

Seat Number

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BT - 301

Recombinant DNA Technology

P. Pages : 1

Time : Three Hours

Max. Marks : 80

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Graph or diagram should be drawn with the black ink pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.

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|-------------------------------------|--|-------------------------------------|-------------|-----------------------------|------------------|-----------------------------------|-------------------|------------------------------|-----------------------|---------------------|--|--|
| 1. | Attempt any eight . | 16 | | | | | | | | | | |
| | <table border="0"> <tr> <td>i) Ligases</td> <td>ii) Cosmids</td> </tr> <tr> <td>iii) Antisense RNA</td> <td>iv) Transduction</td> </tr> <tr> <td>v) HST</td> <td>vi) C-DNA Probes.</td> </tr> <tr> <td>vii) Expression in yeast</td> <td>viii) Tagged proteins</td> </tr> <tr> <td>ix) Connector</td> <td></td> </tr> </table> | i) Ligases | ii) Cosmids | iii) Antisense RNA | iv) Transduction | v) HST | vi) C-DNA Probes. | vii) Expression in yeast | viii) Tagged proteins | ix) Connector | | |
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| iii) Antisense RNA | iv) Transduction | | | | | | | | | | | |
| v) HST | vi) C-DNA Probes. | | | | | | | | | | | |
| vii) Expression in yeast | viii) Tagged proteins | | | | | | | | | | | |
| ix) Connector | | | | | | | | | | | | |
| 2. | Explain. | 16 | | | | | | | | | | |
| | <table border="0"> <tr> <td>a) Liposome mediated gene transfer.</td> <td></td> </tr> <tr> <td>b) S₁ Nuclease.</td> <td></td> </tr> <tr> <td colspan="2" style="text-align: center;">OR</td> </tr> <tr> <td>a) Calcium phosphate method.</td> <td></td> </tr> <tr> <td>b) Shuttle Vectors.</td> <td></td> </tr> </table> | a) Liposome mediated gene transfer. | | b) S ₁ Nuclease. | | OR | | a) Calcium phosphate method. | | b) Shuttle Vectors. | | |
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| b) S ₁ Nuclease. | | | | | | | | | | | | |
| OR | | | | | | | | | | | | |
| a) Calcium phosphate method. | | | | | | | | | | | | |
| b) Shuttle Vectors. | | | | | | | | | | | | |
| 3. | Attempt any two . | 16 | | | | | | | | | | |
| | <table border="0"> <tr> <td>a) Cells for cloning.</td> <td></td> </tr> <tr> <td>b) Nucleic acids probes.</td> <td></td> </tr> <tr> <td>c) Protein Engineering.</td> <td></td> </tr> </table> | a) Cells for cloning. | | b) Nucleic acids probes. | | c) Protein Engineering. | | | | | | |
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| 4. | Attempt any two . | 16 | | | | | | | | | | |
| | <table border="0"> <tr> <td>a) Sanger's method.</td> <td></td> </tr> <tr> <td>b) Hazards & Impact of GE.</td> <td></td> </tr> <tr> <td>c) Expression of gene in insects.</td> <td></td> </tr> </table> | a) Sanger's method. | | b) Hazards & Impact of GE. | | c) Expression of gene in insects. | | | | | | |
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| c) Expression of gene in insects. | | | | | | | | | | | | |
| 5. | Write short notes on any three . | 16 | | | | | | | | | | |
| | <table border="0"> <tr> <td>a) PUC18</td> <td>b) DEAE</td> </tr> <tr> <td>c) HAT</td> <td>d) Gene Bank.</td> </tr> <tr> <td>e) Adding tags and signals.</td> <td></td> </tr> </table> | a) PUC18 | b) DEAE | c) HAT | d) Gene Bank. | e) Adding tags and signals. | | | | | | |
| a) PUC18 | b) DEAE | | | | | | | | | | | |
| c) HAT | d) Gene Bank. | | | | | | | | | | | |
| e) Adding tags and signals. | | | | | | | | | | | | |

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BT - 401

Food and Pharmaceutical Biotechnology

P. Pages : 2

Time : Three Hours

Max. Marks : 80

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Graph or diagram should be drawn with the black ink pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory.
5. Figures to write indicates full marks.

