(5)

[This question paper contains 6 printed pages.]

Your Roll No.....

2019

Sr. No. of Question Paper : 2183 **IC**

Unique Paper Code : 32491601

Name of the Paper : Genetic Engineering and Biotechnology

Name of the Course : **B.Sc. (Hons.) / 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 No. **1** is compulsory.

1. (a) State true or false and explain.

(i) Plasmid pUC 8 is preferred over pBR322 for cloning of DNA.

(ii) Lambda replacement vectors are used to make genomic DNA libraries.

P.T.O.

(iii) The enzyme sequenase is a genetically modified version of T4 DNA polymerase.

(iv) If a given DNA fragment is cut with a four – base cutter restriction enzyme, it will always yield fragments that are 256 bp long.

(v) Disarmed vectors donot possess any virulence genes.

(vi) IPTG is the gratuitous inducer of lac operon. (1.5×6=9)

(b) Explain the following briefly :

(i) Shuttle vectors

(ii) Star activity

(iii) Direct selection

(iv) Helper phage

(v) Adapters (2×5=10)

2. (a) What are fusion tags? Explain with the help of examples and emphasize on their usefulness.

(b) Compare the mega-primer and overlap extension methods of site directed mutagenesis.

(c) Discuss a physical method of DNA transformation. (5,6,3)

3. (a) Draw the slab gel profile of the DNA fragment whose sequence by the Sanger's dideoxy method has been found to be 5'- ATG CAG TTA AGT TCC TCC GAG-3'. Also draw the slab gel profile of its complementary strand.

(b) What are the transient and permanent protection groups in the phosphoramidite method of DNA synthesis? What are the differences between the chemical and enzymatic methods of DNA synthesis?

(c) Describe the salient features of the Ti Plasmid. (5,5,4)

4. (a) The following gel profile is obtained on digesting a linear DNA fragment with two restriction enzymes:

EcoRV	4, 12, 34
Hind III	7,15,28
EcoRV + Hind III	4, 5, 7, 11, 23 (all fragment sizes are in kilobases)

Draw the restriction map of the given linear DNA.

(b) Who invented the technique of PCR? Explain technique.

(c) What are factors that are kept in mind while designing the primers for PCR? (5,5,4)

5. Write short notes on the following :

(i) Protein engineering

(ii) Plaque hybridization

(iii) cDNA library (5,4,5)

6. (a) What are probes? Discuss any two methods of DNA probe preparation.

(b) What is pyrosequencing?

(c) What is sequence independent library screening? Explain in detail. (5,3,6)

7. (a) What are pET vectors? Why are they successful in ensuring tight regulation of expression from a gene of interest?

(b) Which enzymes are preferred for each of these and why :

(i) Labeling of 5' end of DNA.

(ii) Joining blunt ended molecules

(iii) Adding homopolymer tails to DNA ends

(iv) Protecting the sequence 5'-GATC-3' in any DNA fragment from getting cleaved by restriction enzyme. (6,8)

8. (a) What are GM crops? Give two examples of different types of GM crops that are already

available around the world, with the details of recombinant DNA technology which were used to create them.

(b) What do you understand by *in-vitro* packaging of DNA? Explain. (8,6)

(6)

[This question paper contains 6 printed pages.]

Your Roll No.....

2019

Sr. No. of Question Paper : 2184 **IC**

Unique Paper Code : 32491602

Name of the Paper : Immunology

Name of the Course : **B.Sc. (Hons.) 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, including Question No. **1** which is compulsory.

1. (a) Write true or false for the following statements, (correct the false statement).

(i) The heavy chain variable region is twice as long as the light chain variable region.

(ii) Antigen presenting cells express both class I and class II MHC molecules on their membrane.

P.T.O.

(iii) A single molecule of membrane bound IgM can activate the C1q component of the classical complement pathway.

(iv) Antihistamines are effective for the treatment of delayed type hypersensitivity reactions.

(v) Mast cells possess surface receptors for IgD antibodies.

(vi) Carbohydrate antigens generally do not take help from T cells.

(vii) Cytotoxic Tcells are identified by monoclonal antibodies against CD 4

(viii) Infection has no influence on the rate of hematopoiesis.

(ix) A large protein antigen can combine with many different antibody molecules. (9)

(b) Explain the following statements briefly :

(i) Antibodies can act as antigens.

