

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 3372 H

Unique Paper Code : 42164401

Name of the Paper : Plant Physiology and Metabolism

Name of the Course : B.Sc. (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. Attempt five questions in all including Question 1 which is compulsory.
3. All questions carry equal marks.
4. All parts of the question must be attempted together.
5. Illustrate your answers wherever possible.

1. (a) Write True or False against the following (any five) : (5×1=5)

(i) N, P, and K are micronutrients

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- (ii) Active site and Allosteric site are same
- (iii) RUBISCO is a dual enzyme
- (iv) RQ of protein is 1
- (v) Hydathode helps in transpiration
- (vi) Abscisic acid is a stress hormone

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

- (i) AcCoA
- (ii) DPD
- (iii) NR
- (iv) Pr
- (v) NADPH
- (vi) FMN

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

- | | |
|---|------------------------------|
| (i) Chlorophyll <i>a</i> | Passive process |
| (ii) Boussingault | Krebs cycle |
| (iii) Willy Kuhne | Phosphorous deficiency |
| (iv) Mitochondrial matrix | Non-polar molecule |
| (v) Transpiration pull | Enzyme |
| (vi) Dark green colouration of young leaves with purple vein on the underside of leaf | Biological nitrogen fixation |

2. Write short notes on the following (any three) :
(3×5=15)
- (i) Photosynthetic pigments
 - (ii) Enzymes classification
 - (iii) Ethylene as a hormone
 - (iv) Nitrogen deficiency in plants
3. Differentiate between the following (any three) :
(3×5=15)
- (i) Competitive and Non-competitive enzymes
 - (ii) Photoperiodism and Vernalization
 - (iii) Phosphorescence and Fluorescence
 - (iv) Diffusion and Facilitated diffusion
4. Comment upon the following (any three) (3×5=15)
- (i) Effect of red and far red lights on photomorphogenesis
 - (ii) Factors affecting the rate of transpiration
 - (iii) Lock and Key model of enzyme action
 - (iv) C₄ and CAM pathway

5. (a) Describe the mechanism of phloem loading and unloading in plants. (7)
- (b) Describe the discovery of auxins in detail. Enumerate its commercial applications. (8)
6. (a) Discuss evidences to show that Photosynthesis has two phases light and dark. (8)
- (b) Explain the mechanism of conversion of lipids into sugars during seed germination via glyoxylate pathway. (7)
7. (a) Discuss the mechanism of biological nitrogen fixation. What are the significances of the process for the plants. (8)
- (b) Give brief account on oxidative pentose phosphate pathway. (7)

3402

4/6/24
SET A

Unique Paper Code : 42167901
Name of the Paper : Economic Botany and Biotechnology
Name of the Course : Life Sciences
Semester : VI
Duration : 3 hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question.
2. Attempt Five questions in all including Question No. 1 which is compulsory.
3. All parts of a question must be answered together.
4. All questions carry equal marks.

Q. 1 (a) Give the scientific name, common name, economically important plant part used and family of the following (Any five) (5X1=5)

- i. Beverage
- ii. Pulse
- iii. Cereal
- iv. Oil yielding crop
- v. Fibre yielding crop
- vi. Spice

(b) Expand (Any five)

(5X1=5)

- I. RAPD
- II. BAC
- III. GUS
- IV. ddNTPs
- V. pUC18
- VI. PAGE

(c) Briefly explain the following (Any five)

(5X1=5)

- I. Totipotency
- II. Probe
- III. Plasmid
- IV. Geocarpic fruit
- V. Aleurone layer
- VI. Synthetic seeds

Q. 2. Write short notes on (Any three)

(5X3=15)

- I. PCR
- II. DNA fingerprinting
- III. Micropropagation
- IV. Evolution of bread wheat
- V. Vavilov's centre of origin of cultivated plants

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Q. 3 Differentiate between (Any three)

(5X3=15)

- I. Southern and Northern Blotting
- II. Genomic and cDNA library
- III. Green tea and Black tea
- IV. pUC18 and pBR322
- V. Primary and Secondary centres of origin