1. Answer the following any eight.**16**

- i) Inulin.
- ii) Estrogen.
- iii) DE₅₀.
- iv) Probiotic.
- v) GM-CSF.
- vi) Progesterone.
- vii) Vector.
- viii) Hormone.
- ix) Toxicity.
- x) Endotoxin.

2. Attempt any two. 16
- Biotechnology of wine yeast.
 - Causes of food spoilage.
 - Food laws and standards related to Packaging.
3. Attempt any two. 16
- Good manufacturing practices.
 - Biopharmaceuticals of animal origin.
 - Recombinant thrombolytic agents.
4. Answer any two. 16
- Biotechnology of B-carotene.
 - Clinical trial design.
 - Growth hormone.
5. Write short note on any four. 16
- FDA.
 - Chlorella.
 - Pharmacokinetics.
 - Pyrogen detection.
 - Coagulation factor.
 - Food irradiation.

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BT - 201
Molecular Biology

P. Pages : 1

Time : Three Hours

Max. Marks : 80

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Graph or diagram should be drawn with the black ink pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions carry equal marks.
5. All questions are compulsory.

1. Attempt any eight. 16

| | |
|-------------------------|--------------------------|
| i) Chaperon | ii) Inducer |
| iii) CpG island | iv) Okazaki fragment |
| v) Poly A Tail | vi) Psion |
| vii) Open reading frame | viii) Nonsense Mutation. |
| ix) Termination codon | |

2. Explain the types and mechanism of DNA damage. 16

OR

Describe the post transcriptional modification.

3. Attempt any two. 16
 - a) Nucleotide and polynucleotide.
 - b) Replication of linear DNA.
 - c) Enzymes for DNA manipulation.

4. Attempt any two. 16
 - a) Aminoacyl tRNA synthetase.
 - b) Initiation factor and their regulation.
 - c) Lactose operon.

5. Write short notes on any four. 16

| | |
|-----------------------------------|-------------------------|
| a) Base excision repair. | b) DNA binding protein. |
| c) Chromatin. | d) RNA editing. |
| e) Gene expression in eukaryotes. | |

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नक्षत्र - 004



BT - 101

**Microbial Diversity and Physiology
(Old)**

P. Pages : 2

Time : Three Hours

Max. Marks : 80

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Graph or diagram should be drawn with the black ink pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions carry equal marks.
5. Draw a neat labelled diagram wherever necessary.

1. Answer in brief any eight.

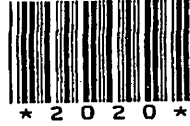
16

- a) Explain the role of photosynthetic pigments in bacteria.
- b) Write general character of algae.
- c) Explain function of mesosome in bacteria.
- d) What is Syntrophy.
- e) Describe role of nitrogen fixing bacteria.
- f) Define the term Rickettsia and Spirochetes.
- g) What is significance of FISH assay.
- h) Discuss briefly general characteristics of fungi.
- i) Give function of flagella and pili in bacteria.
- j) Explain how atmospheric microorganisms causes disease.

2. Answer the following **any two**. 16
- a) Describe the biosynthesis of bacterial cell wall and add note on significance of Gram character.
 - b) Explain various pure culture techniques in isolation of microorganisms.
 - c) How microorganisms are useful for production of primary and secondary metabolite in industry
3. Answer the following **any two**. 16
- a) Explain molecular analysis of bacterial community with suitable method.
 - b) Write a note on merits and demerits of culture dependent and culture independent method.
 - c) Explain briefly industrial application of microbes.
4. Answer the following **any two**. 16
- a) Discuss in brief use of microbes in production of Biogas and Biofertilizer.
 - b) Explain in detail pk pathway of microbes.
 - c) Write general character and classification of viruses.
5. Write short note on the following **any four**. 16
- a) Ribosomal RNA sequencing.
 - b) Hydrocarbon transformation.
 - c) Hyperthermophilic archaea.
 - d) Nutritional grouping of microorganisms.
 - e) Thermoplasma.
 - f) Microbes in terrestrial environment.