(ii) Human skin is resistant to colonization by *Escherichia coli.*

(iii) Patients suffering from DiGeorge's syndrome suffer from recurrent infections.

(iv) B cells exhibit allelic exclusion.

(v) Hyper acute rejection reactions occur within 24 hours after transplant. (10)

2. (a) What are the hallmark characteristics of localized inflammatory response? How do these characteristics contribute to the mounting of an effective immune response?

(b) Draw a schematic diagram of IgG immunoglobulin and indicate the function of each domain. How would you modify the diagram of IgG to depict an IgA molecule isolated from saliva?

(c) Explain isotype, allotype and idiotype? (5,6,3)

3. (a) The mucous membrane lining the digestive and respiratory systems are the major sites of entry for most pathogens. How are these surfaces defended from attack by pathogens?

(b) For each pair of antigens listed below, indicate which is likely to be more immunogenic when injected in rabbit? Explain your answer.

(i) Native BSA and denatured BSA

(ii) Hen egg white lysozyme and hen collagen

(iii) A protein with molecular weight of 30,000 and a protein with molecular weight of 150,000

(iv) Homopolymers and heteropolymers

(c) Highlight the role of TAP, Calnexnin, invariant chain and HLA-DM in antigen processing. (4,4,6)

4. (a) Explain why a V_H segment cannot join directly with a J_H segment in a heavy chain gene rearrangement?

(b) What is the importance of somatic hypermutation and the enzyme terminal deoxy transferase in generation of antibody diversity?

(c) The microenvironment provided by the bone marrow stromal cells is essential for the differentiation of Pro B cells into a mature B cell. Why? (4,5,5)

5. (a) Discuss the sequence of events that are responsible for destruction of target cells by T cytotoxic cells.

(b) What are the advantages and disadvantages of using attenuated organisms as vaccines?

(c) Diagrammatically show the structure of BCR coreceptor complex. (7,4,3)

6. (a) Explain the Classical pathway of complement activation. How is it different from Lectin Pathway?

(b) State the biological role of DAF, HRF, Factor H and C4BP.

(c) Differentiate between class I and class IIMHC. (6,4,4)

7. (a) Explain the cause of following clinical conditions :

(i) A person developed redness on skin with pustules and severe inflammation after coming in contact with Poison oak.

(ii) A patient developed severe anaemia symptoms after having Penicillin to cure a microbial infection. The anaemia symptoms disappeared with discontinuation of Penicillin.

(b) Describe at least three different mechanisms by which a localized viral infection might contribute to the development of an organ specific autoimmune disease.

(c) Explain how NK cells lacking TCR recognize infected cells? (4,6,4)

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

(a) Thymic education

(b) DNA vaccines

(c) SLE

(d) Adjuvants

(e) TLR (3.5×4=14)

This question paper contains 4 printed pages] (7)

Roll No. | | | | | | | | | | | |

2019

S. No. of Question Paper : **2626**

Unique Paper Code : **32497906** **IC**

Name of the Paper : **Advanced Cell Biology**

Name of the Course : **B.Sc. (Hons.) Biochemistry : DSE-3**

Semester : **VI**

Duration : **3 Hours** Maximum Marks : **75**

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

Attempt *five* questions in all including Q. No. **1** which is compulsory.

1 (*a*) Fill in the blanks :

(*i*) ..... coated vesicles transport proteins from Golgi apparatus to lysosomes.

(*ii*) The transmembrane proteins namely ..... mediate cell-matrix contact in focal adhesions.

(*iii*) ..... microscopy cannot be used for live cell imaging.

(*iv*) The presence of KDEL sequence directs the localization of polypeptide in .....

(*v*) The anticancer drug called ..... inhibits cell division via stabilization of microtubules. 1×5=5

P.T.O.

(*b*) Give reasons for (any *seven*) :

(*i*) Skeletal muscles show striated appearance.

(*ii*) Ran GTP concentration is higher in nucleus than in cytoplasm.

(*iii*) The synthesis of phospholipids takes place on the cytosolic side of the SER membrane.

(*iv*) Gap junctions play a role in intercellular communication in animal cells.

(*v*) Oocytes can remain arrested at diplotene stage for long periods of time.

(*vi*) Cancer patients undergoing chemotherapy often need bone marrow transplantation.

