

**M.Sc. BOTANY**  
**Second Semester**  
**CYTOGENETICS & PLANT BREEDING**  
**(MSB – 203)**

**Duration: 3Hrs.**

**Full Marks: 70**

Part-A (Objective) =20  
Part-B (Descriptive) =50

**(PART-B: Descriptive)**

**Duration: 2 hrs. 40 mins.**

**Marks: 50**

**Answer any four from Question no. 2 to 8**  
**Question no. 1 is compulsory.**

1. What do you mean by gene interaction? Explain how Mendel's dihybrid ratio (9:3:3:1) could be converted into (i) 9:7 (ii) 12:3:1 and (iii) (13:3). Give example. (3+7=10)
2. Define crossing over. Describe in detail the cytological basis of crossing over with a suitable example. (2+8=10)
3. Define sex chromosomes. What are the differential and non-differential regions of XY chromosome? Describe genic-balance theory of sex determination in *Drosophila*. (2+3+5=10)
4. What do you mean by frame shift mutation? Discuss briefly the mutation at molecular level with special emphasis on different types of transition mutation. (3+7=10)
5. Distinguish between autopolyploids and allopolyploids. With suitable example, explain the role of allopolyploidy in crop improvement. (4+6=10)
6. Describe the different DNA fingerprinting techniques and its application in forensic science. (10)

7. Briefly, give an account on different methods for crop improvement. Differentiate between artificial selection and pure line selection. (5+5=10)
8. What is cell cycle? Describe the cell cycle regulation mechanisms and its importance. (3+7=10)

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**Duration: 20 minutes**

**Marks – 20**

**(PART A - Objective Type)**

**I. Choose the correct answer:**

**1×20=20**

- i) Sister chromatids  
a. are created when DNA is replicated.  
b. are separated during mitosis.  
c. are attached at the centromere prior to division.  
d. all the above.
- ii) PCR based DNA amplification is an essential feature of which of the following combination of molecular markers?  
a. RFLP, AFLP and SSR.  
b. AFLP, SSR and RAPD.  
c. RFLP, RAPD and SSR.  
d. RAPD, RFLP and SSR.
- iii) Which of the following proteins acts as an energy transducer?  
a. G-protein  
b. Bacteriorhodopsin  
c. Hemoglobin  
d. Heat shock protein
- iv) Amplification of a chemical signal occurs when  
a. a receptor in the plasma membrane activates several G-protein molecules while a signal molecule is bound to it.  
b. a cAMP molecule activates one protein kinase molecule before being converted to AMP.  
c. Phosphorylase and phosphatase activities are balanced.  
d. receptor tyrosine kinases dimerize upon ligand binding.
- v) Mitosis occurs between  
a. G<sub>1</sub> and S phase  
b. S phase and G<sub>2</sub> phase  
c. S phase and G<sub>1</sub> phase  
d. G<sub>2</sub> and G<sub>1</sub> phase
- vi) Crossing over occurs during  
a. cytokinesis  
b. zygotene  
c. pachytene  
d. deplotene

- vii) Linked genes  
a. are located near each other on the same chromosome.  
b. violate the law of independent assortment.  
c. segregate together during meiosis.  
d. all of the above.
- viii) A woman carrier for haemophilia (Hh) marries a normal man (HO). Daughter of such a lady would be  
a. 75% carrier (Hh) and 25% haemophilic (hh)  
b. 50% normal (HH) and 50% carrier (Hh)  
c. 50% normal (HH) and 50% haemophilic (hh)  
d. 25% carrier (Hh) and 75% haemophilic (hh)
- ix) In a trisomic individual the number of chromosomes is  
a.  $2n - 1$   
b.  $2n + 2$   
c.  $2n + 3$   
d.  $2n + 1$
- x) Which one of the following is known as frame shift mutation?  
a. Addition  
b. Transition  
c. Transversion  
d. Substitution
- xi) Which one of the following technique is used in fingerprinting?  
a. Western blotting  
b. Flow cytometry  
c. Northern blotting  
d. Southern blotting
- xii) Plant breeding is science known for  
a. crop improvement  
b. food security  
c. disease resistance  
d. none of the all
- xiii) Crossing between two different species is known as  
a. intergeneric  
b. inter specific  
c. intra specific  
d. none of the above
- xiv) Self pollinated homozygous plant is a progeny of  
a. female parent  
b. pure line  
c. inbred  
d. hybrid