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BT - 302
Plant Biotechnology

P. Pages : 2

Time : Three Hours

Max. Marks : 80

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Graph or diagram should be drawn with the black ink pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions carry equal marks.
5. Draw neat and labelled diagrams wherever necessary.

1. Explain any eight.

16

- i) Somatic embryo.
- ii) Plant cell staining.
- iii) Somaclonal variation.
- iv) Antisense.
- v) Transplastomic plants.
- vi) Subprotoplasts.
- vii) Reporter markers.
- viii) Plantibodies.
- ix) Micro satellites.
- x) Vitrification.

2. Describe any two.

16

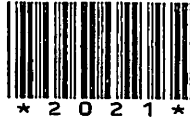
- i) Laboratory organization for plant tissue culture.
- ii) Virus detection and elimination methods.

- iii) Naploid production.
3. Explain any two. 16
- i) Transposon.
- ii) Somatic hybridisation.
- iii) Secondary metabolites.
4. Explain any two. 16
- i) Chloroplast genome organisation.
- ii) Protoplast fusion techniques.
- iii) Virus resistances transgenic plants.
5. Write short notes any four. 16
- i) Major applications of plant cell, tissue and organ culture.
- ii) Protoplast isolation.
- iii) Ti plasmid.
- iv) Cytoplasmic male sterility.

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नक्षत्र - 006



BT - 402
Bioinformatics

P. Pages : 2

Time : Three Hours

Max. Marks : 80

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Graph or diagram should be drawn with the black ink pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions carry equal marks.
5. Draw neat labelled diagrams wherever necessary.

1. Answer in brief the following **any eight**. **16**
 - a) What is multiple sequence alignment?
 - b) What is Scop and CATH.
 - c) Enlist biological databases?
 - d) What is data Visualization?
 - e) Describe in brief Clustal.
 - f) What is SRS?
 - g) Enlist the program names used for gene predictions.
 - h) Define : Identity.
 - i) What is data mining?
 - j) What is Bioperl and biojava.

2. Answer **any two** of the following. **16**
 - a) Explain PAM and BLOSSUM.
 - b) Write note on Protein Data Bank.
 - c) Explain mass spectrometry with respect to MALDI-TOF.

3. Answer any two of the following.

16

- a) Write a note on ExPasy.
- b) Explain methods of sequence alignment.
- c) Give details of Gen Bank.

4. Attempt any two of the following.

16

- a) Explain protein structure Prediction.
- b) Write in detail Swiss - PDB viewer.
- c) Explain structure based homology modelling.

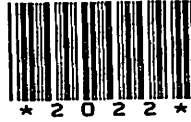
5. Write short note on any four.

16

- a) NCBI.
- b) Modeller.
- c) PIR.
- d) FASTA.
- e) DDBJ.
- f) Online free web resources of bioinformatics.

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BT - 202

Bioinstrumentation and Biostatistics

P. Pages : 2

Time : Three Hours

Max. Marks : 80

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Graph or diagram should be drawn with the black ink pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory.
5. All questions carry equal marks.
6. Draw neat and labelled diagram wherever necessary.

1. Define any eight.

16

- i) Wall effect.
- ii) Electrophoresis.
- iii) Mode
- iv) Standard deviation.
- v) Frequency
- vi) Phase shifting plate.
- vii) Radioactivity
- viii) Half life period.
- ix) Sedimentation coefficient
- x) Regression.

2. a) Calculate mean, median, mode of given data : 12

| | | | | | | | | | | |
|-----------|----|----|----|----|----|----|----|----|----|----|
| Variable | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 |
| Frequency | 15 | 20 | 25 | 27 | 30 | 20 | 15 | 21 | 10 | 11 |

OR

Data on Gram -ve bacteria is recorded in soil sample calculate standard deviation and coefficient of variation of the following data.

| | | | | | | |
|-------------------|----|----|----|----|----|----|
| Gram -ve bacteria | 7 | 8 | 9 | 10 | 11 | 12 |
| No. of bacteria | 13 | 13 | 18 | 17 | 15 | 14 |

- b) Explain in brief density gradient centrifugation. 4

OR

Applications of ORD and CD.

