

K: Botany

Q. 1 – Q. 6 carry one mark each.

- Q.1 Availability of free energy is maximum in which of the following trophic levels?
- (A) Producers (B) Decomposers
(C) Herbivores (D) Secondary consumers
- Q.2 From the given statements identify the *INCORRECT* one.
- (A) GA involves in flowering
(B) Ethylene is produced during ripening of the seeds
(C) Auxin helps in cell elongation and formation of root
(D) Cytokinin helps in embryo development and prevent leaf senescence
- Q.3 The correct equation for the reduction of nicotinamide adenine dinucleotide phosphate is
- (A) $\text{NADP}^+ + 2\text{H}^+ \rightarrow \text{NADPH}^+ + \text{H}^+$
(B) $\text{NADP}^+ + \text{H}^+ + \text{e}^- \rightarrow \text{NADPH}$
(C) $\text{NADP}^+ + \text{H}^+ + 2\text{e}^- \rightarrow \text{NADPH}$
(D) $\text{NADP}^+ + 2\text{H}^+ + 2\text{e}^- \rightarrow \text{NADPH}_2$
- Q.4 Which of the following factors is critical for haploidy induction?
- (A) Presence of optimum levels of auxin and cytokinin in the medium
(B) Treatment of donor plants with phytohormones
(C) Use of colchicine in the medium
(D) Induction and proliferation of callus from anther culture
- Q.5 Gene transfer method: Choose the correct answer.
- (A) *Agrobacterium*-mediated transformation was developed by E. C. Cocking
(B) Biolistic transformation was first developed by J. C. Sanford
(C) Protoplast transformation was first reported by I. Potrykus
(D) Pollen tube transformation was demonstrated by Oifa Zhang
- Q.6 Identify the mismatch tissue.
- (A) Periderm (B) Phelloderm
(C) Phellem (D) Pallisade

Q. 7 – Q. 24 carry two marks each.

- Q.7 Find out the correct statements for Linnaeus system of classification.
- P It is also known as artificial-sexual system of classification
 Q It was published in the name of "*Genera Plantarum*"
 R In this system plants belonging to widely distant natural groups are placed under one order of a class
 S In this system Gymnospermae and Angiospermae are placed in two taxa of equal ranks
- (A) P, Q (B) Q, R
 (C) R, S (D) P, R
- Q.8 Which of the following statements are true in case of fluid-mosaic model cell membranes.
- P Between 5-8 nm thick and appear trilaminar when viewed in cross section under electron microscope
 Q Less than 1 nm thick and consist of a layer of protein sandwiched between two layers of phospholipids
 R In the lipid bilayer, proteins are embedded at irregular intervals and held by hydrophilic interactions between lipids and hydrophilic domains of the proteins
 S The protein domains exposed on one side of the lipid bilayer are different from those exposed on the other side
- (A) P, Q (B) P, S
 (C) Q, S (D) P, R
- Q.9 Identify the correct statements.
- P Bundle sheath containing chloroplast present in C_4 plants
 Q Annual rings differentiate into barks and woods
 R Sap wood is important for biological functions and heart wood is economically important as it contains gums, resins, oils, tannins, etc.
 S Clonal propagation leads to somaclonal variation
- (A) P, Q (B) Q, R
 (C) R, S (D) P, R
- Q.10 Which of the following statements are true on ecological point of view?
- P 'Pyramid of numbers' can sometimes be inverted
 Q Standing crop is not a reliable measure of productivity
 R Primary productivity should always be calculated on dry matter rather than on fresh biomass
 S The total solar energy trapped in the food material by photosynthesis is referred to as net primary production
- (A) P, Q (B) Q, R (C) R, S (D) P, R

Q.11 Identify the wheat disease based on the following given symptoms.

- The disease appears when the ears emerge in plants
- Diseased ears emerge out of the boot leaf a little earlier than the healthy ones
- Black powdery mass of spores replace the flowers
- The growth of the plant and its general appearance is not affected

(A) Loose smut of wheat
(B) Flag smut of wheat
(C) Black rust of wheat
(D) Powdery mildew of wheat

Q.12 Identify the correct statements from the following with respect to improvement of shelf-life of fruits and vegetables.

