Sl. No of Question Paper : 1647 (12)

Unique Paper Code : 2491601

Name of the Paper : Add *

Name of the Course: : Add #

Semester : VI

11/5/17

Semester : Semester VI

Name of the Paper : * DC 1.14 / Concepts of Genetics

Unique Paper code : 2491601

~~Medium of setting the Question paper: English~~

Time : 3 Hours

Maximum Marks : 75

Specific instructions : *Attempt five questions in all. Question No. 1 is compulsory.*

Use of scientific calculator / log tables may be allowed.

2017

Concepts in genetics

1. (A) Give a term that best describes the following:

(a) A gene that has multiple phenotypic effects.

(b) Donor bacteria with high frequency of recombination.

(c) Heterozygote at an advantage over both homozygotes.

(d) Non-coding RNA involved in dosage compensation in mammals.

(e) Region of homology between X & Y chromosomes.

(f) Substance that controls developmental events in a concentration dependent manner

(1 x 6 = 6)

(B) Give reasons for the following:

(a) *Neurospora crassa* is extensively used for centromere mapping.

(b) Human having XXXY genotype is a male.

(c) LHON is maternally transmitted.

(d) Founder effect can result in genetic drift.

(e) The phenotypic variation in complex traits often follows normal-distribution.

(2 x 5 = 10)

(C) Give contribution of the following scientists:

(a) Alfred Sturtevant

(b) Mary Lyon

(c) Lederberg and Zinder

(1 x 3=3)

2. (A) Give reasons for Mendel's success in genetic crosses with pea plant.

(3)

(B) A boy with Klinefelter's syndrome is born to a phenotypically normal female parent and the male parent suffering from an X-linked skin disease called dysplasia. Explain the occurrence of patches of normal and abnormal skin on the body of the son.

(3)

(C) 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)

(D) Discuss the applications of the following in genetics:

(a) Genetic markers

(b) Molecular clocks

(c) Heteroplasmic cells

(d) Test cross

(1.5 x 4 = 6)

3. Differentiate between:

(a) Specialized and Generalized transduction.

(b) Maternal effect and Maternal Inheritance.

(c) Dominance and Epistasis

(d) Sex linked inheritance and sex influenced inheritance

(e) Allopatric and Sympatric speciation

(3, 3, 3, 2.5, 2.5)

4. (a) The genetic map distance measured over a long interval of chromosome is generally underestimated. Explain why? How can this problem be solved?

(4)

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

(6)

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

(4)

5. (a) Differentiate between paracentric and pericentric inversion.

(3)

(b) Explain the mechanisms underlying gene duplication? Discuss the implication of gene duplication in evolution.

(3)

(c) A strain of yeast requiring both tyrosine (*tyr*–) and arginine (*arg*–) is crossed to the wild-type. After meiosis, the following ten asci are dissected. Classify each ascus as to segregational type (PD, NPD, TT).

00

1	$arg^- tyr^-$	$arg^+ tyr^+$	$arg^+ tyr^+$	$arg^- tyr^-$
2	$arg^+ tyr^+$	$arg^+ tyr^+$	$arg^- tyr^-$	$arg^- tyr^-$
3	$arg^- tyr^+$	$arg^- tyr^+$	$arg^+ tyr^-$	$arg^+ tyr^-$
4	$arg^- tyr^-$	$arg^- tyr^-$	$arg^+ tyr^+$	$arg^+ tyr^+$
5	$arg^- tyr^-$	$arg^- tyr^+$	$arg^+ tyr^-$	$arg^+ tyr^+$
6	$arg^+ tyr^+$	$arg^+ tyr^+$	$arg^- tyr^-$	$arg^- tyr^-$
7	$arg^- tyr^-$	$arg^+ tyr^+$	$arg^- tyr^+$	$arg^+ tyr^-$
8	$arg^+ tyr^+$	$arg^+ tyr^+$	$arg^- tyr^-$	$arg^- tyr^-$
9	$arg^+ tyr^+$	$arg^- tyr^-$	$arg^- tyr^-$	$arg^+ tyr^+$
10	$arg^- tyr^-$	$arg^+ tyr^+$	$arg^+ tyr^+$	$arg^- tyr^-$