3. Describe in detail any two. 16

- i) Autoradiography and its applications.
- ii) Affinity chromatography.
- iii) Measures of central tendency.

4. Attempt any two. 16

- i) Give principle, working and applications of phase contrast microscope.
- ii) What is centrifugation, explain principle and types of centrifuge.
- iii) Applications of x-ray diffraction and NMR.

5. Write short note on any four. 16

- i) Test of significance and level of significance.
- ii) Chi square test.
- iii) Denaturing gel electrophoresis.
- iv) Solid scintillation counter.
- v) Principles of chromatography.

Seat Number

नक्षत्र - 008

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BT - 102

Biomolecules and Molecular Enzymology (Old)

P. Pages : 2

Time : Three Hours

Max. Marks : 80

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Graph or diagram should be drawn with the black ink pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory.
5. Draw neat and labelled diagram wherever necessary.

1. a) Answer the following any four.

8

- i) Km.
- ii) Cofactor.
- iii) Competitive inhibition.
- iv) Immobilisation.
- v) Linking number.
- vi) Isomers.

b) Explain any four.

8

- i) Coenzyme.
- ii) Enzyme activity.
- iii) Feedback inhibition.
- iv) Activation energy.
- v) Hypoglycemia.
- vi) Mutarotation.

2. Attempt any two. 16
- i) Classification of lipids.
 - ii) Secondary structure of proteins.
 - iii) Methods of Immobilisation.
3. Attempt any two. 16
- i) Ramachandran plot.
 - ii) Glycolysis.
 - iii) Industrial applications of Immobilised enzymes.
4. a) Explain in detail HMP shunt. 10
- b) TPP in carbohydrate metabolism. 6
5. Write short note on any four. 16
- i) Cori cycle.
 - ii) Ketone bodies.
 - iii) Cis-trans isomerism.
 - iv) Chargaff's rule.
 - v) Isoenzymes.
 - vi) Enzyme specificity.

Seat Number

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BT - 303

Advanced Environmental Biotechnology

P. Pages : 2

Time : Three Hours

Max. Marks : 80

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Graph or diagram should be drawn with the black ink pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory and carry equal marks.
5. Number to right indicate full marks.
6. Draw neat labelled diagram wherever necessary.

1. Define / Explain any eight.

16

- a) Biopesticide.
- b) Bioaccumulation.
- c) Metagen sensor.
- d) Detoxification.
- e) Bioavailability.
- f) Threshold dose.
- g) Biodiversity index.
- h) Biosafety.
- i) Biofuel.

2. Answer any two.

16

- a) Vermiculture and it's application in biotechnology.
- b) Write in detail activated sludge process for waste water management.

c) Comment on evaluation of bioremediation.

3. Answer any two.

16

a) Causes of biodiversity losses.

b) Define solid waste, enlist types & sources of solid waste.

c) Discuss environmental persistence & bioaccumulation.

4. Answer any two.

16

a) Test for mutagenic & teratogenic agents.

b) Write in detail strategy for removal of SO₂.

c) Applications of biosensor in environmental monitoring.

5. Write short notes on any four.

16

a) Extinct and endangered species.

b) Forensic toxicology.

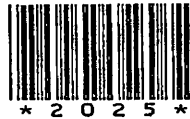
c) Glucose biosensor.

d) Energy from biomass.

e) Anaerobic digestion.

Seat Number

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BT - 403

Industrial and Business Biotechnology

P. Pages : 2

Time : Three Hours

Max. Marks : 80

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Graph or diagram should be drawn with the black ink pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory.
5. Figures to right indicate full marks.

1. Define / explain **any eight** of following. 16
 - i) Organic solvents.
 - ii) Management.
 - iii) Filtration.
 - iv) Dextran.
 - v) VitB₁₂.
 - vi) Importance of PHB.
 - vii) Antibiotics.
 - viii) Fermentation.
 - ix) Give example of lactic acid producing organism.