Q.4 (a) Draw the labelled diagrams

(3X3=9)

- I. T. S. of peppercorn
- II. L. S. of wheat caryopsis
- III. L. S. of clove bud

(b) Explain selectable markers? Write their significance in production of transgenic plants. 6

Q. 5 (a) With the help of illustrations, describe the structure of Ti Plasmid. Explain how *Agrobacterium* -mediated transformation is achieved using the binary vector or cointegrate vector approach. 9

(b) What are pulses? Enumerate the economic importance of pulses. 6

Q. 6 (a) Name the inventors of golden rice. Explain the technique of production of golden rice in detail. 9

(b) Give a detailed account of restriction endonucleases and their applications. 6

Q. 7. (a) Do you think fats are necessary in our diet? Enumerate economic importance of fats. Mention two plants from which oils are used as cooking oil. Why does overcooking renders the oil unfit for later use? 9

(b) Give a detailed account of processing of Cotton. 6

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[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 4006

H

Unique Paper Code : 2172521201

Name of the Paper : DSC: Chemical Bonding and
Elements in Biological
System

Name of the Course : B.Sc. Life Science with
Chemistry

Semester : II

Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

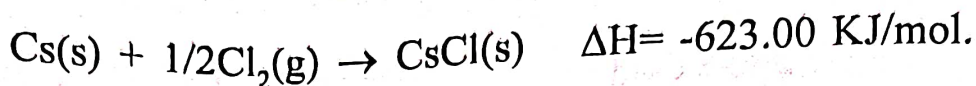
1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **four** questions.
3. **All** questions carry equal marks.

1. (a) Draw the Born Haber cycle and calculate the lattice energy of CsCl from the following data:



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

(i) Why Be_2 molecule does not exist?

(ii) Paramagnetic character in O_2 molecule.

(c) Write the toxic effects of Pb (II). Give the reasons for its toxicity. How can it be treated?

(5,5,5)

2. (a) Write down the main postulates of the Valence bond theory.

(b) (i) Explain, in spite of the same hybridization, H_2O is angular, whereas NH_3 is pyramidal.

(ii) Using the LCAO method, draw the shapes of molecular orbitals formed by the combination of p-p atomic orbitals, both axial as well as sideways.

- (c) How is the unequal concentration of Na^+ and K^+ ions in extracellular and intracellular fluid controlled in the human body? Give a diagrammatic representation of the process and explain the mechanism involved in it. (5,5,5)
3. (a) Draw the MO energy level diagram of CO. Calculate its bond angle and comment on its magnetic behaviour.
- (b) Define resonance and resonance energy. Draw the possible structure of CO_3^{2-} .
- (c) How is iron transported and stored in the human body? Where is it stored? (5,5,5)
4. (a) Arrange the following in the increasing order of their solubility in water and explain LiF, LiCl, LiBr, LiI.
- (b) Write the differences between :
- (i) Bonding orbitals and Anti bonding orbitals.
- (ii) Sigma bonding and pi bonding.
- (c) What do you understand by essential and toxic metal ions in the bio-system?
- Draw the Dose-response curve for essential elements and toxic metal ions in a human body. (5,5,5)

5. (a) Write down the Born Lande equation to calculate the lattice energy of an ionic crystal and explain various terms involved in the equation.
- (b) (i) Arrange the following molecules in the decreasing order of X-P-X bond angle
 PB_3 , PCl_3 , PI_3
- (ii) Why bond angle of CH_4 is higher than NH_3 ?
- (c) Describe the role of calcium in blood clotting?
(5,5,5)
6. (a) (i) $BaSO_4$ is ionic in nature but insoluble in water. Explain.
- (ii) The dipole moment of HI is 0.384D and the bond distance is 1.60Å. What will be the % of the ionic character in HI?
- (b) Give the hybridisation of the central atom and the shapes of the following molecules :
 SF_4 , PO_4^{3-} , XeO_2F_2
- (c) Describe the role of copper metal ion along with its impact in case of excess and deficiency of it in the human body?
(5,5,5)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 4019 H
Unique Paper Code : 2162521201
Name of the Paper : Genetics and Molecular Biology
Name of the Course : B. Sc. Life Sciences Botany-
DSC
Semester : II
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 **four** questions in all including Question No. 1 which is compulsory.
3. **All** parts of a question must be answered together.
4. **All** questions carry equal marks.

