

(12)

[This question paper contains 6 printed pages.]

Your Roll No. 2022

Sr. No. of Question Paper : 1104

A

Unique Paper Code : 32491601

Name of the Paper : Genetic Engineering and
Biotechnology

Name of the Course : B.Sc. (H) Biochemistry

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.
3. Question 1 is compulsory.
4. All questions carry equal marks.



1. (a) Explain the following :

(i) Type II restriction endonucleases are more popularly used as molecular scissors as compared to Type I and Type III restriction endonucleases.

P.T.O.

- (ii) M13 phage is useful for DNA sequencing work.
- (iii) Three bands are seen upon running plasmid DNA on agarose gel electrophoresis.
- (iv) Ti plasmid is 'disarmed' before its used to make transgenic plants.
- (v) YACs and BACs are preferred over plasmids as vectors during genomic library production.
- (vi) Hybrid promoters are used in the expression vectors.

(b) Explain the use of the following enzymes in gene cloning (**any two**) :

- (i) Alkaline phosphatase
- (ii) Terminal Transferase
- (iii) Reverse transcriptase (12,3)

2. (a) Differentiate between the following (**any three**) :

- (i) Colony and Plaque
- (ii) PCR and Real Time PCR

(iii) Lambda insertion and lambda replacement vectors

(iv) Cosmids and plasmids\

(b) A purified piece of DNA is cut with PstI and BamHI separately and then with both enzymes together. The following table depicts the result of agarose gel electrophoresis. Construct a restriction map of the DNA

Enzyme	DNA fragment sizes (bp)		
	PstI	300	500
BamHI	100	600	950
PstI & BamHI	100	250	300, 400, 600

(9,6)

3. (a) Give the steps in making of a cDNA library.

(b) A young researcher was trying to amplify a gene responsible for cystic fibrosis in his lab using PCR. However, upon running the PCR reaction on an agarose gel, no bands were seen indicating no amplification had taken place. Explain the possible reason behind the failure of DNA amplification.



P.T.O.

(c) Write the characteristic features of Ti plasmid. Illustrate your answer with help of a diagram.

(5,5,5)

4. (a) As a protein engineer, you are trying to express a mammalian protein in bacterial cells. What are the potential challenges that you may face in trying to express the protein?

(b) Describe the features of three main types of yeast vectors?

OR

What are phagemids? What are their advantages?

(c) Differentiate between southern blotting and northern blotting. (5,5,5)

5. (a) Give the characteristics of a good expression vector. Draw a suitable diagram to support your answer. Also give an example of an expression vector.

(b) Explain the principle of Sanger's method of DNA sequencing. What are the problems associated with it and how can they be overcome? Draw the slab

gel profile of the DNA fragment whose sequence by Sanger's dideoxy method has been found to be
5' TAC TGG TAT GTC CAG TCA GGC 3'

(5,10)

6. (a) Between pBR322 and pUC8 plasmid, which is a preferred vector for the purpose of gene cloning? Justify your answer.

OR

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What are shuttle vectors and how are they useful in gene cloning?

- (b) What is the use of linkers in gene cloning? What is the disadvantage and how can it be overcome?
- (c) Describe the principle and significance of T7 promoter based expression systems. (5,5,5)
7. (a) Describe any one technique used for detection of the translation product of a cloned gene.
- (b) What is the principle behind production of *Bt* crops? What are the problems associated with them?

P.T.O.

- (c) Describe the technique of nested PCR using appropriate diagram. (5,6,4)
8. (a) Explain the use of any **one** of the following for protein purification :
- (i) Poly-histidine tag
 - (ii) GST tag
- (b) Explain the oligonucleotide mediated method of site-directed mutagenesis.
- (c) Write a short note on recombinant pharmaceuticals. (5,5,5)



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Your Roll No. 2022

Sr. No. of Question Paper : 1161

A

Unique Paper Code : 32497904

Name of the Paper : Molecular Basis of Infectious Diseases

Name of the Course : B.Sc. (H) Biochemistry (LOCF)

Semester : VI

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates **Deshbandhu College Library**
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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 questions carry equal marks.

1. (a) Briefly describe the following (any 5) :

(i) Fungal dimorphism

(ii) Vehicle and horizontal transmission

P.T.O.

