial Nomenclature | (c) George Bentham |
| (iv) The Families of Flowering Plants | (d) Adanson |
| (v) Flora of British India | (e) Engler & Prantl |
| (vi) <i>Die Natürlichen Pflanzenfamilien</i> | (f) Hutchinson |
| (vii) Father of Numerical Taxonomy | (g) First May 1753 |

2. (a) Discuss the principles of ICN. (5)
- (b) What are the functions of a herbarium? (5)
- (c) Identify the taxonomic rank of the following: (5)
Parietales, *Solanum*, Magnoliophyta, Liliopsida, Rosaceae

3. (a) Discuss the role of palynology in relation to taxonomy. (5)

- (b) Briefly discuss the differences between the phenograms and cladograms. (5)
- (c) Mention the alternate names used for the following families: (5)
- Compositae, Cruciferae, Graminae, Umbelliferae, Leguminosae
4. (a) Discuss merits and demerits of Engler and Prantl's system of classification. (8)
- (b) Expand any three of the following: (3)
- OTU, APG, DC, *nom.nud.*
- (c) Interpret the following: (4)
- (i) *Stellaria media* (L.) Will.
- (ii) *Delphinium viscosum* Hook. f. et Thompson
- (iii) *Cerasus cornuta* Wall. ex Royale.
- (iv) *Carex kashmirensis* Clarke in Hook. f.

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1892

GC-4

Unique Paper Code : 42231202

Name of the Paper : Comparative Anatomy and
Developmental Biology of
Vertebrates

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

Semester : II

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. Question No. 1 is compulsory.
3. There are two sections, **Section A** and **Section B**. Attempt two question from each section.
4. Attempt five questions in All.
5. Draw neat labelled diagrams wherever necessary.

1. (a) Define the following terms (**any four**)

(i) Sebaceous gland

(ii) Cleavage

P.T.O.

(iii) Induction

(iv) Crop

(v) Archinephric duct

(1×4)

(b) Differentiate between the following terms (any five):

(i) Apocrine gland and Holocrine gland.

(ii) Physostomous swim bladder and Physoclistous swim bladder.

(iii) Demibranch and Holobranch.

(iv) Morula and Blastula.

(v) Animalpole and Vegetal pole.

(vi) Deciduous placenta and Non-deciduous placenta

(2×5)

(c) Name the germ layers from which the following are derived:

(i) Spinal cord

(ii) Kidney

(iii) Lung

(iv) Bone

(0.5×4)

(d) Fill in the blanks;

(i) Left systemic arch is present in _____

(ii) _____ is the only gland present in birds.

- (iii) The stretching and spreading of ectodermal cells during gastrulation is called _____.
- (iv) Yolk synthesis in egg during Oogenesis is known as _____.
- (v) _____ are the receptors of touch. (1x5)
- (e) Match the following
- | A | B |
|-------------------------|-----------------------|
| (i) Islet of Langerhans | (a) Claw |
| (ii) Unguis | (b) Pancreas |
| (iii) Corona radiata | (c) Cerebrum |
| (iv) Pallium | (d) Graafian follicle |
- (1x4)
- (f) Mention one function of the following:
- (i) Sertoli cells
- (ii) Glomerulus (1x2)

Section A

- (a) Give an account of evolution of heart in vertebrates with the help of suitable diagrams.
- (b) How is single circuit circulation different from double circuit circulation? (9,3)

P.T.O.

3. (a) Discuss the succession of kidneys in vertebrates.
(b) Describe the structure of lung of birds.
4. Write short notes on any **three** of the following
- (a) Visceral arches
 - (b) Digestive glands
 - (c) Chemoreceptors
 - (d) Mammalian brain

Section B

5. (a) What is Spermiogenesis? Explain it with the help of a suitable diagram.
(b) Discuss the hormonal control of metamorphosis in insects.
6. (a) Explain the process of fertilization in mammals.
(b) Discuss the mechanisms of block to polyspermy.
7. Write short notes on any three of the following:
- (a) Fate maps
 - (b) Vitellogenesis
 - (c) Morphogenetic movements
 - (d) Implantation in humans

[This question paper contains 4 printed pages.]