(2)

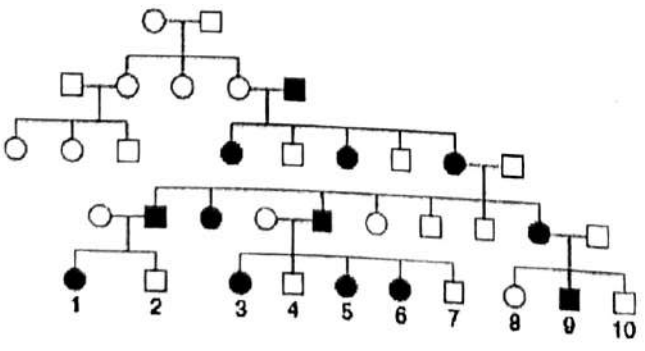
(d) Explain the basis of sex determination in *Drosophila*. How does it differ from humans?

(6)

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

(5)

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



(3)

(c) State Hardy Weinberg law. What are the assumptions on which it is based?

(3)

(d) Explain somatic cell hybridisation and state its application.

(3)

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 testcross:

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) Construct the genetic map of these three genes.

(b) Determine the coefficient of coincidence and interference.

(5, 2)

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

(C) What is phenocopy? Explain giving suitable example.

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

(a) Familial Down's Syndrome

(b) Genomic imprinting

(c) Complementation test

(d) *Arabidopsis* as a model organism

(e) Lethal Genes

(B) Discuss the role of segmentation genes in *Drosophila* development [illegible] each class

(c) What is phenocopy? Explain giving suitable example.

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

(a) Familial Down's Syndrome

(b) Genomic Imprinting

(c) Complementation test

(d) *Arabidopsis* as a model organism

(e) Lethal Genes

~~SET A~~ Sl-No. of Q.P.: 1648 (13) 22/5/17

Unique Paper Code : 2491602

Name of the paper : Immunology

Name of the course : ~~Biochemistry~~ B.Sc. (Hons.) Biochemistry

Semester : ~~II, 2016~~ 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 5 questions in all.
3. Question No. 1 is compulsory.

1. (A) Indicate whether each of the following statements are true or false with justificaftion.

i) Babies can acquire IgE mediated allergies by passive transfer of maternal antibodies.
ii) The alternate pathway of complement is activated by properdin.
iii) Type III hypersensitivity reactions develop when antigen activates sensitized T DTH cell.
iv) Both CTLs and NK cells release perforins after interacting with target cells.
v) Contact sensitivity is a skin reaction mediated by IgA antibody.
vi) Allograft is a tissue transferred between genetically identical individuals.
vii) Attenuated vaccines are more likely to induce humoral immune response than killed vaccines.
viii) The splenic white pulp is populated by macrophages and numerous red blood cells.
ix) Dendritic cells express both class I and class II MHC.
x) CD 4 is a co-receptor having two polypeptide chains. 10

1. (B) Explain the following statements :

i) All immunoglobulin molecules on the surface of a given B cell have the same idiotype.

ii) B cell epitopes generally loose their immunogenicity when heated.

iii) Passive immunization with horse anti venom for snake bites sometimes leads to anaphylactic reactions.

iv) Patients with Di George's syndrome suffer from recurrent infections.

v) Skin serves as an important component of innate immune system. 1.5x6=9

2. (a) Differentiate between an antigen and immunogen. What properties a molecule should have to act as an immunogen?

(b) What are the two primary characteristics that distinguish hematopoietic stem cells from progenitor cells?

(c) Describe the structure of Thymus and explain the two step selection process that thymocytes undergo in the thymus. 6,2, 6

3. (a) Explain how cytotoxic T cells cause destruction of target cells?

