



**DEPARTMENT OF BOTANY**  
**NAMBOL L. SANOI COLLEGE, NAMBOL**  
**QUESTION BANK**

**4<sup>TH</sup> Semester BOT: SE 44 (ELECTIVE)**

**PREVIOUS 5 YEARS (2016-2020)**

**PAPER-IV / BOT: SE 44: CYTOLOGY, GENETICS, PLANT BREEDING, BIOTECHNOLOGY AND  
BIOMETRY**

**UNIT-1: CYTOLOGY**

**OBJECTIVE TYPE**

**(1 MARK QUESTIONS)**

- (a) The cell theory is not applicable to (2016)**
- i) bacteria**
  - ii) fungi**
  - iii) plants**
  - iv) virus**
- b) The two subunits of 80S ribosomes are of (2017)**
- i) 50S and 30S**
  - ii) 60S and 40S**
  - iii) 50S and 40S**
  - iv) 650S and 30S**
- c) Smooth endoplasmic reticulum is abundant in cells that synthesis huge amount of (2018)**
- i) toxins**
  - ii) proteins**
  - iii) lipids**
  - iv) nucleic acids**

**d) Mitochondria and chloroplast option are similar in having (2019)**

- i) Cristae**
- ii) thylakoids**
- iii) ATPsynthase**
- iv) 80S ribosomes**

**VERY SHORT ANSWER TYPE**

**(1 MARK QUESTIONS)**

- a) What is oxidative phosphorylation? (2016)**
- b) Give a functional difference between smooth and rough endosperm reticulum. (2016)**
- c) What is fibrous lamina? (2017)**
- d) What is the importance of having a cis double bond in one of the fatty acyl chains of a membrane phospholipid? (2017)**
- e) What is a metacentric chromosome? (2018)**
- f) What are the rRNAs synthesized in nucleolar organizer region? (2018)**
- g) Give one difference between prokaryotic and eukaryotic ribosomes. (2019)**
- h) State one function of nucleolus. (2019)**

**SHORT ANSWER TYPE**

**(3 MARKS QUESTIONS)**

- a) Differentiate between 70S and 80S ribosomes with three points. (2016)**
- b) Write a note on complementary genes. (2016)**
- c) Give one similarity and two differences between mitochondria and chloroplast. (2017)**
- d) Write a note on vesicles of Golgi complex. (2017)**
- e) Give three structure differences between chloroplasts and mitochondria. (2018)**
- f) Write three functions of plasma membrane proteins. (2018)**
- g) Consequence of mitotic cell division depends on the cell in which it occurs. Explain. (2019)**

**h). Write three functions of smooth endoplasmic reticulum. (2019)**

**(6 MARKS QUESTIONS)**

**a) Describe the primary active transport with a diagram.**

*Or*

**Describe the structure of a 30nm chromatin fiber. (2016)**

**b) Describe prophase 1 of meiosis. (2017)**

**c) Draw a neat labelled diagram each of metaphase and anaphase, and write two distinguishing features between them. (2018)**

**d) Describe, along with diagram, the types of chromosomes on the basis of centromeric position. (2019)**

**UNIT-2: GENETICS**

**OBJECTIVE TYPE**

**(1 MARK QUESTIONS)**

**a) Who used the term independent assortment for the first time? (2016)**

- i) Gregor johann Mendel**
- ii) Carl Correns**
- iii) Thomas Hunt Morgan**
- iv) Hugo de Virus**

**b) A purple –flowered pea plant is crossed with a white –flowered pea plant. All the F<sub>1</sub> plants produced purple flowers. On selfing F<sub>1</sub> plants, 300 and 100 out of 400 F<sub>2</sub> plants produced purple flowers and white flowers respectively. Then the genotype of parents are (2017)**

- i) Ww and ww**
- ii) WW and ww**
- iii) Ww and Ww**
- iv) ww and ww**

**c) Which of the following is a dihybrid? (2018)**

- i) TTRRGG**
- ii) TTRrGg**
- iii) TtRrGg**

iv) TtRRGG

- d) Phenotypic ratio of a cross between AaBb and aaBb, when both A and B are haplosufficient and completely dominant over their recessive counterparts is (2019)
- i) 3:3:1:1
  - ii) 9:3:3:1
  - iii) 1:1:1:1
  - iv) 1:2:1:2:4:2:1:2:1