2. Write short notes on **any four** of following. 16
 - i) Intellectual property rights.
 - ii) Penicillin acylase.

- iii) Importance of entrepreneurship & self employment in India.
- iv) General recovery method for vitamins.
- v) Fermentation parameters for Riboflavin production.
3. Describe method of fermentative production & recovery of following **any two**. **16**
- a) Acetone & Butanol.
- b) Erythromycin.
- c) Dextran & Alginate.
4. Write in detail **any two** of following. **16**
- i) Production & applications of celluloses.
- ii) Transformation of prostaglandins.
- iii) Production & recovery of acetic acid.
5. a) Write general features of microbial polysaccharides & give suitable examples. **8**

OR

Write microorganisms involved, production & recovery of Glycerol.

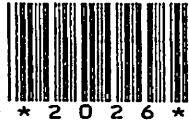
- b) Write production & applications of Glucose isomerase. **8**

OR

Write production process, recovery and applications of Tetracycline

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BT - 203

Bioprocess Engineering and Technology

P. Pages : 2

Time : Three Hours

Max. Marks : 80

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Graph or diagram should be drawn with the black ink pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory.
5. All questions carry equal marks.
6. Draw a neat labelled diagram wherever necessary.

1. Answer briefly any eight.**16**

- a) Define Bioreactor.
- b) Give the significance of Del factor.
- c) Write note on centrifugation.
- d) How protoplast fusion takes place in cell.
- e) Write note on feedback inhibition.
- f) Explain in brief cascade system.
- g) Draw a neat labelled sketch of Impeller.
- h) Write a note on two phase aqueous extraction.
- i) Write significance of dilution rate in continuous culture.
- j) Discuss briefly process of primary screening.

2. Answer the following. 12
- a) Design a method of sterilization kinetics.
- OR
- a) How mutagenesis can lead to development of culture over producing primary metabolite.
- b) Write significance of KLa. 4
- OR
- b) Write significance of filtration.
3. Answer the following any two. 16
- a) Write a note on classification of fluid.
- b) Describe kinetics of microbial growth and death.
- c) Explain process of continuous sterilization.
4. Answer the following any two. 16
- a) Describe the process for preservation of culture.
- b) Write a note on cyclone reactor.
- c) Explain safety consideration in down stream processing.
5. Write note on following any four. 16
- a) Air sterilization.
- b) Genetic engineering for strain improvement.
- c) Cell disruption by chemical method.
- d) Concept of "Reynolds number".
- e) Secondary screening.

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BT - 103

Immunology (Old)

P. Pages : 2

Time : Three Hours

Max. Marks : 80

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Graph or diagram should be drawn with the black ink pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Draw neat labelled diagrams wherever necessary.
5. All questions are compulsory.
6. All questions carry equal marks.

1. Explain the following briefly any eight.

16

- i) CD₈⁺ Cell.
- ii) MHC molecules.
- iii) Antigenicity & immunogenicity.
- iv) Lymphocyte homing.
- v) IgE.
- vi) FACS.
- vii) Agglutination.
- viii) APc.
- ix) B cell.
- x) Vaccine.

2. Explain the following any two.

16

- a) Explain exogenous & endogenous antigen presentation.
- b) Explain classification of hypersensitivity reactions.
- c) Explain RIA & its applications.

3. Explain the following **any two**. 16
- a) Explain structure & function of MHC I & II molecules.
 - b) Explain productions of recombinant vaccine with suitable example.
 - c) Explain activation of T & B cells.
4. Explain **any two** of the following. 16
- a) Primary & secondary immunodeficiency.
 - b) Explain classical pathway of complement activation.
 - c) Explain properties of cytokines.
5. Write notes on **any four**. 16
- a) IgG.
 - b) Factors affecting antigenicity.
 - c) Inflammation.
 - d) Immunoelectrophoresis.
 - e) Mechanism of autoimmunity.