1. (a) Fill in the blank (Any five) : (5×1=5)

- (i) 2,4 dioxy-5-methyl pyrimidine is _____.
- (ii) When a second mutation restores the lost original phenotype, the process is known as _____.
- (iii) Tetraploid method for seedless watermelon production was invented by _____.
- (iv) _____ occurs in a genome when a one nucleotide is replaced by other.

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(v) _____ is the enzyme that relieves supercoiling in DNA.

(vi) Class of genetic elements that moves from one location to another within a genome are known as _____.

(vii) Linkage was discovered by _____.

(b) List the contribution of the following (any five):
(5×1=5)

(i) G. Beadle and E. Tatum

(ii) Barbara McClintock

(iii) J. D. Watson

(iv) T.H. Morgan

(v) Hugo de Vries, K. Correns, E. Tschermak

(vi) Karl Landsteiner

(c) Define (Any five):
(5×1=5)

(i) Okazaki fragments

(ii) Polygenic inheritance

(iii) Sex linkage

(iv) Haploids

(v) codominance

(vi) t RNA

(vii) lethal genes

2. Write short notes on (Any three): (5×3=15)
- Extrachromosomal inheritance
 - Central dogma
 - Translocation
 - Frameshift mutations
 - Multiple allelism
3. Differentiate between (Any three): (5×3=15)
- Translation in Prokaryotes and Eukaryotes
 - Incomplete dominance and codominance
 - Aneuploids and euploids
 - A-DNA form and B-DNA form
 - Transition and transversion
4. Explain with the help of diagrams (Any three): (5×3=15)
- DNA replication
 - Meselson and Stahl Experiment
 - Para and pericentric inversions
 - Transcription
 - Lactose operon
5. (a) Explain the salient features of genetic code. (5)
(b) What are mutagens? Explain how UV light functions as mutagens. (5)

(c) In rats black color (B) is dominant to brown (b), while full color (C) is dominant to chinchilla (c^{ch}). The genes controlling these traits are linked. Rats that are heterozygous for both traits and express black, full color were crossed with rats that express brown, chinchilla with the following results.

31 brown, chinchilla

34 black, full color

16 brown, full color

19 black, chinchilla

Determine the arrangement of alleles in the heterozygous parents and the map distance between the two genes. (5)

6. (a) Describe the cis-trans complementation test. (5)

(b) In a dihybrid cross in pea, two randomly selected plants with purple flowers were crossed and in the F_2 population, 105 purple, 40 red and 52 colorless flowers bearing plants were obtained. Use the given information to find out probable segregation ratio. Also, explain the genetic basis of segregation. Write down the genotypes and phenotypes of parents, F_1 and F_2 . (10)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 3369 H

Unique Paper Code : 42231202

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

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

Semester : II-LOCF

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. All the parts of a question must be attempted together.
4. Draw well labelled diagrams wherever required.

1. (a) Define the following: (5)

(i) Sebaceous gland

(ii) Holobranch

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(iii) Carnassial teeth

(iv) Zona pellucida

(v) Preformation

(b) Differentiate between the following: (12)

(i) Euryhaline and Stenohaline organism

(ii) Horns and Antlers

(iii) Larynx and Syrinx

(iv) Pseudobranch and Holobranch

(v) Epiboly and Emboly

(vi) Monospermy and Polyspermy

(c) Give location and function of the following: (3)

(i) Ceruminous gland

(ii) Iter

(iii) Macula lutea

(d) Write the contribution of the following: (3)

(i) Hans Spemann

(ii) J. F. Gudernastch

(iii) W. Vogt

(e) State whether the following statements are true or false: (4)

(i) Glenoid cavity of pectoral girdle articulates with the humerus.