### VERY SHORT ANSWER TYPE

(1 MARK QUESTIONS)

- a) What do you mean by reciprocal translocation? (2016)
- b) Distinguish between a monopodial and a haploid with one point. (2016)
- c) What do you mean by dominance? (2017)
- d) Distinguish between transition mutation and transversion mutation. (2017)
- e) What is the role of tRNA in protein synthesis? (2018)
- f) Distinguish between autopolyploidy and allopolyploidy with one point. (2018)
- g) What do you mean by 'inversion'. (2019)
- h) Give one cause of spontaneous mutation. (2019)

### SHORT ANSWER TYPE

(3 MARKS QUESTIONS)

- a) How do alkylating agents cause mutations? (2016)
- b) Give three advantages of pureline breeding. (2016)
- c) Explain how 9:3:4 ratio is obtained in recessive epistasis. (2017)
- d) Give three advantages of bulk method. (2017)
- e) When will two genes not assort independently and why? (2018)
- f) Write a note on reciprocal translocation. (2018)
- g) Bateson and punnet crossed a variety of sweet pea having purple flower and long pollen to a variety of sweet pea having red flower and round pollen. when  $F_1$  is test

crossed, the offspring are in 7:1:1:7. Why does it happen? Explain the phenomenon. (2019)

h) Write a note on segmental allopolyploids. (2019)

**(6 MARKS QUESTIONS)**

a) In maize plants alleles for dwarfism and striped leaves are recessive to alleles for normal height and green leaves. A plant heterozygous for both recessive alleles is self-pollinated and 320 seeds are collected. How many striped leaves and normal height, if the genes for the two characters assort independently? (2016)

*Or*

In a three –point test cross, the following data were obtained:

<i>Type</i>	<i>Number</i>
Non recombinant	63
Crossingover region 1	22
Crossingover region 2	13
Double crossing over	2

Find the coefficient of confidence.

b) Suppose that a set of reciprocal crosses produce different phenotypic ratios and extranuclear inheritance is suspected. Suggest, with proper explanations, two further investigations to be done to completely rule out nuclear inheritance. (2017)

c) What are spontaneous mutations? Elucidate with a suitable diagram, a spontaneous mutation caused by tautomerism. (2018)

*Or*

In pea, full pod (F) is dominant over constricted pod (f) and round seed (R) is dominant over wrinkled

seed (r). In a cross involving parents of unknown genotype and phenotype, the following offspring were obtained:

phenotype	proportion
Full round	3/8
Full wrinkled	3/8
Constricted round	1/8

Determine the genotypes and phenotypes of the parents. (2018)

d) Explain law of segregation with the help of a diagram. (2019)

### UNIT-3: PLANT BREEDING

#### OBJECTIVE TYPE

#### (1 MARK QUESTIONS)

- a) Bagging is done (2016)
- i) to avoid cross pollination
  - ii) to avoid self-pollination
  - iii) to achieve desired pollination
  - iv) to prevent contamination from unwanted pollen
- b) Which of the following is not true for inbreeding? (2017)
- i) It causes inbreeding depression after a few generations
  - ii) It leads to homozygously
  - iii) It is used to produce a pure line
  - iv) It always increases the productivity
- c) The method which is not appropriate for cross-pollinated crops is (2018)
- i) mass selection
  - ii) backcross method
  - iii) heterosis breeding
  - iv) pure line selection
- d) Hybrids are (2019)
- i) heterozygous
  - ii) homozygous
  - iii) may be homozygous or heterozygous
  - iv) mostly homozygous

**VERY SHORT ANSWER TYPE**

**(1 MARK QUESTIONS)**

- a) What is the purpose of mass selection? (2016)
- b) How does dominance hypothesis differ from overdominance hypothesis? Give one point. (2016)
- c) Give one significance of apomixes in plant breeding. (2017)
- d) Why is pure line selection not employed in breeding the cross pollinated crops? (2017)
- e) Give one demerit of plant introduction. (2018)
- f) What is the purpose of bagging after emasculation? (2018)
- g) What is polyembryony? (2019)
- h) State one objective of hybridization in plant breeding. (2019)