- (iii) Herd immunity
- (iv) Sporozoites and Trophozoites
- (v) Antibody enhancement effect
- (vi) Toxoid

(b) What is the Baltimorean classification of viruses?
Describe with examples. (10,5)

2. Explain the following (any 5) :

- (i) Mechanism utilized by bacteria to evade host immune response
- (ii) Source, Reservoir and Vector
- (iii) Emerging and Re-emerging diseases
- (iv) PCR based diagnosis
- (v) Antimicrobial resistance
- (vi) Biosafety levels
- (vii) Secondary, Opportunistic and Nosocomial infections (15)

3. Differentiate between (any 5) :

- (i) Cholera and Tetanus Toxin
- (ii) Mortality and Morbidity
- (iii) Sabin and Salk Vaccine
- (iv) Hemagglutinin and Neuraminidase
- (v) Active and Latent TB infection
- (vi) Amastigote and Promastigote
- (vii) Endotoxin and Exotoxin (15)

4. Explain the method of diagnosis of following infections (any 5) :

- (i) Diphtheria
- (ii) Typhoid
- (iii) Malaria
- (iv) HIV
- (v) Herpes
- (vi) Tuberculosis
- (vii) Bacterial Pneumonia (15)



5. (a) Describe the mechanism of action of following drugs (any 5) :

- (i) Penicillin
- (ii) Tetracycline
- (iii) Nystatin
- (iv) Amantadine
- (v) Metronidazole
- (vi) Fluoroquinolones
- (vii) Isoniazid

(b) Explain the principal of the IGRA assay and give its advantages over traditional TST. (10,5)

6. (a) Describe the type of vaccine used in the prevention of following diseases (any 5) :

- (i) Tuberculosis
- (ii) Hepatitis B
- (iii) Tetanus
- (iv) Pertussis



- (v) Influenza
- (vi) Pneumonia
- (vii) Malaria

(b) What are the different stages of Rabies?

(c) What is the causative organism of amoebiasis?
Write the symptoms and treatment.

(10,2.5,2.5)

7. Draw and explain the life cycle of the following pathogens (any 3) :

- (i) HIV
- (ii) Plasmodium
- (iii) Influenza
- (iv) Hepatitis B
- (v) Leishmania

(15)

8. Write short notes on the following (any 5) :

- (i) Koch's Postulates
- (ii) Aspergillosis

- (iii) African sleeping sickness
- (iv) HAART
- (v) Acid Fast Staining
- (vi) Whooping Cough
- (vii) Anthrax

(15)

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Your Roll No. 2022

Sr. No. of Question Paper : 1249

A

Unique Paper Code : 32497907

Name of the Paper : Plant Biochemistry

Name of the Course : B.Sc. (H) Biochemistry

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. Question Number 1 is compulsory.

1. (a) Define any six of following :

- (i) Cytokinin
- (ii) Enhancement effect
- (iii) VLFR



P.T.O.

(iv) Proplastid

(v) Accessory pigments

(vi) Cryptochrome

(vii) Abscisic acid

(viii) Phytoalexins

(1.5×6)

(b) Discuss the contribution of the following scientists:

(any four)

(i) Robert Hill

(ii) Guha and Maheshwari

(iii) Hatch and Slack

(iv) Murashige and Skoog

(v) Sterling Hendricks and Harry Borthwick

(1.5×4)

2. Give a diagrammatic/schematic representation of the following :

(a) Electron transport in photosynthesis involving PSI and PSII

(b) Three phases of Calvin cycle

(c) Photorespiratory pathway

(5,5,5)

3. Differentiate between the following :

(a) Form I and Form II of Rubisco

(b) Primary and secondary cell wall

(c) Nitrate and Nitrite reductase

(d) NADP-ME and NAD-ME pathway

(e) Direct and indirect Somatic embryogenesis

(3×5)

4. Explain briefly the following statements:

(a) Plants have alternative NAD(P)H oxidative pathways.

(b) The temperature affects the quantum yield of photosynthesis in C₃ plants.

(c) C4 pathway enzymes are light regulated.

(d) CAM plants show slow rate of mass production.

(4,3,4,4)

5. (a) Give the structure and mechanism of nitrogenase enzyme.

(b) Write a short note on the process of nodule formation.