R.No.

32

Your Roll No.....

Sr. No. of Question Paper : 121

G

Unique Paper Code : 223451

Name of the Paper : Molecular Biology (LSPT 407)

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

Semester : IV

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. Answer **five** questions in all, including Q. No. 1 which is compulsory.
3. Illustrate your answers with appropriate diagrams wherever necessary.

1. (a) Expand the following terms :

(5)

(i) ORC

(ii) UTR

(iii) f-met

P.T.O.

(iv) ESC

(v) RBS

(b) Define :

(i) Chaperons

(ii) Plasmid

(iii) Polyribosome

(iv) Central Dogma

(v) Autophagy

(vi) Charged tRNA

(c) Write the major contribution of following scientists :

(i) Meselson and Stahl

(ii) Francis Crick

(iii) Rosalind Franklin

(iv) E. Chargaff

(v) Roberts and Sharp

(d) Differentiate between :

(i) B DNA and Z DNA

(ii) Prokaryotic and Eukaryotic Ribosomes

(iii) Purines and Pyrimidines

(iv) Hereditary and Sporadic Cancer

(e) State true or false giving reasons (Attempt any five):

(5)

(i) Metastasis is associated with benign tumours. ✓

(ii) Okazaki fragments are formed on 5' → 3' DNA strand.

(iii) Anticodons are located on rRNA.

(iv) Transcription and translation are the coupled processes in prokaryotes.

(v) Telomere shortening helps to promote cancer ✗

(vi) snRNPs are part of spliceosome involved in cutting/removal of introns.

2. (a) Define and differentiate between inducible and repressible operons with examples. (6)

(b) Explain the working of tryptophan operon in prokaryotes. (6)

3. (a) Explain how structural organization of DNA influences replication in eukaryotes. (6)

- (b) Discuss post-transcriptional changes during conversion of pre mRNA into functionally mature mRNA in eukaryotes.
4. (a) Discuss double helical model of DNA proposed by Watson and Crick.
- (b) Explain rolling circle model of replication.
5. (a) Explain clover leaf model of tRNA molecule.
- (b) Discuss briefly various types of carcinogens.
6. (a) Differentiate between prokaryotic and eukaryotic translation.
- (b) Describe the role of mitochondria in the process of apoptosis.
7. Write short notes on any **THREE** :
- (i) Oncogenes
 - (ii) RNA Polymerases
 - (iii) Genetic code
 - (iv) Bacterial transformation
 - (v) Nucleosome

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 128 G

Unique Paper Code : 216453

Name of the Paper : LSPT-408 Biodiversity III – Plants

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

Semester : IV

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.
3. Q. No. **1** is compulsory.
4. Attempt all parts of a question together.
5. Draw well labelled diagrams wherever necessary.

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

(i) Ligule

(ii) Protonema

(iii) Siliqua

P.T.O.

- (iv) Transfusion tissue
- (v) Epipetalous
- (vi) Coenosorus
- (vii) Collenchyma

(b) Match the following :

(5×1=5)

Column A	Column B
(i) <i>Funaria</i>	Poaceae
(ii) Resin canal	Multicellular rhizoids
(iii) Caryopsis	<i>Pinus</i>
(iv) Horse tail	Sunflower
(v) Capitulum	<i>Equisetum</i>

(c) Write the botanical name and family (**any five**) :

(5×1=5)

- (i) Black pepper
- (ii) Wheat
- (iii) Gram
- (iv) Tea
- (v) Cotton
- (vi) Teak
- (vii) Rauwolfia