(*vii*) The presequences of mitochondrial proteins are positively charged whereas the transit peptides of chloroplast proteins are not. 2×7=14

2 (*a*) Give subcellular location and function of the following :

(*i*) Emerin

(*ii*) Protein Disulfide Isomerase

(*iii*) Axonemal Dynein

(*iv*) TOC complex

(*v*) Catalase. 2×5=10

(*b*) Describe *four* major differences between transformed cells and normal cells. 4

3 (*a*) Explain how a polypeptide synthesized in cytosol moves to mitochondrial matrix. 4

(*b*) A mature human gamete has C amount of DNA. How much DNA does a somatic cell have :

(*i*) In G_1 phase

(*ii*) In G_2 phase

(*iii*) At the end of mitosis. 1×3=3

(*c*) Explain how does one develop primary and secondary cell cultures using intact tissues. What is the purpose of addition of serum in culture growth medium ? 4

(*d*) Explain how tight junctions help in maintaining cell polarity. 3

4 (*a*) Explain biochemical basis of lysosomal storage diseases. Discuss *two* examples. 4

(*b*) Explain the significance of the following :

(*i*) Flippase

(*ii*) Centrosome

(*iii*) Dolichol

(*iv*) Caspases

(*v*) MPF. 2×5=10

5. Differentiate between :

(*a*) SEM and TEM.

(*b*) Differential centrifugation and Density gradient centrifugation.

(*c*) Hemidesmosomes and Desmosomes

(*d*) Actin Bundles and Actin Networks

(*e*) COPI and COPII coated vesicles. 3,3,3,3,2

6. (*a*) Discuss the contribution of the following scientists :

(*i*) Günter Blobel

(*ii*) Robert Horvitz

(*iii*) Alan Smith. 3×1=3

(*b*) Explain actin binding proteins. List *four* examples with their specific functions. 5

(*c*) Discuss the organization and functions of golgi apparatus. Give a list of final destinations of the proteins leaving golgi apparatus. 6

7. Write short notes on :

(*i*) Cell cycle checkpoints.

(*ii*) Induced pluripotent stem cells.

(*iii*) Endosymbiotic theory of origin of organelles.

(*iv*) Laser scanning confocal microscope.

(*v*) Cadherins. 3,3,3,3,2

8. (*a*) Compare and contrast structure, assembly, organization and function of microtubules and intermediate filaments. 5

(*b*) Discuss the metabolic significance of peroxisomes. What is Zellweger syndrome ? 3

(*c*) Explain the principle of phase contrast microscopy. Discuss *one* limitation of this technique. 4

(*d*) Explain briefly the application of the following :

(*i*) FRET

(*ii*) Herceptin. 2×1=2

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This question paper contains 4 printed pages] (8)

Roll No. | | | | | | | | | | |

2019

S. No. of Question Paper : **2759**

Unique Paper Code : **32497904** **IC**

Name of the Paper : **Molecular Basis of Infectious Diseases**

Name of the Course : **B.Sc. (Hons.) Biochemistry : DSE-4**

Semester : **VI**

Duration : **3 Hours** Maximum Marks : **75**

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

Attempt *five* questions in all including;

Question No. **1** which is compulsory.

1. (A) Name the pathogen, symptom and treatment of the following diseases :

(*a*) Cholera

(*b*) Ringworm

(*c*) Giardiasis

(*d*) Chickungunya. 3×4=12

(B) Give the full form of the following :

(*a*) BCG

(*b*) DPT

(*c*) XDR

P.T.O.

(*d*) INF

(*e*) STR

(*f*) HBsA

(*g*) HCC. 7×1=7

2. Comment on the following :

(*a*) The virulence of *C. diphtheriae* is dependent on its potent exotoxin.

(*b*) Anti-Tubercular therapy of Rifampicin, Isoniazid and Ethambutol is carried out for at least 9 months.

(*c*) Many DNA viruses can cause cancer.

(*d*) HAV shows hepatotropism.

(*e*) Thrush is a common symptom of Candidiasis.

(*f*) Patients suffering from Malaria show recurring cycles of chills, fever and sweats.

(*g*) Kaposi sarcoma and opportunistic pneumonia are seen in patients with AIDS. 2×7=14

3. Explain the mechanism behind the following. :

(*a*) Muscular spasms in patients suffering from tetanus infection.

(*b*) Seizures, hallucination, muscular spasms and excessive salivation in rabies patients.

