1 Mark Questions

1. For the formation of embryo sac the functional megaspore undergoes
   (a) three meiotic divisions
   (b) three mitotic divisions
   (c) two mitotic divisions
   (d) two meiotic divisions

2. How many nucleosomes per turn are present in 30 nm chromatin fibre?
   (a) 4 (b) 8
   (c) 6 (d) 10

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

4. The term 'somaclonal variation' was coined by
   (a) Murashige and Skoog
   (b) Karp and Maddock
   (c) Gamborg and Phillips
   (d) Larkin and Scowcroft

5. Storage and transport of lipid occurs in
   (a) glycoxysomes (b) peroxisomes
   (c) lysosomes (d) sphaerosomes

6. The drug morphine is obtained from which plant part of *Papaver somniferum*?
   (a) Leaf (b) Stem
   (c) Capsule (d) Root

7. The floristic regions 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

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

9. Apospory can be defined as
   (a) development of sporophytes on the gametophyte without any reduction division
   (b) development of gametophytes on the sporophyte 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

10. The synonym of the families Labiatae, Umbelliferae Compositae and Gramineae are
    (a) Leguminaceae, Acanthaceae, Asteraceae, Lamiaceae
    (b) Solanaceae, Aricaceae, Apiaceae, Poaceae
    (c) Lamiaceae, Apiaceae, Asteraceae, Poaceae
    (d) Lilliaceae, Cucurbitaceae, Poaceae, Asteraceae

2 Marks Questions

11. The following features outline a system of plant classification
    1. Unisexual flowers are the most primitive within the angiosperms.
    2. Polyphyletic origin of angiosperms.
    3. 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

12. Following are the features of one type of C4 mechanism
1. The mitochondrion is responsible for malate decarboxylation.
2. The mesophyll cell tends to form aspartate rather than malate, from oxaloacetate.
3. Presence of double bundle sheath.

Identify the correct one.
(a) NADP-ME type (b) PCK-type
(c) NAD-ME type (d) CAM-type

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

14. Following are the symptoms of a disease in potato
1. Small, isolated, scattered, pale brown spots on the leaflets.
2. The lowest leaves are attacked first and the disease progresses upwards.
3. In the necrotic spots, concentric rings appear on the older leaves and darkened areas on the stem.
4. There is usually a narrow chlorotic zone around the spots which fades into normal green and increases with an increase in the size of 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

15. The two important biochemical reactions of nitrogen metabolism are shown below

$$NO_2 + 8H + 6e^- \xrightarrow{\text{Enzyme}} NH_4 + 2H_2O$$

$$\text{Glutamate} + NH_3 + ATP + Mg^{2+} \xrightarrow{\text{Enzyme}} \text{Glutamine} + ADP + Pi$$

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

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

17. $O_2 \longrightarrow {}^1O_2 \longrightarrow X \longrightarrow Y$

In the given stepwise reduction of O_2, choose the correct sequence of 'reactive oxygen species' formed marked as X and Y.
(a) $^*O_2 \rightarrow {}^*OH$ (b) $H_2O_2 \rightarrow {}^*OH$
(c) $^*O_2 \rightarrow H_2O_2$ (d) $^*OH \rightarrow {}^*O_2$

18. In a three point test cross XYZ/xyz × xyz/xyz, the following data are obtained

XYZ	xyz	Xyz	xYZ	XYz	xyZ	XyZ	zYz
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. No. 19 to 26 are Matching Exercises
In each question, each item A, B, C and D in Group I matches one of the items in Group II. Choose the correct match from the alternatives (a), (b), (c) and (d).

19.

Group I (Type of Interaction)	Group II (F_2 Phenotypic Ratio)
A. Recessive epistasis	1. 12 : 3 : 1
B. Dominant epistatis	2. 13 : 3
C. Duplicate recessive epistatis	3. 9 : 6 : 1
D. Dominant and recessive epistatis	4. 9 : 3 : 4
	5. 9 : 7
	6. 15 : 1

Codes

	A	B	C	D
(a)	2	1	2	5
(c)	6	3	2	1

	A	B	C	D
(b)	4	1	5	2
(d)	1	5	3	4

20.