- P It should be cooled immediately to slow down the respiration process
Q The air of the store chamber should pass through charcoal to absorb the ethylene produced during the ripening process
R It should be treated immediately with silver nitrate and cobalt chloride
S It should be treated with the low concentration of biotin and nicotinic acid for prolonged preservation

(A) P, R (B) P, Q (C) Q, R (D) P, S

Q.13 Heterosis helps in crop improvement. Identify the correct statements.

- P Parental lines improvement by diversification of *cms* and restorer sources for higher yield
Q Development of fortified food to satisfy market demand
R Improved hybrid crop developed for dual function – salinity tolerance and fungal resistance
S Reciprocal crosses of an improved isogenic line for a better yield

(A) Q, S (B) P, S (C) P, Q (D) P, R

Q.14 Identify the correct statements.

- P Xylogenesis is defined as the differentiation of parenchyma into specialized xylary cell
Q First anther culture was reported by Guha and Maheshwari
R Totipotency was reported by Sundarland
S *In vitro* fertilization reported by Hofmeister

(A) P, S (B) P, Q
(C) P, R (D) R, S

Q.15 Encapsulated somatic embryo in alginate beads produce artificial seeds. Identify the correct statements.

- P Artificial seed is a genetically modified agricultural product
 Q Artificial seed is a patented product for pharmaceutical industry
 R Artificial seeds can be stored and transferred to soil for germination
 S Somatic embryo of single cell origin produce genetically uniform plants

(A) P, S (B) P, Q (C) Q, R (D) R, S

Q. 16-22 are matching exercises.

Choose the correct one from the alternatives A, B, C and D.

Q.16 **Group I (Name of the Fungus)** **Group II (Class)**

- | | | | |
|---|------------------------|----|----------------|
| P | <i>Agaricus sp.</i> | 1. | Ascomycetes |
| Q | <i>Pilobolus sp.</i> | 2. | Deuteromycetes |
| R | <i>Neurospora sp.</i> | 3. | Phycomycetes |
| S | <i>Rhizoctonia sp.</i> | 4. | Actinomycetes |
| | | 5. | Basidiomycetes |
| | | 6. | Zygomycetes |

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

Q.17 **Group I (Biological activity)** **Group II (Chemical compound)**

- | | | | |
|---|------------------------------|----|--------------------|
| P | Antibacterial and antifungal | 1. | Hypericin |
| Q | Antibacterial not antifungal | 2. | Aspergillitic acid |
| R | Antifungal not antibacterial | 3. | Fulvic acid |
| S | Antiviral | 4. | Ustalagic acid |
| | | 5. | Abscisic acid |
| | | 6. | Terramycin |

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

Q.18 **Group I (Common name)**

- P Garden bean
 Q Oat
 R Cashew nut
 S Carrot

Group II (Scientific name)

1. *Raphanus sativus*
2. *Phaseolus vulgaris*
3. *Brassica oleracea*
4. *Anacardium occidentale*
5. *Daucus carota*
6. *Avena sativa*

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

Q.19 **Group I**

- P Insect resistant cotton
 Q Golden rice
 R 'Flavr-Savr' tomato
 S Herbicide tolerant soyabean

Group II

1. Bt
2. Round up
3. 2,4-D
4. Carotenoids
5. Ferritin
6. ACC-deaminase

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

Q.20 **Group I**

- P Funiculus
 Q Seed coat dormancy
 R Reserve food stored in endosperm
 S Vivipary germination

Group II

1. Pea pod
2. Coconut
3. Rice seed
4. *Erycibe*
5. Malvaceae
6. *Rhizophora*

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

Q.21 Group I

- P Chromosome cycle
 Q G₁ phase
 R Salt glands
 S Tunica-carpus

Group II

- Interval between mitosis and DNA replication
- Helps in removing the excess salts
- Behavior of the cell as they grow and divide
- Organization of apical meristem based on a single apical cell
- Concept of tissue differentiation at shoot apical meristem
- Replication and partitioning of the genome into two daughter cells

(A)

P - 1
 Q - 6
 R - 3
 S - 4

(B)