(*c*) After an episode of dengue infection, subsequent infection with other dengue serotypes increases the severity of dengue haemorrhagic fever.

(*d*) Femoral edema in patients of filariasis. 3.5×4=14

4. Differentiate between :

(*a*) Vector and reservoir Host

(*b*) Primary and Secondary Viremia

(*c*) Antigenic shift and Antigenic drift

(*d*) Chagas disease and African sleeping sickness

(*e*) Hepatitis A and C virus. 2.5,2.5,3,3,3

5. Schematically outline the steps in the following conditions :

(*a*) Pathogenesis of Polio virus

(*b*) Life cycle of E. Histolytica

(*c*) Action of Pertussis toxin

(*d*) Endotoxic shock. 3.5×4=14

6. Explain the following terms with an example :

2×7=14

(*a*) Granuloma

(*b*) Dimorphic Fungi

(*c*) Bacteriostatic drug

P.T.O.

(*d*) Nucleotide analog

(*e*) Facultative parasite

(*f*) Intermediary host

(*g*) Latent virus.

7. Explain the mechanism of action of the following drugs : $2 \times 7 = 14$

(*a*) Sulphonamide

(*b*) Artemisin

(*c*) Tetracyclin

(*d*) Metronidazole

(*e*) Amphotericin B

(*f*) Ramatadine

(*g*) Tamiflu.

8. Write short notes on the following : $3.5 \times 4 = 14$

(*a*) Pathogenesis of Influenza

(*b*) Leshmaniasis

(*c*) Antiretroviral therapy

(*d*) Diagnosis and treatment of Tuberculosis.

Sl no 9 R/P : 3555A SET:A (9) 2019

Unique paper code: 107693
Name of the paper: Genetics and Genomics II, GGHT 602
Name of the course: B.Sc. (H) Zoology, Botany, Anthropology, Microbiology, Biochemistry, Biomedical Sciences I~~H~~
Semester: VI
Duration: 3 hours
Maximum Marks: 75

I

Instructions for Candidates

1. Write your Roll no. on the top immediately on receipt for this question paper.
2. Answer five questions in all.
3. Question 1 is compulsory.

Q.1 a) Define any **five** of the following terms: (5x1=5)

i. Allele
ii. Sexduction
iii. Conjugation
iv. Indel
v. Hybrid dysgenesis
vi. Retro-transposons
vii. Inbreeding depression

b) Differentiate between any **five** the following pairs: (5x2=10)

i. Simple and Composite transposon
ii. Sequence Identity and Sequence Similarity
iii. Transformation and Transduction
iv. Genomics and Proteomics
v. Prokaryotic and Eukaryotic genome
vi. Sympatric and Allopatric Speciation
vii. Episomes and Plasmids

c) State the contributions of: (any **two**) (2x1=2)

i. Barbara McClintock
ii. E Wollman and F Jacob
iii. J Lederberg and N Zinder

d) Expand any **four** of the following- (4x1=4)

i. LINEs

ii. VNTR

iii. ORF

iv. DTRs

v. NCBI

e) Enumerate the features that allow the following organisms to serve as model systems in biology (any **two**) (2x2=4)

i. *Sachharomyces cerevisiae,*
ii. *Arabidopsis thaliana*
iii. *Drosophila melanogaster*

f) Cystic fibrosis is an autosomal recessive disorder with an incidence 4 in 10,000 in people of northern European ancestry. Calculate all the genotypic frequencies assuming that this population is under Hardy-Weinberg equilibrium. (2)

Q.2 Explain generalized and specialized transduction (include suitable diagrams). (12)

Q.3a) State the principle of Hardy-Weinberg Equilibrium. What are the basic assumptions of this theorem? (2+4=6)
b) Explain the role of Zygotic genes during development of *Drosophila.* (6)

Q 4 a) Give an account of Ac-Ds system in maize. (6)
b) How is Interrupted mating technique employed for gene mapping in bacteria? (6)

Q 5 a) Define bioinformatics.Briefly describe various types of databases. (8)
b)What are the key characteristics for identifying ORF from a given sequence? (4)

Q.6 Discuss the reproductive isolative mechanisms and their role in speciation. (12)

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

a) Microarray
b) Genetic Drift
c) Gene annotation
d) Class ABC genes of *Arabidopsis*
e) Homeotic genes

SET B (10)

Sl. No. 07 9P 4009 2019

Unique Paper code	:	2491601
Name of the Paper	:	DC 1.14 / Concepts of Genetics
Name of the Course	:	B.Sc. (Hons) / Biochemistry
Semester	:	~~Semester~~ VI
Duration	:	3 Hours
Maximum Marks	:	75

Instructions for Candidates

Attempt five questions in all. Question No. 1 is compulsory.

