

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 7043

K

Unique Paper Code : 2162522301

Name of the Paper : Plant Cell and Developmental
Biology

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

Semester : III

Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. All questions carry equal marks.
3. Attempt total **four** questions including Question No. 1 which is compulsory.
4. All parts of a question must be attempted together.
5. Draw well-labelled diagrams wherever necessary.

1. (a) Fill in the blanks (any five) : (5×1=5)

(i) In wood, elements of xylem are blocked by balloon like ingrowths called _____

(ii) The pollen-kitt substances plays an important role in _____

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- (iii) Primary cell wall is primarily made of _____ and _____
- (iv) Secondary roots originate from _____ layer.
- (v) _____ proposes the Tunica-corpus theory of shoot apex organization.
- (vi) Each Golgi stack has two distinct ends, or faces namely _____ and _____

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

- (i) Open vascular bundles
- (ii) Caruncle
- (iii) Differentiation
- (iv) Cytoplasmic streaming
- (v) Double fertilization
- (vi) Non-albuminous seeds

(c) State true or false for the following statements (any five) : (5×1=5)

- (i) Pollen tube entry into ovule through micropyle is known as mesogamy.
- (ii) Endocytosis usually does not occur in plant cells due to their rigid cell wall.
- (iii) Filiform apparatus is present in the central cell of embryo sac.

- (iv) Dicot leaves are usually dorsi-ventral.
- (v) Styler canal is present in solid type of style.
- (vi) The F-type/ H^+ ATPase is found on the inner mitochondrial membrane in eukaryotes.

2. Differentiate between the following (any three) :
(3×5=15)
- (a) MGU and FGU
 - (b) Smooth and Rough endoplasmic reticulum
 - (c) Monocot and dicot stem
 - (d) Autogamy and Allogamy
3. Draw well-labelled diagram of the following (any three) :
(3×5=15)
- (a) Ultrastructure of chloroplast
 - (b) Vertical section of monocot leaf (*a part cellular*)
 - (c) Pollen wall
 - (d) Types of collenchyma
4. Write short notes on the following (any three) :
(3×5=15)
- (a) Parenchyma
 - (b) Seed development
 - (c) Nucleus
 - (d) Microsporogenesis

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5. Answer the following (any two) : (2×7.5=15)
- (a) What is endosperm? Define the types of endosperm based on development. Briefly discuss about embryo-endosperm relationship.
 - (b) Elaborate on Körper -Kappe theory of root apex organization.
 - (c) Discuss anomalous secondary growth in a stem with the suitable example.
6. Answer the following (any five) : (5×3=15)
- (a) Explain why mitochondria regarded as semi-autonomous cell organelles. Justify your answer.
 - (b) Which stage of dicot embryogenesis exhibits radial organization? Explain in detail.
 - (c) Does plant exhibit polarity in their growth? Discuss your view point.
 - (d) Describe the role of callose in atleast two plant developmental processes.
 - (e) Write a note on structure and functions of trichomes.
 - (f) Define pollen-pistil interactions. What are the steps in the series of pollen-pistil interactions?

Paper No. : 7106

(2 – Pages)

Unique Paper Code: 2230522301/2232522301

Name of the Paper: DSC-LS-ZOO – Biochemistry: Basic Concepts of Metabolism

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

Semester: III (NEP-UGCF)

Duration: 2 hours

Maximum Marks: 60 Marks

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of the question paper.
2. Attempt any 'four' Questions in total. **Question No. 1 is compulsory.**
3. Draw structures wherever necessary
4. Attempt all parts of the question together. All questions carry equal marks.

1. (i) Define (any three) : (3)

- a) Anaplerotic reactions
- b) Feedback inhibition
- c) Coenzyme
- d) Oxidative phosphorylation

(ii) Differentiate between (any three): (6)

- a) Covalent catalysis and acid-base catalysis
- b) Monosaccharides and disaccharides
- c) Co-enzyme and cofactor
- d) Transamination and deamination

(iii) Fill in the blanks : (3)

- a) Molecule bound in the active site and acted upon by enzyme is called _____.
- b) Name the only two carbon compound entering the citric acid cycle _____.
- c) NAD is a form vitamin B _____.
- d) _____ is epimer of glucose at C-4 carbon position.
- e) Glucose -6- phosphatase is present only in these tissues _____ and _____.

