Question Paper Specific Instructions

Please read each of the following instructions carefully before attempting questions:

There are EIGHT questions in all, out of which FIVE are to be attempted.

Questions no. 1 and 5 are compulsory. Out of the remaining SIX questions, THREE are to be attempted selecting at least ONE question from each of the two Sections A and B.

Attempts of questions shall be counted in sequential order. Unless struck off, attempt of a question shall be counted even if attempted partly. Any page or portion of the page left blank in the Question-cum-Answer Booklet must be clearly struck off.

All questions carry equal marks. The number of marks carried by a question/part is indicated against it.

Neat sketches may be drawn, wherever required.

Answers must be written in ENGLISH only.
SECTION A

Q1. Write short notes on the following: 8x5=40
(a) Nucleosome modification and its significance 8
(b) Behaviour and significance of B-chromosome in genetic variation 8
(c) Importance of RNA molecule and its role in the origin and evolution of living organisms 8
(d) Types and applications of molecular markers 8
(e) Calculate the mean, standard error and coefficient of variation from the following data:

<table>
<thead>
<tr>
<th>Number of flowers/plant (x)</th>
<th>4</th>
<th>6</th>
<th>5</th>
<th>8</th>
<th>7</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of plants (y)</td>
<td>3</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>9</td>
<td>4</td>
</tr>
</tbody>
</table>

Q2. (a) Discuss the structure and function of synaptonemal complex, mentioning its location. State the different structural types of DNA with outline sketches. 15+5=20
(b) Describe lac operon and its negative as well as positive controls, with suitable diagrams. 10
(c) Discuss the molecular mechanism of base analogue incorporation and its effects. 10

Q3. (a) Describe the steps involved in T-DNA processing and transfer from Agrobacterium cell to the host plant nuclear genome, with suitable diagram. Add a note on the types and advantages of apomixis. 15+5=20
(b) Distinguish between paracentric and pericentric inversions with diagrams. Explain with sketches the different meiotic products resulting from a single crossover within a paracentric and pericentric loop. 10
(c) Explain the molecular mechanism of point mutation. 10

Q4. (a) What are prions and where do they exist? Explain the process of prion replication and role of cofactors in prion infectivity. 4+8+8=20
(b) Discuss the meiotic configurations in a translocation heterozygote (considering 2 pairs of chromosomes involved in translocation), with diagrams, and its subsequent effects on pollen fertility. 8+2=10
(c) Write an account on the applications of 'z' and chi-square tests in plant breeding programme. 5+5=10

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SECTION B

Q5. Write short notes on the following: 8x5=40
(a) Roles of abscisic acid and cytokinin in the regulation of seed dormancy 8
(b) How can longitudinal growth of the seedlings be manipulated by plant growth regulators? 8
(c) Alpha – Beta – Gamma biodiversity and its relation with different spatial scales of ecosystem 8
(d) IUCN’s classification scheme for the conservation status of species 8
(e) Types of intellectual property rights and justify the role of a particular IPR in biological resources accessibility 8

Q6. (a) How is phytochrome associated with flowering? 10
(b) How do photoperiodic response and photoinductive cycles influence flowering? 10
(c) Give a detailed account of ‘Fire’ as an ecological factor controlling structural and functional integrity of an ecosystem. How does it affect carbon and energy balances in tropical forests? 10+10=20

Q7. (a) Describe the role of cytochromes in electron transport chain during photosynthesis. 10
(b) Write an account on photolysis of water during photochemical reaction. 10
(c) What is meant by biodiversity conservation? Discuss the methods of ex-situ and in-situ conservations. 5+15=20

Q8. (a) What are the most important criteria to classify if an element of nutrient belongs to ‘gaseous’ or ‘sedimentary’ cycle? Draw the global sulphur cycle. 5+5=10
(b) Write an account on nitrate reductase and factors regulating its activity. How is ammonium assimilated into various metabolites? 10+10=20
(c) Define leaf senescence. Describe the important biochemical and physiological changes during this process. 2+4+4=10

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