(ii) The mesonephric duct persists in males forming the vas deferens.

(iii) Metamorphosis occurs in frog under the influence of growth hormone.

(iv) Malleus is the modification of quadrate bone.

SECTION-A

2. (a) Explain the structure of avian lung with help of suitable diagrams. Give the mechanism of respiration in birds. (8)

(b) Write a short note on the fate of first two visceral arches. (4)

3. Describe the succession of kidney in vertebrates with suitable diagrams. (12)

4. Write short notes on any three of the following:
(4×3=12)

- (a) Swim bladder
- (b) Dentition in mammals
- (c) Functions of integument
- (d) Evolution of heart in mammals

SECTION B

5. (a) Discuss the pattern of cleavage in different vertebrate organisms. (6)
- (b) Explain the process of cloning with the help of suitable example. (6)
6. Describe the formation and functions of different types of placentae in mammals. (12)

7. Write short notes on any three of the following:
(4×3=12)

- (a) Spermiogenesis
- (b) Fate of germ layers
- (c) Metamorphosis in frog
- (d) Embryonic induction

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[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 4028 H

Unique Paper Code : 2232521201

Name of the Paper : Cell and Developmental
Biology of Animals

Name of the Course : B.Sc. (P) Life Sciences, 2023

Semester : II

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 including question no. 1 which is compulsory.
3. Draw well labelled diagrams wherever required.
4. All parts of a question to be attempted together.

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

(i) Vitellogenesis

(ii) Polyspermy

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- (iii) Neurulation
- (iv) Amphimixis
- (v) Morphogenesis
- (vi) Grey Crescent

(b) Differentiate between the following (any four) :
(2×4=8)

- (i) Penetration and copulation path
- (ii) Epiboly and Emboly
- (iii) Epigenesis and Preformation
- (iv) Tight junctions and gap junctions
- (v) Karyokinesis and Cytokinesis

(c) Name the germ layers from which the following are derived :
($\frac{1}{2} \times 4 = 2$)

- (i) Liver
- (ii) Brain
- (iii) Ovary
- (iv) Lung

2. (a) Describe the development of frog from fertilized egg to gastrula formation. (8,7)
- (b) Describe various planes and patterns of cleavage in different animals.
3. (a) Describe the process of oogenesis in mammals. (8,7)
- (b) Give an account on stem cells.
4. (a) Describe the process of meiosis and its significance. (8,7)
- (b) Compare and contrast the prophase of mitosis and meiosis.
5. (a) Describe the cortical reaction. Discuss its role to block polyspermy. (8,7)
- (b) Discuss the role of various hormones that control Metamorphosis in frog.

6. Short note any three of the following : (5,5,5)

(a) Fate map

(b) Egg membranes

(c) Extra-embryonic membrane

(d) Von Baer Laws

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08/6/24 (M)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 3491 **H**
Unique Paper Code : 42234406
Name of the Paper : Genetics and Evolutionary
Biology
Name of the Course : **B.Sc. (P) Life Sciences**
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 **Section A & B** on separate answer sheets.
3. Question No. 1 of each section is compulsory.

SECTION A – GENETICS

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

1. (i) Define the following terms (**any five**) : (5)
 - (a) Lethal allele
 - (b) Base analog
 - (c) Intersex
 - (d) Holandric trait

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- (e) Recombination frequency
- (f) Pericentric inversion
- (ii) State an important contribution of the following scientists (**any three**): (3)
- (a) H. J. Muller
- (b) C. B. Bridges
- (c) G. Barski
- (d) A. Sturtevant
- (iii) Differentiate between the following (**any two**): (2×2)
- (a) Pleiotropy and Multiple alleles
- (b) Transition and Transversion
- (c) Cis-coupling and Trans-coupling phase
- (iv) How many different types of gametes will be formed by a parent having following genotypes: (2)
- (a) AaBbCcDdEe
- (b) AaBBCcDDEe
2. (a) Describe Mendelian traits with the help of suitable examples. How do they differ from polygenic traits. (7)

