RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FIFTH SEMESTER EXAMINATION, DECEMBER 2018

THIRD YEAR [BATCH 2016-19]

Date : 15/12/2018 **MICROBIOLOGY [Honours]**

Time : 11 am – 1 pm **Paper : V [Gr-A]** Full Marks : 50

Answer <u>any four</u> questions from <u>Question Nos. 1 to 8</u> : [4×10]

1. a) In mice, a mutant was isolated having yellow coat colour instead of wild type agouti(grey) colour. Crossing experiments were done in various combination among and between the wild and mutant types and following results were obtained.

	Crosses	Phenotypic ratio
i)	Agouti × Agouti	All agouti
ii)	Yellow × Yellow	2 yellow : 1 agouti
iii)	Agouti × Yellow	1 yellow : 1 agouti

Explain the above observation in terms of genotype and phenotype. [3]

b) What is plasmid incompatibility? What is the cause of this phenomenon? [2]

c) What do you mean by epigenetic inheritance? [2]

d) An Hfr strain with genotype <u>met</u>$^-$ *his*$^+$ *leu*$^+$ *trp*$^+$ and that transfers the *met* gene very late was mated with a leu$^-$ met$^+$ trp$^-$ his$^-$(Ts) recipient. The *his* (T_s) mutation introduces a requirement for hisdidine at 42^0C. After mating for several horus, the mixture was diluted and plated on mimimal media with town different supplements. The plates were incubated at 42^0C. The supplements in the plates and the number of colonies per plate are the following.

His+Trp – 250
His + len – 50
Len + Trp–500
His – 10

i) What is the purpose of *<u>met</u>*$^-$ mutation in the Hfr strain in the experiment? [3]

ii) Which genes entered first, second, and third?

2. a) In *<u>Drosophila</u>* *<u>melanogaster</u>*, wild-type eye-colour is brick-red. When two autosomal recessive mutants, brown and scarlet are crossed, the progeny of F_1 generation exhibit wild-type eyecolour. In F_2 generation, wild, scarlet, brown and white-eyed flies are found in a 9:3:3:1.ratio.Though it is a monohybid crossing experiment, the ratio is numerically the same as Mendel's dihybrid ratio. Why? [3]

b) How many different kinds of F_1 gametes, F_2 genotypes and F_2 phenotypes would be expected from the following crosses:

i) AA× aa

ii) AABB × aa bb. [3]

c) In time-of-entry mapping of genes in *<u>E.coli</u>* the plateu value for early markers range from 20 to 50 recombinants per 100 Hfr cells. Can you design an experiment by which you can determine the approximate number of recipients which received DNA from donor Hfr through conjugation? [3]

d) What do you mean by co-dominance? [1]

3. a) What are the phenotypes of the transconjugant after the crossing of

i) $F^+ \times F^-$ ii) Hfr× F^- [2]

b) Briefly describe the steps which are involved in the formation of chromatin fibre of 300 nm diameter from nncleosome core particles of 10 nm diameter. [3]

c) Explain the term epistasis with an example. [3]

d) In *Neurospora*, if male pocky (slow-growing) mutants are crossed with female wild type, the progeny colonies are wild type but if the female parent is pocky and the male parent is wild type, all progeny coloneis are pocky. Can you suggest any explanation for this difference in observattions? [2]

4. a) In a test-cross of a dihybrid, the number of recombinants never exceed 50%. Why? Write down the formula for determination of number of allelic pairs responsible for polygenic inheritance. [2+1]

b) How did Bridges proved that factors for maleness in *Drosophila* are not located on the sex-chromosome but are instead present in the autosomes? [3]

c) How can you obtain nucleosomal core particle using nuclease digestion of chromatin fibre? [2]

d) What do you mean by co-dominance? Cite an example. [2]

5. a) In generalized transduction majority of the transducants are abortive, —Why? [2]

b) Three genes *viz*., *gal* K, *gal* T and *gal* E are involved in galactose metabolism. A new nutant gal 101 has been isolated and on analysis it revealed that the mutation in the *gal* E gene yielded the nutant phenotype. Construct the partial diploids to support the observations. [3]

c) What is meant by atutonomously replicaling sequence? [2]

d) In diploid organism between two gene, increase, mapping estimates become more inaccurate —Why? What is chiasma interferences? [3]

6. a) What is pleiotropy? Cite a suitable example. [2]

b) Design an experiment to show that single-stranded DNA enters the recipient cell during transformation. [4]

c) How can you prove that plasmid controls its own copy number? [3]

d) What are LINEs and SINEs? [1]

7. a) Differentiate between Local and Global alignment. [2]

b) With the help of a flowchart, enumerate the steps taken to perform BLASTN or BLASTP. [3]

c) What are applications of sequence alignment? [2]

d) Explain the logical steps of data processing with the help of a flowchart. [3]

8. a) What is MOI? [1]

b) How are viruses grouped by Baltimore classification? Give an example of a virus for each of these groups. [3]

c) Give a comprehensive description of TMV structure. [2]

d) How ELISA can be used for viral detection? [2]

e) What do you mean by antigenic shift and antigenic drift? [2]

***Answer any one question from Question Nos. 9 & 10* :** [1×10]

9. a) Give a schematic diagram for the strategy of antiretroviral therapy. [3]

b) What is HAART? [1]

c) Write a short note on 'HIV associated secondary infections'. SV40 is believed to suppress transcriptional properties of the tumor-suppressing p^{53}. Can you suggest any consequence of that? [2+2]

d) What do you mean by one-step growth curve of bacteriophages? [2]

10. a) Write down the nature of the genetic material of the following viruses:
i) orthomyxovirus ii) paramyxovirus iii) EBV iv) HTLV-1 [2]

b) Briefly describe the processes by which a virus can evade host immune system. [2]

c) What is cytopathic effect ? [1]

d) What is meant by phage typing? [1]

e) 0.1 ml of a phage sample gave 100 plaques at 10^{-3} dilution. What is the titre of the sample? [2]

f) What are the functions of penton bases and hexon proteins? [2]

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