(b) Briefly explain the role of HRF, Factor H, Clnh, S protein and C3a in the complement pathway.

(c) What are superantigens? 7,5,2

4. (a) Explain the alternative pathway of complement activation.

(b) What is autoimmunity? Describe at least three different mechanisms responsible for the development of autoimmune diseases.

(c) Name any two immunosuppressive drugs with their mode of action. 5,5,4

5. (a) What are recombination signal sequences(RSS)? What is their function in gene rearrangement of antibodies?

(b) Junctional flexibility can generate antibody diversity. How?

(c) Discuss in detail how endogenous antigens are processed in the cytosolic pathway.

5,4, 5

6. (a) What is the function of bone marrow stromal cells in maturation of B cells?

(b) Draw the structure of TCR CD3 complex. What is the function of CD3 complex?

(c)Explain the structure of immunoglobulin G and function of its various domains. 4,4, 6

7. (a) Explain the sequence of events that occur in the development of type III hypersensitive reaction.

(b) Explain the different categories of graft rejection that can occur during kidney transplantation?

(c) What are the various cells and mediators involved in a local acute inflammatory response? 6,4,4

8. Write short note on (Any four)

i) Systemic lupus erythematosus

ii) Natural Killer cells

iii) Somatic hypermutation

iv) DNA vaccines

v) PAMPs

vi) RAST (3.5 x4=12)

~~SET A~~ (14)

Sl. No. 07 Q.P.: 1650

Unique Paper Code	:	2491604
Name of the Paper	:	Advanced Techniques and Technologies
Name of the Course	:	B.Sc. (Hons) Biochemistry
Semester	:	VI
Duration	:	3 hours
Maximum marks	:	75
Instructions for candidates	:	Attempt any five questions. Q.No.1 is compulsory.

1.(a) Give reason for the following

(i) TUNEL assay is commonly used to detect apoptotic programmed cell death.

(ii) IEF gels are treated with trichloroacetic acid (TCA) before staining with Coomassie brilliant blue.

(iii) Brightness of an image decreases with the increasing magnification.

(iv) FRET efficiency is extremely sensitive to the distance between the donor and acceptor

(v) Solid scintillation counting is particularly useful for the quantification of γ-emitting isotopes

(2X5)

(b) What do you understand by the following terms

(i) Magnification

(ii) Curie

(iii) Alpha decay

(iv) Resolution

(v) Scattering of light (1X5)

(c) Name the technique for the following applications

(i) To differentiate neutrophil and granulocytes

(ii) To study cell death

(iii) To isolate a DNA binding protein

(iv) To study a cell surface receptor

(1X4)

2. (a) Differentiate between the following

(i) Light microscopy and electron microscopy

(ii) Alpha radiation and beta radiation

(iii) PFGE and DIGE

(iv) SEM and TEM (2X4)

(b) Explain the principle of confocal microscopy. What are its advantages over fluorescence?

(6)

3. Write down the principle and two applications of the following techniques

(a) South western blotting

(b) FACS

(c) FISH

(5, 5, 4)

4. (a) Explain the role of the following

(i) Primary flour in scintillation counting

(ii) Flourophores in flow cytometry

(iii) Cyanin dyes in DIGE

(iv) Osmium tetraoxide in EM (2X4)

(b) Differentiate between SEM and TEM. Give their applications.

(6)

5. (a) Define half life of a radioisotope. What are the advantages and disadvantages of working with a short half-life radioisotope?

(b) What are carrier ampholytes. Why are they preferred over conventional mixing of two buffers in establishing a pH gradient in isoelectric focusing

(c) What are the commonly used flours (primary and secondary) in liquid scintillation counting.

(5, 5, 4)

6. (a) Briefly describe protein microarray. What are its advantages over other methods to study protein-protein interactions?

(b) Explain the applications of fluorescence-in-situ hybridization in diagnostics

(c) Differentiate between shadow casting and freeze fracture.

