

## Section K: Botany

Q. 1 – Q. 10 carry one mark each

- Q.1 For the formation of embryo sac the functional megaspore undergoes  
(A) Three meiotic division (B) Three mitotic division  
(C) Two mitotic division (D) Two meiotic division
- Q.2 How many nucleosomes per turn are present in a 30 nm chromatin fibre?  
(A) 4 (B) 8 (C) 6 (D) 10
- Q.3 The process by which water undergoes a phase transition from liquid state to an amorphous 'glassy state' is known as  
(A) Desiccation (B) Vitrification  
(C) Ice nucleation (D) Hyperhydricity
- Q.4 The term 'somaclonal variation' was coined by  
(A) Murashige and Skoog (B) Karp and Maddock  
(C) Gamborg and Phillips (D) Larkin and Scowcroft
- Q.5 Storage and transport of lipid occurs in  
(A) Glyoxysomes (B) Peroxisomes  
(C) Lysosomes (D) Spherosomes
- Q.6 The drug morphine is obtained from which plant part of *Papaver somniferum*?  
(A) Leaf (B) Stem (C) Capsule (D) Root
- Q.7 The floristic region of the world are determined on the basis of geographical distribution of plant genera. Identify the correct reason for this speciation.  
(A) Climate change (B) Genetic variation  
(C) Population distribution (D) Ecotypic variation
- Q.8 Pericycle is regarded as  
(A) The origin of lateral root and it is located between the endodermis and vascular bundle  
(B) Internal ground tissue present at the central position of the organ limited by the vascular bundles  
(C) Parenchymatous ground tissues passing in between the vascular bundles  
(D) The layer next to epidermis and solely consists of primary tissues
- Q.9 Apospory can be defined as  
(A) Development of sporophytes on the gametophytes without any reduction division  
(B) Development of gametophytes on the sporophytes without any reduction division  
(C) Development of several embryo within the same ovule  
(D) Development of an embryo directly from an egg cell or male gamete

- Q.10 The synonym of the families Labitae, Umbelliferae, Compositae and Gramineae are:
- |  |  |
|--|--|
| (A) Leguminaceae, Acantheaceae,<br>Asteraceae, Lamiaceae | (B) Solanaceae, Aricaceae, Apiaceae,<br>Poaceae      |
| (C) Lamiaceae, Apiaceae, Asteraceae,<br>Poaceae          | (D) Lilliacae, Cucurbitaceae, Poaceae,<br>Asteraceae |

**Q. 11 – Q. 26 carry two marks each**

- Q.11 The following features outline a system of plant classification
- Unisexual flowers are the most primitive within the angiosperms
  - Polyphyletic origin of angiosperms
  - Monocotyledons have been considered more primitive than dicotyledons
- Which one of the following systems of classification represents above features?
- |              |                       |
|--------------|-----------------------|
| (A) Linnaeus | (B) Engler and Prantl |
| (C) Rendle   | (D) Hutchinson        |
- Q.12 Following are the features of one type of C4 mechanism
- The mitochondrion is responsible for malate decarboxylation
  - The mesophyll cell tends to form aspartate rather than malate, from oxaloacetate
  - Presence of double bundle sheath
- Identify the correct one.
- |                  |              |
|------------------|--------------|
| (A) NADP-ME type | (B) PCK-type |
| (C) NAD-ME type  | (D) CAM-type |
- Q.13 Which one of the following statements is not true for marker-assisted selection?
- |  |
|--|
| (A) The ability to manipulate recessive genes and identify the heterozygotes                             |
| (B) A reduction in phenotypic screening and in the number of backcrosses                                 |
| (C) Without the self-fertilization of individual, heterozygotes cannot be identified                     |
| (D) An early detection of superior lines along with the ability to select multiple traits simultaneously |
- Q.14 Following are the symptoms of a disease in potato
- Small, isolated, scattered, pale brown spots on the leaflets
  - The lowest leaves are attacked first and the disease progresses upwards
  - In the necrotic spots, concentric rings appear on the older leaves and darkened areas on the stem
  - There is usually a narrow chlorotic zone around the spots which fades into normal green and increases with an increase in the size of the spots
- Identify the disease, which manifests these symptoms
- |                            |                            |
|----------------------------|----------------------------|
| (A) Early blight of potato | (B) Wart disease of potato |
| (C) Brown rot of potato    | (D) Late blight of potato  |

Q.15 The two important biochemical reactions of nitrogen metabolism are shown below  
 $\text{NO}_2^- + 8\text{H}^+ + 6\text{e}^- \xrightarrow{\text{NADPH}} \text{NH}_4^+ + 2\text{H}_2\text{O}$



Which one of the following pairs of enzymes is correct for the above reactions respectively?

