

M. SC. (MICROBIOLOGY) SEM-II (C.B.C.S.) (2012 COURSE) :

SUMMER - 2018

SUBJECT: QUANTITATIVE BIOLOGY

Day: Tuesday  
Date: 17/04/2018

S-2018-0908

Time: 03.00 PM TO 06.00 PM  
Max. Marks: 60

**N.B.:**

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Draw neat diagrams **WHEREVER** necessary.
- 4) Use of **log tables** and **calculator** is allowed.

**Q.1** Using Hardy-Weinberg law estimate the allelic frequencies of sex linked alleles. Also state the assumptions on which the Hardy-Weinberg law is based. (15)

**OR**

**Q.1** What is epistasis? Explain with suitable examples how the genes interact with each other to give a modified 9: 3: 3: 1 ratio. (Describe at least three examples of gene interactions with one example each).

**Q.2 a)** Explain the concept of incomplete dominance with a suitable examples. (07)

**b)** Calculate the correlation coefficient between the heights of the father and the son from given data: (08)

Height of father (in inches)	65	66	67	68	69	69	70	64	65	63
Height of son (in inches)	68	65	68	70	67	68	72	66	68	62

**Q.3** Attempt any **THREE** of the following: (15)

- a)** Describe the processes that bring about changes in allelic frequencies.
- b)** In garden peas an allele T for axial flowers (positioned along the stem is dominant to an allele t for terminal flowers (positioned at the tips of the branches)
  - i)** In the F<sub>2</sub> generation of a monohybrid cross, what is the expected ratio of axial: terminal?
  - ii)** Among the F<sub>2</sub> progeny, what proportion are heterozygous?
  - iii)** Among the F<sub>2</sub> progeny with axial flowers, what proportion are heterozygous?
  - iv)** In a testcross of the F<sub>1</sub> progeny of a monohybrid cross, what is the expected ratio of axial: terminal?
- c)** On the basis of information given below about the treatment of 200 patients suffering from disease, state whether the new treatment is comparatively superior to the conventional treatment using chi square test.

Treatment	No. of patients	
	Favourable	Not Favourable
New	60	30
Conventional	40	70

**d)** Explain the different stages for therapeutic trials (clinical trials) of drug.

**P.T.O.**

**Q.4** Attempt any **THREE** of the following:

**(15)**

- a) Write a note on heterozygote superiority.
- b) In snapdragons, red flower color (R) is incompletely dominant over white flower color (r); the heterozygotes produce pink flowers. A red snapdragon is crossed with a white snapdragon, and the  $F_1$  are intercrossed to produce the  $F_2$ .
  - i) Give the genotypes and phenotypes of the  $F_1$  and  $F_2$  along with their expected proportions.
  - ii) If the  $F_1$  are backcrossed to the white parent, what will the genotypes and phenotypes of the offspring will be?
  - iii) If the  $F_1$  are backcrossed to the red parent, what are the genotypes and phenotypes of the offspring?
- c) Following is the data recorded on the length of biological object. Calculate Mean, mode and standard deviation.  
Length: 63, 66, 63, 67, 68, 69, 70, 62, 71, 71.
- d) Alpha particles are emitted by radioactive source at the rate of three per every minute on an average. The number of particles are distributed according to the Poisson distribution. Calculate the probability of getting exactly 5 emissions in one minute.

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