(c) What are different types of seed proteins, compare cereal and legume seed proteins. (5,5,5)

6. Write short note on the following :

(a) Somaclonal variation

(b) Protoplast culture

(c) Role of tannins in plants

(d) Organogenesis

(e) Flavonoids

(3×5)

7. Give the role of any five of the following :

(a) Jasmonic acid in plant defence

(b) ABA in water stress

(c) Auxin in phototropism

(d) Phytochromes in red light response

(e) Nif genes in nitrogen fixation

(f) Gibberellin in seed germination

(g) Lignin in cell wall

(3×5)

8. (a) Enumerate the anthropogenic and biotic threats to plants.

(b) State different strategies of stress avoidance by plants.

(c) Give at least five applications of micro-propagation.

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(d) What are osmolytes? Give their role in salt stress. (5,3,5,2)

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Your Roll No. 2022

Sr. No. of Question Paper : 1349

A

Unique Paper Code : 32491602

Name of the Paper : Immunology

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

Semester : VI, CBCS

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. All questions carry equal marks.
3. Q. No. 1 is compulsory.

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1. (a) Indicate whether True or False. Defend your choice. (Any five)

(i) Neutrophils are the first line of defense in viral infections.

(ii) ABO blood transfusions are clinical manifestations of Type III hypersensitivity.

P.T.O.

- (iii) IgM antibody is a high affinity antibody.
- (iv) An antigen can act as a tolerogen as well as immunogen.
- (v) B cell receptor gene arrangement does not take place in T cells.
- (vi) $\gamma\delta$ T cells are MHC restricted.
- (vii) Eosinophilia is seen in allergic reactions.
- (viii) All antibodies secreted by a single plasma cell have the same idiotype and isotype.

(2×5=10)

(b) Give one word for the following :

- (i) Macrophages found in liver
- (ii) Antibody binding site on Antigen
- (iii) Effector cells secreting antibodies
- (iv) First antibody secreted against the antigen during the immune response.
- (v) Site of proliferation of B cells in secondary follicles

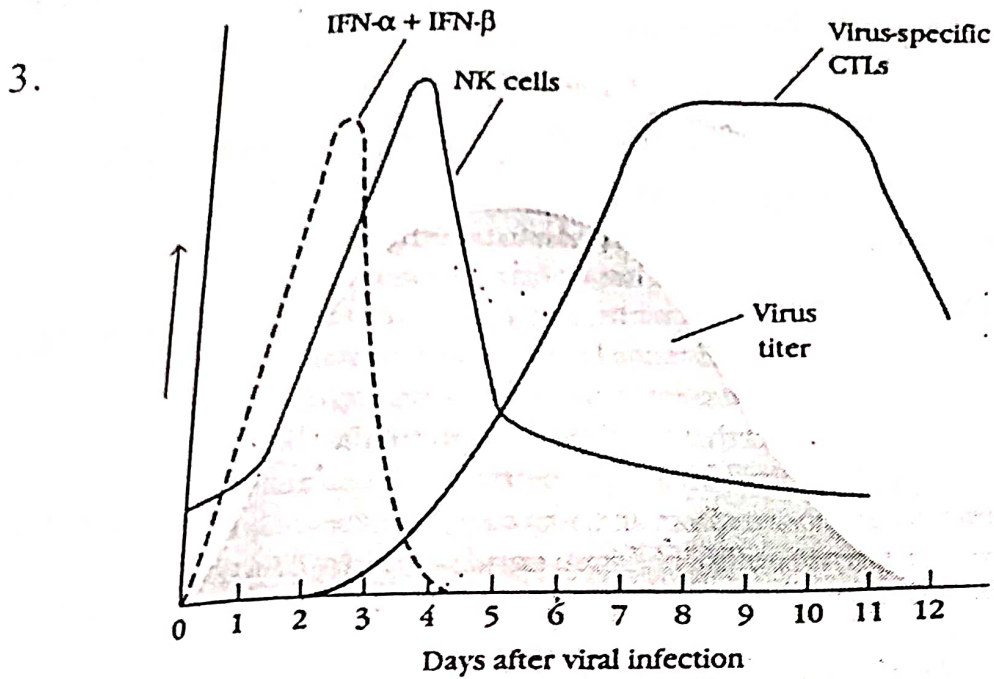
- (vi) Non phagocyte granulocyte releasing pharmacologically active substances
- (vii) Cell exhibiting constitutive expression of B7 molecule.
- (viii) Name the scientist who discovered the anaphylactic response.
- (ix) Lymphoid organ responsible for filtering antigen.
- (x) Fraction of serum that contains antibodies.
(0.5×10=5)

2. Diagrammatically explain the following : (Any five)

- (a) Mast cell degranulation
- (b) Antibody Dependent Cell Cytotoxicity
- (c) Ig A
- (d) Th and B cell conjugate interaction
- (e) Neutrophil extravasation
- (f) Activated Macrophage
- (g) Structure of lymph node

(5×3=15)

P.T.O.