(5, 5, 4)

7. (a) Justify the following statements

(i) Conventional Y2H assay cannot be used to study the interactions between membrane bound proteins. Explain

(ii) The technique of signal FRET has been routinely used to study transduction

(iii) Chip-on-chip is a powerful technique to study DNA protein interactions

(3X3)

(b) Explain the technique of DNA footprinting. What are the applications.

(5)

8. Write short notes on the following

(a) Immunohistochemistry

(b) Pulse Field Gel Electrophoresis

(c) Electron-microscopic autoradiography

(d) EMSA

(3, 3, 4, 4)

[This question paper contains 4 printed pages.] (15)

May 2017

Your Roll No.....

Sr. No. of Question Paper : 680 G

Unique Paper Code : 107693

Name of the Paper : Genetics and Genomics II (GGHT 602)

Name of the Course : **B.Sc. (Hons) Anthropology, Biochemistry, Biomedical Sciences, Botany, Microbiology and Zoology**

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** question in all including **Question No. 1** which is compulsory.

1. (a) Define the following (5)

   (i) Target site duplication

   (ii) Competent cells

   (iii) Selection coefficient

P.T.O.

(iv) Reverse Genetics

(iv) Clade

(b) Describe the function of the following : (3)

(i) Transposase

(ii) Resistance transfer factor

(iii) F factor

(c) Distinguish between: (8)

(i) Local and Global Sequence Alignment

(ii) Temperate and Virulent phages

(iii) Auxotroph and Prototroph

(iv) Genomics and Proteomics

(d) Expand the abbreviations: (4)

(i) EST

(ii) SINE

(iii) UTR

(iv) LTRs.

(e) Write important contributions of the following: (4)

(i) Davis Bernard

(ii) Seymour Benzer

(iii) Craig J. Venter

(iv) Th. Dobzhansky

(f) Fill in the blank with appropriate word: (3)

(i) The bithorax mutation in *Drosophila* is an example of a _____ mutation.

(ii) Lederberg and Zinder used _____ as an organism in the transduction experiment.

(iii) A map based on recombination frequency is called _____ map.

2. (a) With suitable diagram, describe phage λ mediated specialized transduction.

(b) Explain Hfr. Describe conjugation process between Hfr and F bacteria. (6+6)

3. (a) With suitable diagrams explain the distinctive features of various types of prokaryotic transposable elements.

(b) Describe the role of transposons in genome organization. (9+3)

4. (a) Describe key features of *Drosophila melanogaster* which allow it to be used as a model organism.

(b) Describe the function of homeotic genes in plants and animals.

(c) Write the phenotype of the following homeotic mutants of *Arabidopsis*

(i) Loss of B function

(ii) Loss of C function

(iii) Loss of A function

(iv) Complete loss of A, B, and C functions (4+4+4)

5. (a) Differentiate between 'Bottleneck effect' and 'Founde effect'.

(b) Explain 'Allopatric speciation' with the help of suitable examples.

(c) The incidence of recessive albinism in a human population is 0.0004. If mating for this trait is random in the population, find out the frequency of the recessive allele and carriers. (4+4+4)

6. (a) Explain and compare 'Structural Genomics' and 'Functional Genomics'.

(b) Give a comparative account of distinctive features of eukaryotic and prokaryotic genome. (6+6)

7. Write short note on **any three** of the following:

(a) Retrotransposons

(b) Human Genome Project

(c) NCBI

(d) Hardy-Weinberg's law (4+4+4)

(1000)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 932 G

Unique Paper Code : 249601

Name of the Paper : Molecular Physiology

Name of the Course : **B.Sc. (Hons.) Bio-chemistry**

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 Q. No. 1 which is compulsory.

1. (a) Define the following.

(i) Polycythemia

(ii) Bohr's effect

(iii) Residual volume

(iv) Systole

(v) Micturition (5×1)

P.T.O.

(b) Explain how/why?

(i) Peristaltic waves of digestive tract regulate swallowing of food.