- (A) Nitrite reductase and Glutamate dehydrogenase
- (B) Nitrate reductase and Glutamine synthetase
- (C) Nitrite reductase and Glutamine synthetase
- (D) Nitrite reductase and glutamate synthase

Q.16 The functions of vir D2 protein in plant are

- (A) Nuclear targeting and protection of 5' end of T-DNA
- (B) Sensing phenolic kinase and induction of phosphorylation
- (C) Nicking and processing of T-DNA
- (D) Synthesis of transfer apparatus and regulation of cell cycle

Q.17  $\text{O}_2^{\cdot-} \longrightarrow \text{}^1\text{O}_2 \longrightarrow \text{X} \longrightarrow \text{Y}$

In the given stepwise reduction of  $\text{O}_2$ , choose the correct sequence of 'reactive oxygen species' formed marked as 'X' and 'Y'

- (A)  $\text{}^{\cdot}\text{O}_2 \rightarrow \text{}^{\cdot}\text{OH}$
- (B)  $\text{H}_2\text{O}_2 \rightarrow \text{}^{\cdot}\text{OH}$
- (C)  $\text{}^{\cdot}\text{O}_2 \rightarrow \text{H}_2\text{O}_2$
- (D)  $\text{}^{\cdot}\text{OH} \rightarrow \text{}^{\cdot}\text{O}_2$

Q.18 In a three point test cross  $\text{XYZ}/\text{xyz} \times \text{xyz}/\text{xyz}$ , the following data are obtained:

XYZ	xyz	Xyz	xYZ	XYz	xyZ	XyZ	xYz
476	471	15	18	9	9	1	1

Find out the distance between X and Y genes

- (A) 5 cM
- (B) 3 cM
- (C) 8 cM
- (D) 2 cM

Q.19 – 26 are matching exercises. Choose the correct one from among the alternatives A, B, C and D

Q.19	Group I (Type of interaction)	Group II ( $F_2$ Phenotypic ratio)	
T	Recessive epistasis	1. 12:3:1	
Q	Dominant epistasis	2. 13:3	
R	Duplicate recessive epistasis	3. 9:6:1	
S	Dominant and recessive epistasis	4. 9:3:4	
		5. 9:7	
		6. 15:1	
(A)	(B)	(C)	(D)
P-2	P-4	P-6	P-1
Q-1	Q-1	Q-3	Q-5
R-2	R-5	R-2	R-3
S-5	S-2	S-1	S-4

- Q.20 Group I (Secondary metabolite)**
- P Coniine  
Q Morphine  
R Quinine  
S Chalcone
- (A) (B) (C) (D)  
P-1 P-3 P-2 P-4  
Q-5 Q-4 Q-1 Q-3  
R-3 R-1 R-2 R-6  
S-4 S-2 S-3 S-5
- Group 2 (Precursor)**
1. Tryptophan  
2. Phenylalanine  
3. Lysine  
4. Tyrosine  
5. Ornithine  
6. Agmatine
- Q.21 Group I (Plant product)**
- P Hing  
Q Dalchini  
R Saffron  
S Kattha
- (A) (B) (C) (D)  
P-1 P-4 P-3 P-2  
Q-3 Q-2 Q-1 Q-4  
R-6 R-3 R-6 R-5  
S-4 S-1 S-2 S-3
- Group II (Plant species)**
1. *Cinnamomum zeylanicum*  
2. *Acacia catechu*  
3. *Ferula asafoetida*  
4. *Acacia nilotica*  
5. *Cinnamomum tamula*  
6. *Crocus sativus*
- Q.22 Group I (Enzymes)**
- P Glycogen phosphorylase  
Q Hexokinase  
R Pyruvate carboxylase  
S RuBP carboxylase
- (A) (B) (C) (D)  
P-5 P-4 P-2 P-6  
Q-1 Q-2 Q-1 Q-5  
R-6 R-5 R-3 R-2  
S-3 S-1 S-4 S-1
- Group II (Pathways)**
1. Glycolytic pathways  
2. Calvin cycle  
3. C<sub>3</sub> cycle  
4. C<sub>4</sub> cycle  
5. Glycogenolysis  
6. C<sub>6</sub> cycle

Q.23 Group I (Inflorescence)