**SHORT ANSWER TYPE**

**(3 MARKS QUESTIONS)**

- a) Give three comparative points between pedigree method and bulk method. (2016)
- b) Write a note on somatic hybridization. (2016)
- c) When do plant breeders resort to distant hybridization (intraspecific and intergeneric)? (2017)
- d) Write a note on somatic embryogenesis. (2017)
- e) What is backcross method in plant breeding? When is backcross method employed? (2018)
- f) Briefly explain the overdominance hypothesis of heterosis. (2018, 2019)
- g) Differentiates between mass selection and purline selection with three points. (2019)

**(6 MARKS QUESTIONS)**

- a) Hand emasculation is very tedious and difficult in small flowers .write on any two methods of emasculation that can be employed in such a case.

*Or*

Write in brief, the procedure of transfer of a dominant gene by backcross method. (2016)

b) Describe pedigree method in plant breeding. (2017)

c) Describe the procedure of mass selection with a schematic diagram. (2018)

d) Explain law of segregation with the help of a diagram. (2019)

#### UNIT-4: BIOTECHNOLOGY

##### OBJECTIVE TYPE

##### (1 MARK QUESTIONS)

a) *Agrobacterium tumefaciens* (*Rhizobium radiobacter*) is a/an (2016)

i) gram-ve bacterium

ii) gram+ve bacterium

iii) fungus

iv) alga

b) Which of the following is obtained using mRNA molecules as a template? (2017)

i) rDNA

ii) mDNA

iii) cDNA

iv) tDNA

c) The most widely used chemical fusogen is (2018)

i) mannitol

ii) sorbitol

iii) mannol

iv) polyethylene glycol (PEG)

d) Golden rice is known for production of a huge amount of (2019)

i) vitamin K

ii) vitamin C



iii)  $\beta$ -carotene

iv)  $\beta$ -galactosidase

**VERY SHORT ANSWER TYPE**

**(1 MARK QUESTIONS)**

- a) What is dedifferentiation? (2016)
- b) What is somaclonal variation? (2016)
- c) What are DNA vaccines? (2017)
- d) What are bioherbicides? (2017)
- e) Why must liquid cultures be constantly agitated? (2018)
- f) What are symmetric hybrids? (2018)
- g) What is gene therapy? (2019)
- h) What is pharmacogenetics? (2019)

**SHORT ANSWER TYPE**

**(3 MARKS QUESTIONS)**

- a) Write three importance of callus culture. (2016)
- b) Write a note on cluster sampling. (2016)
- c) Write three probable harmful effects eating transgenic plants having selectable marker genes. (2017)
- d) Give three advantages of micropropagation. (2018)
- e) Give the botanical name of a transgenic plant and state the source of transgene and its action. (2018)
- f) Write the protocol of producing haploids through anther culture. (2019)
- g) How does biotechnology help in diagnosing human diseases? (2019)

**(6 MARKS QUESTIONS)**

- a) Write the basic steps of recombinant DNA technology.

*Or*

Write three points each of advantages and disadvantages of chloroplast transformation. (2016)

b) Surface sterilization protocols depend mainly on the surface and the type of tissue of the explant. Elucidate the statement giving two specific examples having different protocols. (2017)

c) Describe a conventional method of plant breeding for self-pollinated crops. (2019)

d) Describe electroporation method of gene transfer. (2019)