Use of scientific calculator / log tables may be allowed.

1(A) Fill in the blanks:

a) The number of barr bodies in a patient with Klinefelter's syndrome is _____.
b) H antigen is absent in _____ phenotype.
c) Bacterial strain with F plasmid integrated within its genome is termed as _____.
d) A chromosome inversion that includes the centromere in the inverted region is a _____inversion.
e) _____ is the phenomenon whereby a cross of red flowered snap dragon with white flowered snap dragon produces only pink flowered offspring.
f) A chemical agent used to arrest mitotically dividing cells in metaphase is _____.
g) Cytological condition in which chromosomes fail to separate at the time of cell division is _____.
h) Normally haploid bacterial strains having two alleles of a gene are termed as _____.

(1 x 8 = 8)

(B) Match the following:

a)	T.H. Morgan	i)	Chromosomal theory of inheritance
b)	Sutton and Boveri	ii)	Induced mutations
c)	Boris Ephrussi	iii)	Sex linked inheritance
d)	H J Muller	iv)	Blood group antigens
e)	Karl Landsteiner	v)	Mitochondrial inheritance

(1 x 5 = 5)

(C) Define the following (*any three*):

a) Heterosis
b) Hemizygous
c) Monosomy
d) Frameshift mutation

(2 x 3 = 6)

2(A) Differentiate between:

(a) Penetrance and Expressivity
(b) Sex linked inheritance and Sex influenced inheritance
(c) Autopolyploidy and Allopolyploidy
(e) Allopatric and Sympatric speciation

(3 x 4 = 12)

(B) A man and woman are heterozygous for a gene and if they have four children, what is the chance that all four will also be heterozygous?

(2)

3(A) Explain the basis of construction of a genetic map. What are its limitations? (3)

(B) Explain epistasis giving two suitable examples. (4)

(C) Define transduction. Explain how specialized transduction differs from generalized transduction. (4)

(D) How does a complementation test enable a geneticist to determine whether two mutations affecting a given function are allelic or non-allelic? (3)

4(A) Give two examples of extensions of Mendelian inheritance and explain the basis of the observed ratio. (5)

(B) Explain the inheritance of leaf colouration in *Mirabilis jalapa* (4'O clock) plant. (5)

(C) Explain briefly:

a) Consanguinity
b) Heterosis

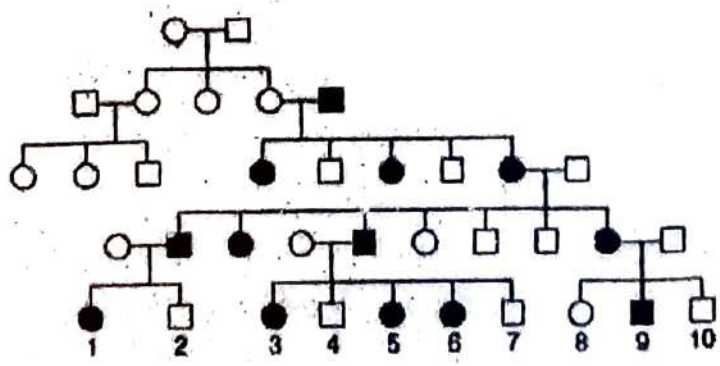
(2 x 2 = 4)

5(A) What are homeotic genes? Explain using Drosophila as an example. (3)

(B) Explain the basis of non-disjunction as a proof for chromosomal theory of inheritance. (5)

(C) Explain the basis of sex determination in *Drosophila*. How does it differ from humans? (6)

6.(A) Propose the most likely mode of inheritance for the following pedigree. Justify your choice.



(4)

(B) State Hardy Weinberg law. What are the assumptions underlying Hardy Weinberg equilibrium.

(5)

(C) Explain somatic cell hybridisation and state its applications.