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BT - 101

Microbial Diversity and Physiology (243111)

P. Pages : 2

Time : Three Hours

Max. Marks : 60

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Graph or diagram should be drawn with the black ink pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory.
5. Figures to right indicate full marks.
6. Draw the neat labelled diagrams wherever necessary.

1. Attempt any six of the following. 12

| | |
|--------------------|--------------------|
| i) Green bacteria | ii) Methanogenesis |
| iii) Complex media | iv) Archaea |
| v) Pure culture | vi) Biogas |
| vii) Respiration | viii) FISH assay |

2. Answer any two of the following. 12
 - i) Explain chemical factors affecting microbial growth.
 - ii) Explain role of microorganisms in bioremediation.
 - iii) Explain biogeochemical cycling.

3. Answer any two of the following. 12
 - i) Explain various mechanisms of nutrients transport in microorganisms.
 - ii) What is amphibolic pathway ? Explain with one example.
 - iii) Explain bacterial cell wall synthesis in detail

4. Explain any two. 12
- i) Evolutionary chronometers & their significance.
 - ii) Explain ribotyping as a approach for bacterial classification.
 - iii) Study of microbial diversity using culture dependent methods.
5. Write notes on any four. 12
- i) Denaturing Gradient Gel electrophoresis (DGGE)
 - ii) Growth curve.
 - iii) Pure culture technique.
 - iv) Staining techniques.
 - v) Biofertilizers.
 - vi) Anaplerotic reaction.

Seat Number

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BT - 102

Biomolecules and Molecular Enzymology (243112)

P. Pages : 2

Time : Three Hours

Max. Marks : 60

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Graph or diagram should be drawn with the black ink pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory.
5. Figures to right indicates full marks.
6. Draw neat labelled diagrams whenever necessary.

1. Attempt any six. 12

- i) Coenzyme A
- ii) Nucleotides.
- iii) Peptide bond
- iv) Active site
- v) Activation energy
- vi) Kcat
- vii) Hill plot equation
- viii) Specificity constant.

2. Answer any two of the following. 12

- i) Explain non-competitive mode of enzyme inhibition.
- ii) Classification of lipids.
- iii) Significance of LB plot.

3. Attempt any two. 12
- i) Glycogen metabolism.
 - ii) Hydrolysis of proteins.
 - iii) Effect of substrate concentration of initial velocity.
4. Attempt any two. 12
- i) Explain sequential mode of allosteric enzyme.
 - ii) Describe Brigg's Haldane hypothesis.
 - iii) Biosynthesis of triglycerides.
5. Write note on any four of the following. 12
- i) Regulation of lipid metabolism.
 - ii) Structure elucidation of proteins.
 - iii) Carbohydrates.
 - iv) Nicotinamide.
 - v) Uncompetitive inhibition.
 - vi) Applications of enzyme in industries.

Seat Number

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BT - 103

Immunology (243113)

P. Pages : 2

Time : Three Hours

Max. Marks : 60

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Graph or diagram should be drawn with the black ink pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory.
5. Figures to right indicate full marks.
6. Draw the neat labelled diagrams wherever necessary.

1. Attempt any six.

12

- i) B cell.
- ii) TCR.
- iii) Complement components.
- iv) IgA
- v) Autoimmunity.
- vi) Agglutination
- vii) Subunit vaccine
- viii) Innate immunity.

2. Answer any two of the following.

12

- i) Explain structure & function of spleen.
- ii) Explain antigen-antibody interactions.
- iii) Explain activation of T_H cell.

3. Attempt any two. 12
- i) Explain type II hypersensitivity reaction in detail.
 - ii) Explain primary immunodeficiency.
 - iii) Define inflammation explain causes of inflammation.
4. Attempt any two of the following. 12
- i) Explain differences between precipitation & agglutination reactions.
 - ii) Explain ELISA test & its applications.
 - iii) Explain recombinant vaccine with suitable example.
5. Write notes on any four of the followings. 12
- i) Adapter immune response.
 - ii) MHC I & II molecules.
 - iii) Immune - complex hypersensitivity.
 - iv) FACS.
 - v) Passive immunization.
 - vi) Autoimmunity mechanisms.