P - 2
 Q - 1
 R - 6
 S - 5

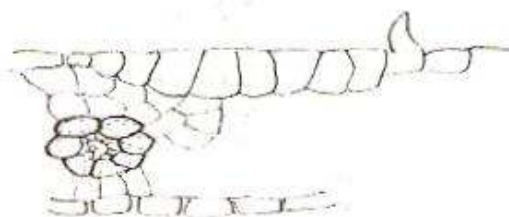
(C)

P - 3
 Q - 6
 R - 4
 S - 5

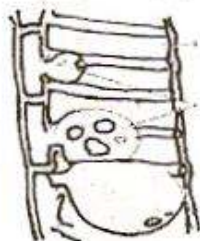
(D)

P - 6
 Q - 1
 R - 2
 S - 5

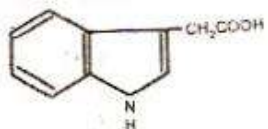
Q.22 Group I



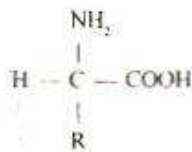
(P)



(Q)



(R)



(S)

- Amino acid
- Glucose
- IAA
- Bulliform cells
- Tyloses
- Kinetin

(A)

P - 5
 Q - 4
 R - 6
 S - 3

(B)

P - 4
 Q - 5
 R - 3
 S - 1

(C)

P - 5
 Q - 4
 R - 2
 S - 3

(D)

P - 4
 Q - 5
 R - 3
 S - 6

Common Data Questions

Common Data for Questions 23, 24:

A researcher studied three independently assorting genes in a plant. Each gene has a dominant and a recessive allele. T: tall plant, t: dwarf plant; W: purple flower, w: white flower; C: full pods, c: constricted pods. A cross was conducted between



- Q.23 How many different kinds of F_1 gametes would be expected from the above cross?
 (A) 2 (B) 4 (C) 8 (D) 16
- Q.24 How many different kinds of F_2 genotypes would be expected from the above cross?
 (A) 8 (B) 9 (C) 16 (D) 27

Linked Answer Questions: Q. 25 to Q. 28 carry two marks each.

Statement for Linked Answer Questions 25 & 26:

Enzyme [E] reacts with substrate [S] to form an [ES] complex at normal temperature to produce the product. In the presence of inhibitor the rate of reaction changes.

- Q.25 Which of the following statements are **INCORRECT** about enzyme-mediated reaction in presence of inhibitor?
- P Competitive inhibition causes rise in K_m value without altering V_{max}
 Q Noncompetitive inhibition causes decrease in V_{max} and rise in K_m
 R Uncompetitive inhibition causes decrease in V_{max} without altering K_m
 S Uncompetitive inhibition is rare and causes a decrease in both V_{max} and K_m
- (A) P, Q (B) Q, R
 (C) P, R (D) P, S
- Q.26 Identify the correct expression for noncompetitive and competitive inhibition.
- | | Slope | Intercept on ordinate |
|---|-------------------------|-----------------------|
| P | $K_m/V_{max} (1+I/K_i)$ | $1/V_{max} (1+I/K_i)$ |
| Q | $K_m/V_{max} (1+I/K_i)$ | $1/V_{max}$ |
| R | K_m/V_{max} | $1/V_{max} (1+I/K_i)$ |
| S | K_m/V_{max} | $1/V_{max}$ |
- (A) P, S (B) R, S (C) P, Q (D) Q, R

Statement for Linked Answer Questions 27 & 28:

Economically important plants are known for their commercial products and recognized with scientific names.

- Q.27 From the given common names, identify sequentially the scientific names of the following plants.

Common names: Cotton, Peanut, Sarpagandha and Tea

- P *Camellia sinensis*
Q *Arachis hypogea*
R *Rauwolfia serpentina*
S *Gossypium arboreum*

- (A) P, Q, R, S
(B) S, R, Q, P
(C) S, Q, R, P
(D) S, P, Q, R

- Q.28 Identify the most important commercial products from the above mentioned plants. (Follow the sequence of the common names)

- P Vegetable Oil
Q Fibre
R Alkaloid
S Beverage

- (A) Q, P, R, S
(B) S, Q, R, P
(C) Q, R, P, S
(D) R, Q, P, S

END OF THE SECTION

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