(ii) SA node generates pacemaker potential.

(iii) Reduced extracellular Calcium ion concentrations leads to tetanic convulsions in muscles.

(iv) Nitroglycerin is used to treat angina.

(v) Osteoclasts are bone desorbing cells.

(vi) Surfactants increase the lung compliance.

(vii) Creatinine can be used to measure Glomerular Filteration Rate (GFR.). (7×2)

2. (a) Compare parasympathetic and sympathetic nervous system.

(b) Sensations from skin, muscle, tendons and bone are initiated by a variety of somatic receptors? Explain.

(c) Why is the action potential of the cardiac muscles different from the skeletal muscles? Explain. (6,4,4)

3. Explain with the help of diagram/flow chart

(a) The events in the clotting of blood through extrinsic pathway

(b) Juxtaglomerular apparatus

(c) The structure of GI tract wall (5,5,4)

4. (a) Explain the various events of cardiac cycle

(b) How does Aldosterone control the blood pressure?

(c) How is HCl secreted in the stomach lumen? Explain the mechanism. (6,4,4)

5. (a) Explain the following

(i) The mechanism of counter current multiplier system for the concentration of urine

(ii) The mechanism of excitation-contraction coupling in muscles

(iii) Respiratory acidosis and alkalosis (5,5,4)

6. (a) How does the 'Y' chromosome control the determination of the male phenotype.

(b) What is sperm capacitation? Explain.

(c) How does ovulation take place from the follicular cells? (5,5,4)

7. Write short notes on the following diseases.

(a) Asthma

(b) Diabetes mellitus

(c) Liver cirrhosis

(d) Ischemia (4X3.5)

8. Differentiate between the following (**any four**)

(a) Afferent neurons and efferent neurons

(b) Pulmonary and systemic circulations

(c) Depolarization and repolarization

(d) Skeletal and smooth muscles

(e) Short-term and Long-term memory (4X3.5)

[This question paper contains 4 printed pages.]

15/5/17

Your Roll No.....

Sr. No. of Question Paper : 933 G

Unique Paper Code : 249603

Name of the Paper : Recombinant DNA Technology

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) Explain why?

(i) M13 phage is useful for sequencing work.

(ii) Inducible promoters are preferred for expression vectors.

(iii) Phage vectors are preferred over plasmid vectors for Genomic library preparation.

P.T.O.

(iv) DNA is treated with alkaline phosphatase before cloning.

(v) Agarose gel electrophoresis is important in DNA analysis.

(vi) Blue white colony selection is done for screening of recombinant clones.

(vii) Taq Polymerase is used for PCR.

(viii) $CaCl_2$ treatment is given to E.coli cells before transformation.

(b) Write down the use of following enzymes

(i) Exonuclease

(ii) Terminal transferase

(iii) T4 DNA ligase (16,3)

2. (i) Differentiate the following:

(a) Genomic and cDNA library

(b) PCR and RT-PCR

(c) Colony and plaque

(ii) Explain the principle of DNA finger printing. (9,5)

3. (i) A purified piece of DNA is cut with EcoRI and BamHI separately and then with both enzymes together. The following are the observations in gel electrophoresis (fragments in bp).

EcoRI	300	500	850
BamHI	100	600	950
EcoRI and BamHI	100	250	300, 400, 600

Use this information to construct a restriction map of the DNA

(ii) Give the characteristics of Ti plasmid.

(iii) What do you understand by replica plating? Explain with one example. (5,5,4)

4. (i) Bacteria are able to defend themselves against bacterial viruses. How do bacteria protect their own DNA from endonucleases?

(ii) What are the major difficulties encountered in expressing animal genes in bacteria? What are the ways to overcome these difficulties?

(iii) Write the use of shuttle vectors in cloning experiments. Give an example of a shuttle Vector. (4,5,5)

5. (i) Differentiate between Southern and Northern Hybridization.

(ii) How is mRNA purified from eukaryotic cells?