(iv) Give full form of (any three): (3)

- a) PDH
- b) NADPH
- c) TPP
- d) PEP

2. Elaborate citric acid cycle with chemical structures. Give an account of amount of energy yield in terms of ATP and explain the regulatory controls of the cycle. (15)

3. a) Describe metabolic pathway for biosynthesis of palmitic acid. (9)
b) Add a note on structural and storage lipids. (6)

4. a) Elaborate the role of respiratory chain complexes in oxidative phosphorylation. (9)
b) Explain how three irreversible reactions of glycolysis are bypassed in gluconeogenesis. (6)

5. a). Explain the different levels of organization in protein structure and describe various types of molecular interactions that contribute to the stabilization of each level. (9)
b) Illustrate the classification of enzymes with examples. (6)

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

- a) Glutamine formation and significance
- b) Chemiosmotic theory
- c) Mechanism of enzyme action
- d) Glucose-alanine cycle

(2000)

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[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 7157

K

Unique Paper Code : 2233582001

Name of the Paper : DSE Biostatistics and
Bioinformatics

Name of the Course : B.Sc. Applied Life Sciences
with Agrochemicals and Pest
management.

Semester : III

Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Use of simple calculator is allowed.
3. Statistical tables should be provided.
4. Attempt **four** questions in all, including Question No 1 which is compulsory.

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1. (a) Expand the following abbreviations : (6)

- | | |
|-------------|-------------|
| (i) NCBI | (ii) BLOSUM |
| (iii) BLAST | (iv) OMIM |
| (v) ORF | (vi) PIR |

(b) Explain the following symbols : (3)

- | | |
|----------------|------------|
| (i) H_0 | (ii) S^2 |
| (iii) Σ | (iv) C.V. |
| (v) α | (vi) df |

(c) Define the following : (7)

- (i) Median
- (ii) Standard Deviation
- (iii) Coefficient of Variance
- (iv) Metabolomics
- (v) Composite database
- (vi) Transcriptomics
- (vii) Gap penalty

(d) Differentiate between the following (Any Four) :
(8)

(i) Type I error and Type II error.

(ii) Level of significance and Level of confidence.

(iii) Primary Databases and Secondary Databases.

(iv) Sequence similarity and Sequence homology.

(v) bits score and e-value.

2. (a) Ovary weight of 50 fishes and their frequency is given in class interval. Calculate the mean and standard deviation of the given data :

Weight of Ovary	3-3.9	4-4.9	5-5.9	6-6.9	7-7.9
Frequency	6	13	11	8	12

- (b) What is standard deviation. Discuss about its formula and significance of calculating standard deviation. (8+4=12)

3. (a) Define Chi-square (χ^2) test. Write down the formula of chi-square test and describe the null and alternate hypothesis.

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(b) The weights (in gm) of a fish, collected from two different ponds were measured as :

Pond A: 22, 26, 22, 24, 23, 20, 22, 25, 23, 24

Pond B: 13, 14, 13, 12, 11, 12, 10, 12, 11, 14

Conduct t-Test and find out if there is a statistical difference in body weights of the fishes collected from two ponds. (4+8=12)

4. (a) Distinguish between pairwise and multiple sequence alignment. (2+6+4=12)

(b) Discuss about Dynamic programming method of pairwise sequence alignment.

(c) Discuss about PAM and BLOSUM scoring matrices.

5. (a) Discuss about the role of Bioinformatics in various branches of biology.

(b) What is BLAST ? Discuss about different types of standard BLAST. (6+6=12)

6. Write short notes on (any three) : (4×3=12)

(i) Role of Biostatistics in Biological Sciences

(ii) Z test

(iii) Protein Data Bank (PDB)

(iv) Proteomics

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 7002

K

Unique Paper Code : 2172523501

Name of the Paper : DSC-A5: Coordination Chemistry and its Applications
in Biological Systems

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

Semester : V

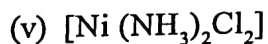
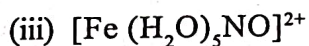
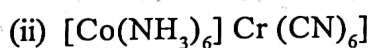
Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any four questions.
3. All questions carry equal marks.

1. (a) Write IUPAC name of the following complexes :



(b) Explain the following in details :

(i) Strong and Weak Jahn-Teller distortion

(ii) Tetrahedral complexes are high spin

- (c) Draw all possible isomers of $[\text{Cr}(\text{C}_2\text{O}_4)_2(\text{H}_2\text{O})_2]$. Which of these isomers will be optically active and why? (5,5,5)
2. (a) Calculate the number of unpaired electrons (n) and CFSE value in terms of CFS and P for the following complex :
- (i) $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$
 - (ii) $[\text{CoCl}_4]^{2-}$
- (b) On the basis of Valence Bond theory answer the following questions for a six- coordinated complex ion $[\text{Co}(\text{NO}_2)_6]^{3-}$
- (i) What is the oxidation state of Cobalt?
 - (ii) What type of hybridization is involved?
 - (iii) What will be no. of unpaired electron(s)?
 - (iv) What is the magnetic behavior of the complex ion?
 - (v) Whether the given complex is inner orbital or outer orbital complex?
- (c) Write the chemical formula for the following complexes :
- (i) Ammonium aquapentafluoronickelate(IV)
 - (ii) pentaamminecarbanatochromium(III) chloride
 - (iii) Sodium pentacyanonitrosoniumferrate(I)
 - (iv) Tetracarbonylcobaltate (-1)
 - (v) Hexaamminecobalt(III) chloride (5,5,5)
3. (a) What are the differences between hemoglobin and myoglobin?