- xv) Pedigree method of hybridization is followed in
- cross pollinated
  - self pollinated
  - often cross pollinated
  - none of all
- xvi) Mutation is
- sudden change
  - heritable change
  - non heritable change
  - all of the above
- xvii) Inbreeding depression is observed in
- cross pollinated
  - self pollinated
  - often self pollinated
  - none of the above
- xviii) Heterosis is
- superior the parent
  - increased vigour
  - balance heterosis
  - no superiority
- xix) Inbreeding depression is observed in
- cross pollinated
  - self pollinated
  - often self pollinated
  - none of the above
- xx) RAPD is a
- DNA sequencing based method.
  - restriction digestion based method.
  - PCR based method.
  - all the above.

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**University of Science and Technology, Meghalaya**

Date Stamp: \_\_\_\_\_

<b>SESSION: 2016-17</b> <b>COURSE _____ PAPER Code: _____</b> <b>NAME OF THE PAPER: _____</b> <b>SEMESTER _____</b>																																																																							
<b><u>Instructions to Candidates</u></b> 1. This answer booklet has 4 pages. Please check before writing whether it is complete or in good condition. 2. Do not write your name anywhere in the answer booklet. 3. Write legibly on both sides of the paper 4. You may use some space for any rough notes or calculation on the answer booklet if you need. These rough notes, calculations must be scored out before submitting the answer booklet. 5. Do not bring any book or loose paper in the examination hall. 6. Do not tear any page from the answer booklet. 7. Do not write anything on the question paper or blotting paper or any pieces of paper while you are in the examination hall. 8. Any act of indiscipline or misbehavior in the examination hall will result in your expulsion. 9. No examinee is allowed to leave the examination hall until 30 minutes lapse after the commencement of the examination. 10. Additional answer sheet will be supplied after the main answer booklet is completed.		<table style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: center; font-weight: normal;">For Objective Type Questions</th> <th style="text-align: left; font-weight: normal;">Session: 2016-17</th> </tr> <tr> <td style="font-weight: normal; text-align: center;">Page No.</td> <td style="font-weight: normal; text-align: center;">Marks</td> <td style="font-weight: normal;">Course _____</td> </tr> <tr><td> </td><td> </td><td>Roll No. _____</td></tr> <tr><td> </td><td> </td><td>Enrollment No. _____</td></tr> <tr><td> </td><td> </td><td>Semester _____</td></tr> <tr><td> </td><td> </td><td>Name of the Paper _____</td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr> <td style="font-weight: normal; text-align: center;">Total</td> <td> </td> <td style="font-weight: normal;">Paper Code _____</td> </tr> <tr> <th colspan="2" style="text-align: center; font-weight: normal;">For Descriptive Type Questions</th> <th></th> </tr> <tr> <td style="font-weight: normal; text-align: center;">Question No.</td> <td style="font-weight: normal; text-align: center;">Marks</td> <td></td> </tr> <tr><td> </td><td> </td><td></td></tr> <tr><td> </td><td> </td><td></td></tr> <tr><td> </td><td> </td><td></td></tr> <tr><td> </td><td> </td><td></td></tr> <tr><td> </td><td> </td><td></td></tr> <tr><td> </td><td> </td><td></td></tr> <tr><td> </td><td> </td><td></td></tr> <tr><td> </td><td> </td><td></td></tr> <tr><td> </td><td> </td><td></td></tr> <tr><td> </td><td> </td><td></td></tr> <tr> <td style="font-weight: normal; text-align: center;">Total</td> <td> </td> <td></td> </tr> <tr> <td style="font-weight: normal; text-align: center;">Grand Total</td> <td> </td> <td></td> </tr> </table>	For Objective Type Questions		Session: 2016-17	Page No.	Marks	Course _____			Roll No. _____			Enrollment No. _____			Semester _____			Name of the Paper _____							Total		Paper Code _____	For Descriptive Type Questions			Question No.	Marks																																Total			Grand Total		
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