(iii) Draw a diagram to show the relative electrophoretic mobility of relaxed, supercoiled and nicked plasmid on an agarose gel. (6, 4, 4)

6. (i) What is site directed mutagenesis? Explain how this is achieved.

(ii) Differentiate between the following:

(a) Linkers and adapters

(b) Recombinants and Transformants

(c) Type I and Type II Restriction endonucleases (5,9)

7. (i) What are the various steps involved in gene cloning?

(ii) Write down the steps of Polymerase chain reaction.

(iii) Explain industrial production of Insulin using recombinant DNA Technology. (5,5,4)

8. Write short notes on the following:

(i) Two methods of screening of recombinants clones

(ii) Dideoxy method of sequencing

(iii) Chromosome walking (5,5,4)

[This question paper contains 6 printed pages.] May 2017

Your Roll No.....

Sr. No. of Question Paper : 934 G

Unique Paper Code : 249605

Name of the Paper : BCHT-613/Immunology-II

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.
4. Use of scientific calculator/log tables may be allowed.

1. (a) State whether true or false with justification.

   (i) A pepsin digest of anti-SRBC antibodies can agglutinate SRBC.

   (ii) In humans, grafts from parents to children are usually rejected.

(iii) Indirect immunofluorescence is a more sensitive technique than direct immunofluorescence.

(iv) Antihistamines are effective for the treatment of type III hypersensitivity

(v) Multiple Sclerosis is a T cell associated autoimmune disease

(vi) Most immunosuppressive drugs are also used as anticancer drugs.

(vii) The reaction to poison ivy is classified as DTH reaction. (14)

(b) Mention the contribution of the following scientists-

(i) Edward Jenner

(ii) Karl Landsteiner

(iii) Gell and Coombs

(iv) Rosalyn Yalow

(v) Bordet

(5)

2. Differentiate between the following pairs- (*any 7*)

(i) RIST and RAST

(ii) Precipitation and Agglutination

(iii) Affinity and Aviity

(iv) Direct and Indirect ELISA

(v) Active and passive immunization

(vi) Primary and Secondary Immunodefeciency

(vii) Toxin and Toxoid

(viii) TATA and TSTA

(ix) Oncogene and Protooncogene (14)

3. (a) What are monoclonal antibodies? Describe their method of production.

(b) Name one organ-specific and one systemic autoimmune disease. Indicate their symptoms and possible treatments. (5,9)

4. (a) Indicate four properties of cytokines with suitable examples.

(b) What are the advantages of the Sabin polio vaccine compared with the Salk vaccine? Why the Sabin vaccine is no longer recommended in most parts of the world?

(c) Describe the possible mechanisms for the induction of autoimmunity. (4,5,5)

5. (a) Describe Type I hypersensitivity reaction. Name some allergens that mediate this type of hypersensitivity.

(b) For each of the following immunodeficiency disorders indicate the primary cause and the associated symptoms

(i) Di George's syndrome

(ii) Chronic Granulomatous Disease (CGD)

(iii) X-linked Agamma globulinema (8,6)

6. (a) Describe briefly the following

(i) Xenograft

(ii) Privileged sites

(iii) Alloreactivity

(iv) GVHD

(v) Immunoelectrophoresis

(b) For each of the antigen or antibody below, indicate an appropriate assay method keeping in mind the sensitivity of the assay and the expected concentration of the protein.

(a) IgG in serum

(b) Complement component C3 on glomerular basement membrane.

(c) IgE in serum.

(d) Anti A antibodies to blood group antigen A in serum. (10,4)

7. (a) Explain the protective mechanisms for combating infection by extracellular bacteria and how do bacteria evade host defense mechanism?

(b) Describe some ways by which tumors evade the immune system. (9,5)

8. Write short notes on-

(i) Attenuated Vaccine or DNA vaccine

(ii) Direct Immunofluorescence or Complement Fixation Test

(iii) Immunosuppressive Drugs

(iv) SLE or Rheumatoid Arthritis (3,3,4,4)