



Name : .....  
Roll No. : .....  
Invigilator's Signature : .....

**CS/M.TECH (BT/PHMB/PHMC)/SEM-2/MBT-204/PHMB-204/PHMC-204/2012**

**2012**  
**GENETICS & CELL BIOLOGY**

*Time Allotted : 3 Hours*

*Full Marks : 70*

*The figures in the margin indicate full marks.*  
*Candidates are required to give their answers in their own words*  
*as far as practicable.*

**GROUP – A**  
**( Genetics )**

( FULL MARKS : 35 )

Question No. 1 is compulsory

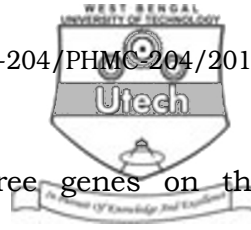
1. Answer any *five* of the following : 5 × 1 = 5
- i) What is meiosis ?
  - ii) Name two agents used for cell hybridization.
  - iii) What is the consequence of nondisjunction of chromosome 21 ?
  - iv) What is the function of *Sry* gene ?
  - v) What is linkage ?
  - vi) What is the function of antisense RNA ?
  - vii) What is oncogene ?

**MODULE – I**Answer any *one* of the following questions.

1 × 9

2. a) What is recombination ?
- b) Singed bristles (*sn*), crossveinless wings (*cv*), and vermilion eye colour (*v*) are due to recessive mutant alleles of three X-linked genes in *Drosophila melanogaster*. When a female heterozygous for each of the three genes was testcrossed with a singed, crossveinless, vermilion male, the following progeny were obtained :

Class	Phenotype	Number
1	singed, crossveinless, vermilion	3
2	crossveinless, vermilion	392
3	vermilion	34
4	crossveinless	61
5	singed, crossveinless	32
6	singed, vermilion	65
7	singed	410
8	wild type	3



What is the correct order of these three genes on the X chromosome ? What are the genetic map distances between *sn* and *cv*, *sn* and *v*, *cv* and *v* ? What is the coefficient of coincidence ?

1 + 8

3. Explain the mechanism of liposome mediated gene delivery. Compare the viral and nonviral based gene delivery system.

5 + 4

4. Depict the molecular mechanism of sex determination in *Drosophila*.

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## MODULE – II

Answer any *three* of the following questions.  $3 \times 7 = 21$

5. a) Explain Hardy-Weinberg Principle ?  
b) The following data for the A-B blood types were obtained from Salt Lake & New Town.

Group	Sample Size	A	AB	B
Salt Lake	86	53	29	4
New Town	278	78	61	139

Calculate the frequencies of the  $L^A$  and  $L^B$  alleles for the two groups.

2 + 5



6. State the strategy, applications and implications of Human genome project. 4 + 2 + 1
7. What is somatic cell hybridization ? How are hybrid cells selected in HAT medium ? 2 + 5
8. Define genetic counseling. What are the steps in genetic counseling ? What is the cause of fragile X syndrome ? 2 + 2 + 3

**GROUP – B**  
**( Cell Biology )**

( FULL MARKS : 35 )

1. Answer any *five* questions : 5 × 2 = 10

Fill in the blanks :

- a) Cephalins contain the amino alcohols ..... or ..... .
- b) Binding of GABA at certain synapses in the central nervous system admits ..... ions into the cell and ..... the creation of a nerve impulse.
- c) Binding immunoglobulin protein (BiP) are also known as ..... kDa..... regulated protein.



- d) Rabs are anchored via .....groups on two..... in the C-terminus.

Answer in brief :

- e) "Most of the fatty acids in the membrane are unsaturated" – Why ?
- f) Name four types of "gated" ion channels.
- g) Which ionic channels are defective in patients with cystic fibrosis ?
- h) What are Porosomes ?

2. Answer any *three* of the following questions :  $3 \times 5 = 15$

- a) Name three P-type ion transporters. Describe in brief, role of any one of these three pumps to mediate active transport. Who discovered Patch Clamp technique ?

$$\left(3 \times \frac{1}{2}\right) + 2\frac{1}{2} + 1$$

- b) Name two categories of SNAREs. Where are they located ? Draw a diagram to explain postulated role of SNAREs in guiding vesicular transport.  $1 + 1 + 3$



- c) Define a Symporter. Give an example and explain its involvement to move specific cargo molecules through plasma membrane. What is Liddle's syndrome ?

1 + 2 + 2

- d) Define Chaperone, Co-chaperone and Pharmacological chaperone. Draw a diagram to show the difference between normal and mutant LDL receptor.

3 + 2

- e) Describe diagrammatically a low density lipoprotein particle. Name four functional regions of cisternae stack present in Golgi apparatus. Define Prenylation.

$2 + 4 \times \frac{1}{2} + 1$

3. Answer any *one* question of the following :

1 × 10 = 10

- a) Write a short note on Centrosome. "Tight junction is one kind of intracellular bridge which perform two vital functions" – Explain. What is the difference between Integrins and Cadherins ? Describe four types of signal through which animal cells can signal to one another.

$2 + 2 + 4 \times 1\frac{1}{2}$



- b) What is Cytokinesis ? How does it differ in plant and animal cells ? Name and describe individual roll of three proteins which control cell cycle. Define Endoreplication.  $2 + 1 + (3 \times 2) + 1$
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