2. Draw labelled diagrams (**any three**) : (3×5=15)
- (i) L.S. sporophyte of *Funaria*
 - (ii) T.S. stem of *Selaginella*
 - (iii) T.S. coralloid root of *Cycas*
 - (iv) C.S. mericarp of Fennel
 - (v) T.S. Monocot stem
3. Differentiate between (**any three**) : (3×5=15)
- (i) Natural and Phylogenetic system of classification
 - (ii) Apogamy and Aposory
 - (iii) Manoxylic and Pycnoxylic wood
 - (iv) Rhizoids of liverworts and mosses
 - (v) Cotton fibre and Jute fibre
 - (vi) Monocot and Dicot root
4. Write short notes (**any three**) : (3×5=15)
- (i) Stelar evolution
 - (ii) Adaptations of bryophytes to land habit
 - (iii) Polyembryony in *Pinus*
 - (iv) Economic importance of Rice
 - (v) Sclerenchyma
 - (vi) Floral characters of Solanaceae and Brassicaceae

5. (a) Discuss the significance of heterospory with special reference to *Selaginella*. (5)
- (b) With the help of suitable diagram(s) explain archegoniophore of *Marchantia*. (5)
- (c) Expand the following : (5×1=5)
- (i) Linn.
 - (ii) Hook.f.
 - (iii) D.C.
 - (iv) APG
 - (v) ICN
6. (a) *Equisetum* shows xerophytic and hydrophytic characters. Discuss. (5)
- (b) *Cycas* is a living fossil. Discuss. (5)
- (c) Discuss merits and demerits of Bentham and Hooker's system of classification. (5)
7. (a) Discuss the centres of origin as given by Vavilov. (5)
- (b) With the help of suitable diagram(s) explain the structure of female cone of *Pinus*. (5)
- (c) Explain the methods of asexual reproduction in *Funaria*. (5)

- (ii) Pfam
- (iii) GIB
- (iv) PIR
- (v) Uniprot
- (vi) TrEMBL
- (vii) PDB

(b) Fill in the blanks (**any four**)

(1×4=4)

- (i) Bioinformatics centre is present in _____ .
- (ii) _____ was the first protein to be sequenced.
- (iii) Atlas of protein sequences and structure, 1965 was written by _____ .
- (iv) The first genome of a free living organism was published of _____ in 1995.

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

(5×3=15)

- (i) Genomics
- (ii) FASTA

- (iii) GenBank
 - (iv) PubChem
 - (v) BLink
3. (a) What is BLAST and Discuss about the various Specialized Tools ? (7.5)
- (b) Define Biological databases and explain their Features. (7.5)
4. (a) Differentiate between (any two) (3×2=6)
- (i) Primary database and secondary database
 - (ii) Enterz and SRS
 - (iii) Unigene and Homologene
- (b) Define LIBRA and discuss its function. (6)
- (c) Explain the resources of PIR. (3)

Section B

Attempt three questions in all including Question No. 1, which is compulsory.

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

- (i) MSA
- (ii) ORF
- (iii) PAUP
- (iv) DPA
- (v) QSAR
- (vi) CINEMA

(b) Differentiate between **any two** of the following :

(2×2=4)

- (i) Local and Global Sequence Alignment
- (ii) Orthologous and Paralogous sequences
- (iii) Rooted and Unrooted phylogenetic tree

(c) Define **any three** of the following : (3×1.5=4.5)

- (i) Optimal alignment

(ii) Unitary matrix

(iii) Domain

(iv) Transcriptomics

(a) What do you understand by Scoring Matrix ?

(b) How does PAM differ from BLOSUM matrix ?

(c) Find out the best alignment score for the given two sequence alignments based on similarity (S) and Distance (D) methods, provided that the gap penalty for 1nt (or wk1) = 2 and 2nt (or wk2) = 6 :

(i) ATCAGACGA_TTG

ATC_GA_GACT_G

(ii) ATCAGACGATTG

ATCAGACGAT__

(1+2+9)

(a) Describe various features of a phylogenetic tree.

(b) Describe NJ method of constructing phylogenetic tree with a suitable example.

(c) Discuss the advantages of NJ method over UPGMA method of constructing phylogenetic tree. (2+7+3)

P.T.O.