Group I (Secondary Metabolite)	Group II (Precursor)
A. Coniine	1. Tryptophan
B. Morphine	2. Phenylalanine
C. Quinine	3. Lysine
D. Chalcone	4. Tyrosine
	5. Ornithine
	6. Agmatine

Codes

	A	B	C	D
(a)	1	5	3	4
(b)	3	4	1	2
(c)	2	1	2	3
(d)	4	3	6	5

21.

Group I (Plant Product)	Group II (Plant Species)
A. Heeng	1. *Cinnamomum zeylanicum*
B. Dalchini	2. *Acacia catechu*
C. Saffron	3. *Ferula asafoetida*
D. Kattha	4. *Acacia nilotica*
	5. *Cinnamomum tamala*
	6. *Crocus sativus*

Codes

	A	B	C	D
(a)	1	3	6	4
(b)	4	2	3	1
(c)	3	1	6	2
(d)	2	4	5	3

22.

Group I (Enzyme)	Group II (Pathway)
A. Glycogen phosphorylase	1. Glycolytic pathway
B. Hexokinase	2. Calvin cycle
C. Pyruvate carboxylase	3. C_3 cycle
D. *RuBP* carboxylase	4. C_4 cycle
	5. Glycogenolysis
	6. C_6 cycle

Codes

	A	B	C	D
(a)	5	1	6	3
(b)	4	2	5	1
(c)	2	1	3	4
(d)	6	5	2	1

23.

Group I (Inflorescence)	Group II (Plant Genera)
A. Raceme	1. *Poinsettia*
B. Catkin	2. *Ocimum*
C. Cyathium	3. *Raphanus*
D. Verticillaster	4. *Calotropis*
	5. *Ficus*
	6. *Salix*

Codes

	A	B	C	D
(a)	1	4	3	5
(b)	3	6	1	2
(c)	2	5	3	1
(d)	4	3	1	6

24.

Group I (Hormone)	Group II (Function)
A. Gibberellin	1. Phototrophism and gravitrophism
B. IAA	2. Stomatal movement
C. Cytokinin	3. Delay of senescence
D. Ethylene	4. Combating water deficit
	5. Seed germination
	6. Ripening of fruits

Codes

	A	B	C	D
(a)	6	4	1	2
(b)	5	1	3	6
(c)	3	4	5	1
(d)	4	3	1	5

25.

Group I (*In vitro* Problem)	Group II (Remedial Measure)
A. Browing of explants	1. Addition of antioxidants in the medium
B. Hyperhydricity of regenerated shoots	2. Nurse culture
C. Low frequency of formation of protoplast colonies	3. Osmotic pre treatment of tissues
D. Low transformation frequency during biolistic operation	4. Membrane raft culture
	5. Decrease agar concentration
	6. Depletion of CO_2 in the culture vessel

Codes

	A	B	C	D
(a)	2	3	5	4
(b)	3	2	4	6
(c)	1	4	2	3
(d)	4	3	1	6

26.

Group I (Plant Disease)	Group II (Causal Organism)
A. Bunt of rice	1. *Macrophomina phaseolina*
B. Stem rot of jute	2. *Cercospora personata*
C. Ergot of rye	3. *Tilletia barclayana*
D. Ring rot of potato	4. *Xanthomonas oryzicola*
	5. *Claviceps purpurea*
	6. *Corynebacterium sepidonicum*

Codes

	A	B	C	D
(a)	1	4	4	3
(b)	3	1	5	6
(c)	2	5	3	5
(d)	4	3	2	1

Statement for Linked Answer Questions 27 and 28

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

Result of the cross

+ + +/dmp × dmp/dmp were,

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

27. Which one of the following progeny groups represents double crossovers?
(a) +mp/d++ (b) ++p/dm+
(c) +m+/d+p (d) +++/dmp

28. What would be the value of coincidence?
(a) 0.25 (b) 0.48
(c) 0.66 (d) 0.82

Statement for Linked Answer Questions 29 and 30

Two proteins having same molecular weight of 1,92,000 dalton were identified. During post-translational modification one of the protein is phosphorylated.

29. 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

30. 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