## UNIT-5: BIOMETRICS

### OBJECTIVE TYPE

#### (1 MARK QUESTIONS)

a) Formula of calculating expected frequency of a contingency table is (2017)

i) Column total x Row total

Grand total

ii) Grand total x Column total

Row total

iii) Column total x Grand total

Grand total

iv) Row total x Grand total

Column total

b) Median of 5,7,9,12,10,8,7,15,21 is (2018)

i) 9

ii) 10

iii) 8

iv) 7

c) When a distribution is skewed, the better measure of central tendency is/are (2019)

i) arithmetic mean

ii) mode

iii) median

iv) both arithmetic mean and median

**VERY SHORT ANSWER TYPE**

**(1 MARK QUESTIONS)**

- a) When is method of grouping applied while calculating mode? (2016)
- b) What is conditional probability? (2016)
- c) What is chi-square test of goodness of fit? (2017)
- d) What is stratified random sampling? (2017)
- e) Define standard deviation. (2018)
- f) Name two characteristics of a good average. (2018)
- g) Define arithmetic mean. (2019)
- h) What is random sampling? (2019)

**SHORT ANSWER TYPE**

**(3 MARKS QUESTIONS)**

- a) Find the median of the following distribution: (2016)

<b>Class</b>	<b>Frequency</b>
<b>0-10</b>	<b>4</b>
<b>10-20</b>	<b>4</b>
<b>20-30</b>	<b>9</b>
<b>30-40</b>	<b>7</b>
<b>40-50</b>	<b>13</b>
<b>50-60</b>	<b>3</b>
<b>60-70</b>	<b>3</b>
<b>70-80</b>	<b>2</b>
<b>80-90</b>	<b>2</b>
<b>90-100</b>	<b>3</b>

b) Write a note on Addition Rule of probability. (2017)

c) Find standard deviation of the following distribution: (2017)

Class	Frequency
0-10	10
10-20	20
20-30	10

d) Sampling error is inherent and unavoidable in any sampling scheme. (2018)

Despite this fact, sample method is preferred to census method in most cases. Why?

e) A pure breeding pea plant with yellow cotyledons was crossed to another pea plant with green cotyledons, and all  $F_1$  plants were selfed and  $F_2$  plants were grown. When  $F_2$  plants bore fruits, a mature pod was selected at random. The pod had 5 seeds. Find the probability that 2 seeds out of the five have been green cotyledons and the other 3 have yellow cotyledons. (2018)

f) Calculate the standard deviation of the following data: (2019)

No of seeds per pod	No of pods
5	10
6	13
7	15
8	17

j) Given that for data 1, no. of observation =  $n_1$  and mean =  $\bar{x}_1$  for data 2, no. of observation =  $n_2$  and mean =  $\bar{x}_2$ . Find the combined mean of data 1 and data 2. (2019)

**(6 MARKS QUESTIONS)**

a) Write the basic steps of recombinant DNA technology. (2016)

*Or*

Write three points each of advantages and disadvantages of chloroplast transformation.

b) A plant of  $AaBb$  genotype forms  $AB$ ,  $Ab$ ,  $aB$  and  $ab$  gametes in the proportion as given in the following table: (2017)

<b>Gametes</b>	<b>B</b>	<b>b</b>
<b>A</b>	<b>160</b>	<b>36</b>
<b>a</b>	<b>39</b>	<b>165</b>

Calculation  $\chi^2$  and test the independence of attributes to see whether the gene A and B are linked or not. [Given, table value of  $\chi^2$  at 0.05 p and 1 d.f.=3.841]

If both husband and wife are carriers of albino, the probability of getting birth to a normal child is 0.75 and that of an albino child, 0.25. Suppose that four children were born to them. Find the probability that-

- a) the first two children are normal and the latter two are albinos;
- b) the two out of the four children are albinos.
- c) The median and mode of the following distribution are 335 and 340 respectively.

Frequencies of two classes (300-400 and 400-500) are missing. Find these missing frequencies:

<b>Class</b>	<b>Frequency</b>
<b>0-100</b>	<b>4</b>
<b>100-200</b>	<b>16</b>
<b>200-300</b>	<b>60</b>
<b>300-400</b>	<b>?</b>
<b>400-500</b>	<b>?</b>
<b>500-600</b>	<b>6</b>
<b>600-700</b>	<b>4</b>
<b>Total</b>	<b>230</b>

Plants having AaBb genotypes are selfed, and their progenies are grown on a field. Out of those plants,

a plant is selected at random. What is the probability that the selected plant has Aabb genotype? (2017)

d) Explain the following relation with an appropriate example: (2018)

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$