- P Raceme
- Q Catkin
- R Cyathium
- S Verticillaster

- |     |     |
|-----|-----|
| (A) | (B) |
| P-1 | P-3 |
| Q-4 | Q-6 |
| R-3 | R-1 |
| S-5 | S-2 |

Group II (Plant genera)

1. *Poinsettia*
2. *Ocimum*
3. *Raphanus*
4. *Calotropis*
5. *Ficus*
6. *Salix*

- |     |     |
|-----|-----|
| (C) | (D) |
| P-2 | P-4 |
| Q-5 | Q-3 |
| R-3 | R-1 |
| S-1 | S-6 |

Q.24 Group I (Hormone)

- P Gibberellin
- Q IAA
- R Cytokinin
- S Ethylene

- |     |     |
|-----|-----|
| (A) | (B) |
| P-6 | P-5 |
| Q-4 | Q-1 |
| R-1 | R-3 |
| S-2 | S-6 |

Group II (Functions)

1. Phototropism and gravitropism
2. Stomatal movement
3. Delay of senescence
4. Combating water deficit
5. Seed germination
6. Ripening of fruits

- |     |     |
|-----|-----|
| (C) | (D) |
| P-3 | P-4 |
| Q-4 | Q-3 |
| R-5 | R-1 |
| S-1 | S-5 |

Q.25 Group I (In vitro problems)

- P Browning of explants
- Q Hyperhydricity of regenerated shoots
- R Low frequency of formation of protoplast colonies
- S Low transformation frequency during biolistic operation

- |     |     |
|-----|-----|
| (A) | (B) |
| P-2 | P-3 |
| Q-3 | Q-2 |
| R-5 | R-4 |
| S-4 | S-6 |

Group II (Remedial measure)

1. Addition of antioxidants in the medium
2. Nurse culture
3. Osmotic pretreatment of tissues
4. Membrane raft culture
5. Decrease agar concentration
6. Depletion of CO<sub>2</sub> in the culture vessel

- |     |     |
|-----|-----|
| (C) | (D) |
| P-1 | P-4 |
| Q-4 | Q-3 |
| R-2 | R-1 |
| S-3 | S-6 |

Q.26	Group I (Plant disease)	Group II (Causal organism)			
	P Bunt of rice	1. <i>Macrophomina phaseolina</i>			
	Q Stem rot of jute	2. <i>Cercospora personata</i>			
	R Leaf rot of rice	3. <i>Tilletia barclayana</i>			
	S Ring rot of potato	4. <i>Xanthomonas oryzae</i>			
		5. <i>Claviceps purpurea</i>			
		6. <i>Corynebacterium septu-mium</i>			
	(A)	(B)	(C)	(D)	
	P-1	P-3	P-2	P-4	
	Q-4	Q-1	Q-5	Q-3	
	R-4	R-5	R-3	R-2	
	S-3	S-6	S-5	S-1	

Linked Answer Questions: Q27a to Q28b carry two marks each

Statement for linked answer questions Q.27a & Q.27b:

In tomato the following genes are located on chromosome 3:

+ tall plant      d dwarf plant  
 + normal leaves    m mottled leaves  
 + smooth fruit    p pubescent fruit

Results of the cross

+++/dmp X dmp/dmp were

+++	430	dmp	452	+mp	45	d++	38
++p	16	dm+	17	+m+	1	d+p	1

Q.27 Which one of the following progeny groups represents double crossovers?

- |               |               |
|---------------|---------------|
| (A) +mp / d++ | (B) ++p / dm- |
| (C) +m+ / d+p | (D) +++ / dmp |

Q.27b What would be the value of coincidence?

- |          |          |
|----------|----------|
| (A) 0.25 | (B) 0.48 |
| (C) 0.66 | (D) 0.82 |

Statement for linked answer questions Q.28a & Q.28b: Two proteins having same molecular weight of 1.92,000 dalton were identified. During post-translational modification one of the protein is phosphorylated.

Q.28a What will be the nature of the band(s) if the mixture of these proteins is separated in electrophoretic gel?

- |                       |                                     |
|-----------------------|-------------------------------------|
| (A) Single band       | (B) Distinct two bands              |
| (C) No band(s) at all | (D) Bands with a number of subunits |

Q.28b For further separation of these two proteins what method one should adopt?

- |                                |                                   |
|--------------------------------|-----------------------------------|
| (A) 2-D gel electrophoresis    | (B) Gel filtration chromatography |
| (C) Native gel electrophoresis | (D) Reverse phase chromatography  |