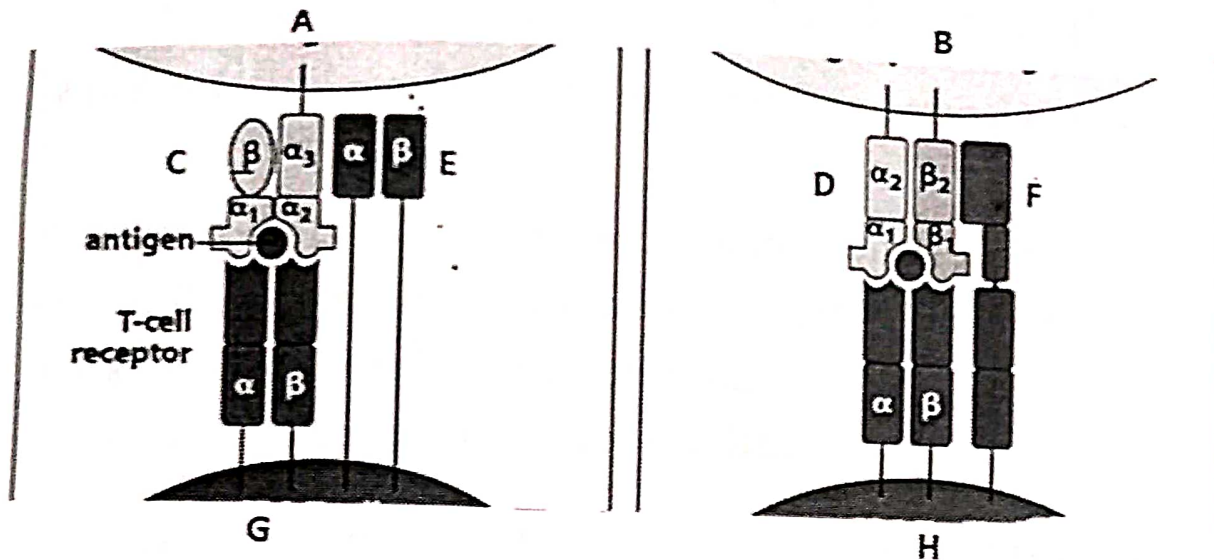


(a) With the help of graph, explain how viral infections are handled by the immune system.

(b) What is positive and negative selection in thymic education? Explain.

(c) Discuss the properties of antigens that contribute to immunogenicity. (3×5=15)

4. The figure below represents the interaction of an immune cell with a target cell. Identify cells A, B, G and H. Identify with justification molecules C, D, E and F. Differentiate between Molecule C and D. Explain process of an endogenous and exogenous antigen processing and presentation. (2,4,3,6)



5. Explain the following : (Any three)

(i) Clinical manifestations of graft rejection

(ii) Hybridoma Technology

(iii) B cell maturation in bone marrow

(iv) Merits and demerits of DNA Vaccines

(v) Gell and Coomb's classification (3×5=15)

6. Differentiate between : (Any 5)

(i) Active and Passive Immunization.

(ii) B1 and B2 cells

(iii) Idiotype and allotype

(iv) B cell and T cell epitope

(v) Naïve and effector B cell

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(vi) Th1 and Th2

(vii) Central and peripheral tolerance.

(5×3=15)

7. (a) One of the remarkable features of the vertebrate immune system is its ability to respond to a limitless array of foreign antigens. Explain how such tremendous antibody diversity is generated.

(b) IgM functions more effectively than IgG in complement reactions, true or false? Justify your answer.

(c) Expand and briefly explain the following terms :

(i) PRR

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(ii) AID

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(iii) MAC

(6,3,6)

8. Write short notes : (Any 5)

(i) Effector functions of Antibodies

(ii) SLE

(iii) Sequestered Antigens

(iv) Superantigens

(v) Primary and Secondary response

(vi) Phagocytosis

(vii) Innate immunity

(5×3=15)

(200)