4. (a) Discuss the bioinformatics analysis of microbial genome
- (b) How the QSAR techniques involve in drug design process ? (6+)
5. Write short notes on **any two** of the followings : (6+)
- (a) CLUSTAL W
- (b) Molecular Docking
- (c) PHYLIP

Your Roll No.....

Sr. No. of Question Paper : 2944

GC-4

Unique Paper Code : 42234406

Name of the Paper : Genetics and Evolutionary Biology

Name of the Course : B.Sc. Life Sciences

Semester : IV

Duration : 3 Hours

Maximum Marks : 75

Instruction for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **both** the sections i.e. **Section A** and **B** on separate sheets.

SECTION A – GENETICS

Attempt three questions including Question No. 1 which is compulsory.

- (i) Define the following (any five) : (5)
- (a) Pleiotropy
 - (b) Chiasmata
 - (c) Nullisomy

- (d) Lethal alleles
- (e) Pseudodominance
- (f) Homogametic sex

(ii) Differentiate between the following (any three):

- (a) Back mutation and suppressor mutation
- (b) Incomplete dominance and co-dominance
- (c) Transition and transversion
- (d) Deamination and depurination (6)

(iii) Name the syndromes in the following human karyotypes

- (a) 47, XXY
- (b) 47, +21
- (c) 46, 5p-
- (d) 45, XO
- (e) 47, +18
- (f) 47, +13 (3)

- (a) Explain epistasis. Discuss the basis of deviation from Mendelian dihybrid ratio giving two examples. (2,3,3)
- (b) If a man of blood-group AB marries a woman of blood group B whose father was of blood group O, what are the expected blood groups of their children? (4)

- (a) A test-cross in *Drosophila* between female F1 flies heterozygous at three loci on the third chromosome, cu/cu^+ (curled versus straight wings), e/e^+ (ebony versus gray bodies) and st/st^+ (scarlet versus red eyes) and completely homozygous recessive ($cu\ e\ st/cu\ e\ st$) male flies. The results obtained are as follows:

Genotype	Number of progeny
$cu\ e\ st^+/cu\ e\ st$	366
$cu^+\ e^+\ st/cu\ e\ st$	380
$cu\ e\ st/cu\ e\ st$	24
$cu^+\ e^+\ st^+/cu\ e\ st$	30
$cu^+\ e\ st/cu\ e\ st$	89
$cu\ e^+\ st^+/cu\ e\ st$	105
$cu\ e^+\ st/cu\ e\ st$	2
$cu^+\ e\ st^+/cu\ e\ st$	4

Based on the given data,

- (i) Determine the order of genes. (2)
 - (ii) Draw a linkage map and calculate the map distance between the genes. (3)
 - (iii) Calculate the coefficient of coincidence and interference. (3)
- (b) Discuss somatic cell genetics. (4)
4. Write short notes on **(any three)**: (4,4,4)
- (a) Sex-linked inheritance
 - (b) Extra-chromosomal inheritance
 - (c) Polyploidy
 - (d) Dosage compensation
 - (e) Mutagens

SECTION B – EVOLUTIONARY BIOLOGY

Attempt three questions in all, including Question No. 1 which is compulsory.

1. (i) Define the following **(any four)**: (4)

- (a) Pangenesis
- (b) Index fossils
- (c) Sibling species
- (d) Missing link
- (e) Phyletic evolution

(ii) Distinguish between : (6)

- (a) Trace fossil and body fossil
- (b) Hybrid sterility and hybrid breakdown
- (c) Coacervates and microspheres

(iii) Mention the contribution of the following : (3)

- (a) H.B.D. Kettlewell
- (b) Ernst Mayr
- (c) Karpechenko

(a) Describe the phylogeny of horse with suitable diagrams.

(b) "Incompleteness of fossil record does not disprove the theory of evolution." Justify. (8,4)

3. (a) Discuss the macro-evolutionary principles with examples.

(b) Discuss the role of organic variation in evolution.