(5)

7.(A) In *D. melanogaster*, cherub wings (*ch*), black body (*b*), and cinnabar eyes (*cn*) result from recessive alleles that are all located on chromosome 2. A homozygous wild-type fly was mated with a cherub, black, and cinnabar fly, and the resulting F1 females were test-crossed with cherub, black, and cinnabar males. The following progeny were produced from the test-cross:

ch b^+ cn	105
ch^+ b^+ cn^+	750
ch^+ b cn	40
ch^+ b^+ cn	4
ch b cn	753
ch b^+ cn^+	41
ch^+ b cn^+	102
ch b cn^+	5

(a) Determine the order of these genes.
(b) Construct the genetic map.

(2,3)

(B) Discuss the role of segmentation genes in *Drosophila* development giving examples for each class.

(6)

(C) Explain the basis of quantitative traits giving suitable example.

(3)

8. Write short notes on (*any four*):

a) Genomic Imprinting
b) X chromosome inactivation
c) *Saccharomyces cerevisae* as a model organism
d) Lethal Alleles
e) Familial Down's Syndrome

(3.5 x 4 = 14)

SET B (11)

Sl. No. 09 9 P 4010

2019

Unique paper code	:	2491602
Name of paper	:	Immunology
Name of the course	:	B.Sc. (Hons.) Biochemistry
Semester	:	VI
Duration	:	3 hours
Maximum Marks	:	75

Instructions for candidates

Write your roll no. on top immediately on receipt of this question paper.
Attempt five questions in all.
Question No.1 is compulsory.

1(a) State whether the following statements are true or false and justify your choice:

(i) Innate immunity is deployed during the primary response and adaptive immunity during a secondary response.
(ii) All immunoglobulins on the surface of a given B cell have same idiotype.
(iii) Isografts are grafts transplanted between two identical species.
(iv) T cell epitopes tend to be accessible amino acid residues that can combine with T cell receptor.
(v) Synthesis of antibody in a primary response to thymus-dependent antigens occurs predominantly in the blood.
(vi) Eosinophil play a role in late- phase response in asthma.
(vii) C4 deficient individuals have difficulty in eliminating immune complexes.
(viii) T_{H1} cells have been associated with development of autoimmunity.
(ix) Corneal grafts are not rejected because they have no lymphatic drainage

(1x9=9)

(b) Give one significant contribution of each of the following Scientists:

(i). Jules Bordet
(ii). W. Dreyer & J. Bennett
(iii). Rodney R. Porter & Gerald M. Edelmann
(iv). Ishizaka

(c) Answer briefly the following:

(i) Cytochrome c is a poor immunogen.
(ii) MHC class I molecules are associated with β_2 microglobulin on the cell surface.
(iii) IgA class of antibody has a secretory component.
(iv) Serum IgM can't activate complement.

(6)

2(a) What two primary features distinguish hematopoietic stem cells from mature blood cells?

(2)

(b) Define antigen and immunogen. What properties a molecule should have to act as an immunogen?

(4)

(c) **Define the terms pleiotropy, synergy, redundancy and antagonism with reference to cytokine action.**

(4)

(d) **Describe the difference between early and late phase of asthma.**

(4)

3(a) List the five classes of antibodies and give key biological properties of each.

(8)

(b) **Briefly discuss immunoglobin allotypic, isotypic and idiotypic determinants. Give example of each.**

(6)

4(a) Describe the steps for immunoglobulin heavy chain class switching from IgM to IgG. Are these events antigen dependent? (6)

(b) How cytotoxic T cells mediate killing of virus infected cell? (8)

5(a) Describe any two mechanisms that generate three hypervariable regions of immunoglobulin heavy and light chain. (6)

(b) Summarize four major functions of complement system. (8)

6(a) How endogenous antigens are processed in MHC class I pathway? (6)

(b) What are the different therapeutic strategies used for the treatment of autoimmune diseases? (8)

7. Write short notes on (*any four*)

(a) Hematopoeitic stem cell transplantation (HCT)
(b) Secondary lymphoid organ
(c) Mixed lymphocyte reaction (MLR)
(d) Antibody dependent cell mediated cell cytotoxicity
(e) Vaccines

(3.5x 4=14)

8. Differentiate between (*any four*)

(i) **MHC class I and MHC class II**
(ii) **Positive and Negative thymic selection**
(iii) **NKT cells and Treg cells**
(iv) **Monoclonal and polyclonal antibodies**
(v) Myasthenia Gravis and Multiple sclerosis
(vi) Hyperacute Rejection and acute rejection

(3.5x 4 = 14)