- (b) Explain what is meant by terms stepwise formation constant K_n and overall formation constant β_n of a coordination complex. How are these two constants related?
- (c) What are the limitations of valence bond theory? (5,5,5)
4. (a) (i) What is the chelate effect? Why does $[\text{Co}(\text{en})_3]^{3+}$ have a higher value of stability constant than $[\text{Co}(\text{NH}_3)_6]^{3+}$?
- (ii) Show how the d-orbital splitting changes as an octahedral complex undergoes tetragonal distortion and eventually becomes a square planar complex.
- (b) Give the mechanism of carbonic anhydrase enzyme where it converts CO_2 to HCO_3^- .
- (c) Write a short note on (any two) :
- (i) Trans effect
- (ii) Spectro-chemical series and its importance
- (iii) Co-operative effect in hemoglobin (5,5,5)
5. (a) Crystal field splitting energy for $[\text{Cr}(\text{NH}_3)_6]^{2+}$ is $10,200 \text{ cm}^{-1}$, while for $[\text{Cr}(\text{NH}_3)_4]^{2+}$ is $5,900 \text{ cm}^{-1}$. Give reasons.
- (b) Explain $[\text{NiCl}_4]^{2-}$ is tetrahedral and paramagnetic but $[\text{Ni}(\text{ON})_4]^{2-}$ ion is square planar and diamagnetic.
- (c) (i) What is central active metal ion in carboxypeptidase enzyme? What is its coordination number?
- (ii) Explain the function of carboxypeptidase enzyme. (5,5,5)

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6. (a) Discuss the mechanism of substitution reactions in square planar complexes.
- (b) State and explain the factors that affect the stability of complex ions.
- (c) Explain :
- (i) Structure and function of Myoglobin
 - (ii) Oxygen binding curve for myoglobin
- (5,5,5)

(2000)

(5)

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Your Roll No.....

Sr. No. of Question Paper : 7037

K

Unique Paper Code : 2162523502

Name of the Paper : Plant Physiology & Metabolism

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

Semester : V

Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

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

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7037

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

(i) NADPH

(ii) ETS

(iii) ROS

(iv) Pfr

(v) LHC

(vi) GOGAT

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

(i) Oxidoreductases

(ii) Solute potential

(iii) Apical dominance

(iv) Bioassay

(v) Aquaporins

(vi) Rubisco

(c) Give one word for each of the following (any five) : (1×5=5)

(i) The metabolic pathway converting glucose to pyruvate.

- (ii) The enzyme catalyzing biological nitrogen fixation.
- (iii) Plant hormone inducing stomatal closure during water stress.
- (iv) Process of chilling treatment for early flowering.
- (v) An antioxidant enzyme.
- (vi) An oxygen-scavenging protein present in the root nodule.

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

- (a) Photosystem I and II
- (b) Apoplast and Symplast
- (c) C₃ and C₄ cycle
- (d) Macro- and micro nutrients
- (e) SDP and LDP
- (f) Phloem loading and unloading

3. Write short notes on the following (any three) :
(5×3=15)
- (a) Cyanide-resistant respiration
 - (b) Induction of seed germination by gibberellin (molecular mechanism)
 - (c) Root pressure theory
 - (d) CAM-pathway
4. (a) Explain the general roles of essential elements. Describe the role of iron, molybdenum, manganese, and potassium. (3+4=7)
- (b) Define transpiration and describe its significance. Explain internal and external factors affecting transpiration. (1+3+4=8)
5. (a) Describe structure of enzyme. Explain the mechanism of enzyme action. (3+4=7)
- (b) Illustrate the basic structure of nitrate reductase (NR) and nitrite reductase (NiR), and explain their role in the assimilation of nitrate to ammonia. (4+4=8)

(6)
[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 8630

K

Unique Paper Code : 2173522013

Name of the Paper : DSE: Research Methodology
for Chemists

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

Semester : VII

Duration : 3 Hours

Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **six** questions. **All** questions carry equal marks.
3. Use of non-programmable calculator is allowed.

1. (a) What do you understand by research hypothesis?
Write the characteristics of a good hypothesis.

(b) Define primary sources, secondary sources, and tertiary sources of information with suitable examples from chemistry research.