- (b) Illustrate the use of 'Three-Factor Crosses' in chromosome mapping. (5)
3. (a) What is the difference between aneuploidy and polyploidy? Discuss different types of polyploidy and their significance. (8)
- (b) Explain the mechanism of dosage compensation in mammals? (4)
4. Write short notes on following (**any three**) :
- (a) Genic balance theory
- (b) Spontaneous mutations
- (c) Somatic cell genetics
- (d) Epistasis (3×4)

SECTION B – EVOLUTIONARY BIOLOGY

Attempt **three** questions in all, including.

Question No. 1 which is compulsory.

1. (i) Define the following terms (**any five**) : (5)
- (a) Gene pool
- (b) Connecting link
- (c) Carbon dating
- (d) Mutation
- (e) Hybrid sterility

(f) Microevolution

(ii) Distinguish between **(any three)** : (3×2)

(a) Natural selection and Artificial selection

(b) Trace fossil and Index fossil

(c) Anagenesis and Cladogenesis

(d) Homologous organs and Analogous organs

(iii) State the contribution of the following scientists
(any two) : (2)

(a) Birbal Sahani

(b) Theodosius Dobzhansky

(c) August Weismann

2. What is speciation? Discuss the various mechanisms of speciation. (12)

3. State Hardy-Weinberg law. Explain the various factors causing the deviation of population from Hardy-Weinberg equilibrium. (12)

4. Write short notes on following **(any three)** : (3×4)

(a) Pre-mating isolating mechanisms

(b) Macroevolution

(c) K-T extinction

(d) Organic variation

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[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 3251 H

Unique Paper Code : 42163601

Name of the Paper : Intellectual Property Rights

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

Semester : VI

Duration : 2 Hours

Maximum Marks : 38

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.
4. Attempt **all** parts of a question together.

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1. (a) Match the following : (4×1=4)

- | | |
|----------------------|------------------------|
| (i) Books | Patent |
| (ii) Invention | Geographical Indicator |
| (iii) Makrana Marble | Industrial Designs |
| (iv) Car Design | Copyright |

(b) Expand the following (any 4) : (4×1=4)

- (i) CBD
- (ii) TKDL
- (iii) GI
- (iv) UPOV
- (v) USPTO

2. Differentiate between : (3×2.5=7.5)

- (a) Product and Process patent
- (b) Biopiracy and Bioprospecting
- (c) Wordmark and Service mark

3. Write short notes on (any 3) : (3×2.5=7.5)
- (a) Novelty and Inventiveness
- (b) Importance of IP protection
- (c) PPVFR Act
- (d) Significance of trademark registration
4. Define a database. List various types of biological databases. Discuss the objectives and provisions of database protection under IPR laws. (7.5)
5. What is the significance of traditional knowledge in the context of intellectual property rights in India and how is it protected under Indian law? (7.5)
6. (a) Define industrial design and discuss the need to protect it as an intellectual property. (5)
- (b) Discuss the procedure of design registration. (2.5)

7. (a) What is the difference between patent and copyright in India? Discuss with examples. (4)
- (b) Describe the role of the patent office in the registration of patents in India. (3.5)

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[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 4023 **H**

Unique Paper Code : 2232522401

Name of the Paper : Fundamentals of Human
Physiology

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

Semester : IV (DSC)

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 and **QUESTION NO. 1** is **COMPULSORY**.
3. Draw Well labelled diagram wherever necessary.

1. (a) Define following (Any three) : (3)

(i) Chyme

(ii) Sinoatrial (SA) node

(iii) Glomerular filtration rate (GFR)

(iv) Lung compliance

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(b) Differentiate between the following. (6)

- (i) Primary active transport and secondary active transport.
- (ii) Action potential and Graded potential.
- (iii) Spermiogenesis and spermatogenesis.