(6,6)

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

(a) Neo-Darwinism

(b) Artificial selection

(c) Role of extinction in evolution

(d) Pre-mating isolating mechanisms

(e) Endosymbiotic theory

(4,4,4)

(b) Distinguish between: (10)

- (i) Primary and Secondary host
- (ii) Type I and Type II restriction endonuclease
- (iii) Sporogony and Schizogony
- (iv) Embryonic and Adult stem cells
- (v) High and Low temperature methods for food preservation

(c) Give reason for the following: (2)

- (i) An ideal cloning vector should have selectable marker gene.
- (ii) A bacterial cell undergoing chemical transformation needs to be competent.

(d) Expand the following: (03)

- (i) pBR322
- (ii) BCG
- (iii) HGH
- (iv) amp^R
- (v) SCID
- (vi) MCS

(e) Write down the contribution of the following scientists: (05)

- 46
- (i) Ian Wilmut
 (ii) E. M. Southern
 (iii) Kary Mullis
 (iv) Karl Ereky
 (v) Alexander Fleming
 (f) Match the following:

(02)

Column I**Column II**

- | | |
|----------------------------|-------------------------------------|
| (i) Ligase | (a) RNA dependent synthesis of DNA |
| (ii) Phosphatase | (b) Join together DNA fragments |
| (iii) Klenow fragment | (c) Remove terminal phosphate group |
| (iv) Reverse Transcriptase | (d) Polymerization of nucleotides |

- (a) Describe the method of industrial production of Glycine and Glutamic acid.
 (b) Enumerate the procedure of DNA sequencing by Sanger's method

(6,6)

- (a) Explain with diagram the production of Bt cotton. Give an account on its significance.

P.T.O.

- (b) Give an account on subunit vaccines with appropriate examples. (7, 5)
4. Write the causative agent and symptoms of Malaria. Enlist the factors contributing to the transmission of the parasite and its control. (12)
5. (a) Illustrate the map of pUC19. How are the transformants carrying pUC19 selected?
- (b) Briefly describe the method of DNA microarray. Give its applications. (5)
6. (a) Add a appropriate note on gene therapy for Cystic fibrosis. Give an appropriate diagram.
- (b) How is the human insulin (Humulin) produced using recombinant DNA technology? (6)
7. Write short notes on the following: (Any Three)
- (i) Polymerase Chain Reaction
 - (ii) Molecular diagnosis of sickle-cell anaemia
 - (iii) Bioremediation
 - (iv) Japanese Encephalitis (4)
 - (v) Antibiotics

(v) Blastula (5)

(b) Differentiate between the following pairs of terms:

(i) Determinate and Indeterminate cleavage

(ii) Tachycardia and Bradycardia

(iii) Cortical and Juxtamedullary Nephrons

(iv) Centrolecithal and Telolecithal eggs

(v) Peristalsis and Segmentation (10)

(c) Expand the following terms :

(i) PNS

(ii) CCK

(iii) ECM

(iv) ERV (4)

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

(i) β cells

(ii) Grey crescent

(iii) Sarcoplasmic reticulum

(iv) Graffian follicle (8)

SECTION A

(Attempt any two questions)

What is polyspermy? Explain the mechanism of slow block to polyspermy.

Give a brief account of the various planes of cleavage.
(8+4)

Give an account of gastrulation in chick embryo.

Explain the mechanism of oogenesis in human females.
(8+4)

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

cytosomal reaction

von Baer's Principles

Extra embryonic membranes in amniotes

Fertilization in mammals (4+4+4)

SECTION B

(Attempt any two questions)

Describe the mechanical events in cardiac cycle.

P.T.O.

- (b) Write a short note on "All or none principle"
6. (a) Explain the molecular mechanism of muscle contraction.
(b) Illustrate the process of protein digestion in the alimentary canal.
7. Write short notes on any **three** of the following
- (i) Oxy-hemoglobin curve
 - (ii) Calcium homeostasis
 - (iii) Renin - Angiotensin system
 - (iv) Conduction in medullary nerve fibres

This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 152

G

Unique Paper Code : 216655

Name of the Paper : Ecology and Environmental
Management (LSPT-615)

Name of the Course : B.Sc. Life Sciences

Semester : VI

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates:

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.