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- (c) Define correlation and regression. What is the difference between them? (5,5,5)
2. (a) Write a short note on following (any two) :
- (i) Citation Tools
 - (ii) VIDWAN Portal
 - (iii) Null Hypothesis
- (b) Explain the concept of royalty and licensing in the context of intellectual property.
- (c) What is a bibliography? How does it differ from a reference list? (5,5,5)
3. (a) Briefly describe the different steps involved in a research process.
- (b) What is plagiarism? Distinguish between intentional and unintentional plagiarism with examples.
- (c) A Proposed method for the determination of chemical oxygen demand in wastewater is compared with standard method with the following results. For each method 8 measurements were made.

Proposed Method: Mean 70; Standard deviation

3.13

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Standard Method: Mean 70; Standard Deviation 1.43

Using F test, determine whether the two methods are equally precised or not. The critical value is $F_{7,7} = 3.787$ (P 0.05). (5,5,5)

4. (a) A well-defined research problem is the foundation of successful research.” Justify this statement and discuss how poor problem definition can lead to flawed research outcomes.
- (b) Write short notes on Research Gate and Google Scholar as author profiles and research networking platforms.
- (c) Define a research paper. What are the key sections of a full-length research article? (5,5,5)
5. (a) Discuss any two software applications commonly used in chemistry research.
- (b) What is ANNOVA? Why ANNOVA is preferred over t-test of significance.
- (c) The percentage of iron in a commercial sample is given by following data.

14.50; 14.80; 14.90; 15.30; 15.50; 15.80; 15.70.
Calculate standard deviation from the data.

6. (a) Distinguish between a review article and a research article. What is the purpose of each?
- (b) What is intellectual property (IP)? Distinguish between copyright and patent.
- (c) What is publication misconduct? Mention the steps to identify violation of publication ethics. (5,5,5)
7. Differentiate between any three of the following :
- (a) h-index and i 10-index.
- (b) Primary and Secondary Data.
- (c) Mendeley and Zotero.
- (d) t-test and F-test. (5,5,5)
8. (a) Explain any two journal metrics to assess the quality of a journal.
- (b) What are open access journals, and why is it important for researcher to be aware of publisher policy for open access?
- (c) How will you identify predatory journals while selecting the journal to publish your manuscript?

(5,5,5)

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Your Roll No.....

Sr. No. of Question Paper : 10529 **K**

Unique Paper Code : 2173522013

Name of the Paper : DSE: Research Methodology
for Chemists

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

Semester : VII

Duration : 3 Hours

Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any six questions.
3. All questions carry equal marks.
4. Use of non-programmable calculator is allowed.

1. (a) Briefly explain the steps involved in the chemistry research designing?

(b) How does a literature review help in designing an experiment?

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- (c) How does contemporary research in chemistry solve real-world problems? Explain with an example. (5,5,5)
2. Write a detailed note on any three of the following :
- (a) Web of science.
 - (b) Effective oral presentation of research paper.
 - (c) Scopus.
 - (d) Chi-square test of significance. (3×5=15)
3. (a) Write the names and standard abbreviations of any two journal published by ACS.
- (b) What are the key differences between full length research paper and short communication.
- (c) What factors should be considered when selecting a journal for the publication of your research? (5,5,5)
4. (a) What is TRIPS agreement? Explain the key features.
- (b) What are different types of plagiarism? Why is proper citation important in preventing plagiarism?
- (c) Write about any two forms of Intellectual properties. (5,5,5)

5. (a) What is falsification and fabrication of data?
- (b) Explain the main sections of a thesis and list commonly used software tools used for thesis writing.
- (c) Calculate the h-index and i10-index for a researcher with the following citation pattern for 9 papers: 30, 33, 6, 7, 11, 18, 20, 9. (5,5,5)
6. (a) Rewrite the following conclusions in appropriate scientific language: "This proves our theory is right." and "The results were bad."
- (b) Name any two reference management software and explain their features.
- (c) Write the full form of the following abbreviations
- (i) COPE (ii) ORCID
- (iii) UGC INFONET (iv) RSC
- (v) SPSS (5,5,5)
7. (a) Eight students performed a synthesis of a compound in a classroom and the percent yields observed by them are reported as follows: 53, 77, 44, 90, 48, 79, 88, 80. Find the mean and median yield.

(b) Find the standard deviation of the boiling point recorded for a liquid (in °C): 194, 198, 202, 206.

(c) What information do you need to perform a t-test on chemical measurement data? What does it mean if calculated t-value is less than the tabulated t-value? (5,5,5)

8. (a) Match the following :

- | | |
|--------------------|-----------------------------------|
| (i) Elsevier | (a) Document preparation software |
| (ii) Origin | (b) Publishing house |
| (iii) LaTeX | (c) Geographical indications |
| (iv) IPR | (d) Digital database |
| (v) Web of Science | (e) Data analysis tool |

(b) Write short note on the following :

- (i) Open-access journals
- (ii) E-consortium

(c) Discuss the various types of publication misconduct briefly. (5,5,5)

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