(c) Give the location and function of the following : (3)

- (i) Papillary muscles
- (ii) Chief cells
- (iii) Gonadotrophs

(d) State whether the statement is true or false. (3)

- (i) The oxytocin and antidiuretic hormone (ADH) are synthesized by posterior pituitary.
- (ii) Pepsinogen is converted to pepsin by the action of HCl secreted from parietal cells.
- (iii) A rightward shift in the O_2 -Hb saturation curve indicates decreased affinity of hemoglobin for oxygen, making it easier for oxygen to dissociate from hemoglobin.

2. (a) Explain chemical digestion and absorption of proteins with detailed account of enzymes involved. (8)
- (b) Draw ultrastructure of a sarcomere and briefly discuss three classes of proteins of a sarcomere. (7)
3. (a) Explain the O_2 -Hb dissociation curve? Describe various factors affecting this curve. (8)
- (b) Describe origin and conduction of action potential in myelinated and non-myelinated nerve fiber. Which of the conduction is more efficient and why? (7)
4. (a) Give a detailed account of the events occurring during menstrual cycle along with hormonal control. (10)
- (b) Describes events of a cardiac cycle in detail. (5)
5. (a) Explain the process of origin and conduction of cardiac impulse. (6)
- (b) Give a detailed account of the factors responsible in regulating of glomerular filtration rate (GFR). (9)

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

(a) Excitation-Contraction coupling

(b) Chloride shift

(c) Counter-current Mechanism

(d) Transport of Carbon dioxide

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Unique Paper Code: 42237904

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

Name of the Paper: Immunology (DSE)

Semester: VI

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. Draw well labelled diagram wherever necessary

1. (a) Define

(5)

- (i) Opsonization
- (ii) Prozone effect
- (iii) Haplotype
- (iv) Superantigens
- (v) Diapedesis

(b) Differentiate between the following:

(10)

- (i) Primary and Secondary Immune Response
- (ii) Apoptosis and Necrosis
- (iii) Humoral and Cell mediated Immunity
- (iv) Macrophage and Monocytes
- (v) Plasma and Memory cells

(c) Expand the following:

(3)

- (i) TNF
- (ii) HLA
- (iii) PRR
- (iv) CLIP
- (v) ADCC
- (vi) IEL

(d) Give the immunological significance:

(2)

- (i) IgM is the first antibody produced in primary immune response.
- (ii) Hapten is not able to induce an immune response.

(e) Give the contributions of the following scientists: (4)

- (i) M. Chase
- (ii) Eva Engvall and Peter Perlmann
- (iii) Gerald M. Edelman and Rodney R. Porter
- (iv) Edward Jenner

(f) Give the immunological significance: (3)

- (i) Adjuvant
- (ii) MALT
- (iii) Calnexin
- (iv) C5a
- (v) IL-2
- (vi) APCs

2. (a) What are the effector cells of anaphylaxis and their biological responses in immediate type hypersensitivity? (6)

(b) Define epitope. What are the properties of T cell and B cell epitopes? (6)

3. (a) Explain the difference between active and passive immunization. Write a note on DNA vaccine. (6)

(b) Discuss the basic properties and functions of cytokines. (6)

4. (a) Describe the initiation and activation of alternate complement pathway. (6)

(b) Describe how monoclonal antibodies are generated and selected using hybridoma technology. (6)

5. (a) What are lymphoid organs? Elucidate the structure and function of the thymus. (6)

(b) Differentiate between MHC molecules of Classes I and II. Discuss their specific functions. (6)

6. (a) Describe how endogenous antigens are processed and presented through a cytosolic pathway. (6)

(b) Define immunogenicity. Discuss the various factors that influence the degree of immunogenicity. (6)

7. Write short notes on (any three of the following): (3x4=12)

(a) Antigenic determinants on immunoglobulin(s)

(b) Hematopoiesis

(c) Inflammation

(d) Autoimmune disorders