All parts of a question must be answered together.

(a) Explain the following terms (any five): (5×1=5)

(i) Biome

(ii) Niche

(iii) Heliophytes

P.T.O.

(iv) Cryopreservation

(v) Natality

(vi) Secondary air pollutant

(b) Fill in the blanks. (any five)

(5×1=5)

(i) _____ and _____ are two components of ecosystem.

(ii) _____ is the instrument to measure light intensity.

(iii) _____ is a process of successful establishment of a species in a bare area.

(iv) _____ is the study of relation between organism and their natural environment.

(v) _____ is an example of an insectivorous plant.

(vi) _____ is the book listing threatened and endangered species of plants and animals.

(c) Expand the following. (any five)

(5×1=5)

(i) CITES

(ii) EPA

(iii) CBD

(iv) UNESCO

(v) BSI

(vi) UNEP

(vii) IUCN

2. Differentiate between the following. (**any three**) ($3 \times 5 = 15$)

(a) National Parks and Sanctuaries

(b) Primary and Secondary succession

(c) Food chain and Food Web

(d) Habitat and Niche

(e) Tundra and Taiga

3. Write short notes. (**any three**) ($3 \times 5 = 15$)

(i) Global Climate change

(ii) Raunkiaer's life forms

(iii) Hydrological cycle

(iv) Soil Profile

(v) Theory of Tolerance

4. (a) Define a population. Discuss the various attributes of a population. (7)

(b) Give a detailed account of vegetation of India. (8)

5. (a) Discuss in detail the methods and processes involved in Environmental Impact Assessment (EIA). (7)
- (b) What are the various sources and effects of water pollution? (8)
6. (a) What is biodiversity? List the various causes for loss of biodiversity. (8)
- (b) Discuss the various stages in a Xerosere. (7)
7. (a) Define Ecosystem. Discuss the flow of energy in an ecosystem with an illustrated diagram. (8)
- (b) Discuss wind as an ecological factor. (7)

Name of the Course : B.Sc. (H) Botany FYUP restructured

Unique Paper Code : 2161402

Name of the Paper * Reproductive biology of angiosperms

Semester : IV

Time : 3 Hours

Maximum marks: 75

Instructions for the Candidates:

Attempt five questions in all. All questions carry equal marks

Question number 1 is compulsory.

All parts of a question must be answered together.

Draw well-labelled diagrams wherever necessary.

1. (a) Fill in the blanks:

1x8=8

- (i) _____ is the study of external morphology of pollen grains.
- (ii) Pseudomonads are found in _____ family.
- (iii) Rejection reaction generally occurs in style in _____ type of self-incompatibility.
- (iv) _____ is an ovular structure involved in directing the pollen tube to micropyle.
- (v) The crowding effect or population effect observed during *in vitro* pollen germination is because of _____.
- (vi) The process of formation of egg cell from _____ megaspore is known as _____.
- (vii) _____ is the pollen receptive surface of pistil.
- (viii) Presence of more than two sperms inside embryo sac is known as _____.

Delivery

4. Attempt any **three** of the following:

5x3=15

- (i) Write a note on male germ unit and its significance.
- (ii) Discuss briefly the method of *in vitro* pollination in plants.
- (iii) What is a suspensor? Describe its structure and function.
- (iv) Comment on the functions of tapetum.

5. (a) Elaborate on the factors affecting pollen viability. Discuss any two methods of pollen storage. 8

(b) Differentiate between the three types of endosperm development. Comment briefly on the endosperm-embryo relationship. 7

6. (a) Discuss the method of germ-line transformation through pollen tube pathway. 5

(b) Draw a well-labelled diagram of a unitegmic, anatropous ovule with Polygonum type of embryo sac. 5

(c) Describe the development of a mature monocot embryo from zygote. 5