

K: Botany

Q. 1 – Q. 6 carry one mark each.

Q.1 Penicillin functions as antibiotic mainly by inhibiting the ability of some bacteria to

- (A) Form spores
- (B) Replicate DNA
- (C) Synthesize normal cell wall
- (D) Produce functional ribosome

Q.2 Glyoxylate cycle is used for generating

- (A) Cyclic adenosine monophosphate
- (B) Precursors for synthesis of aromatic amino acids
- (C) 4-carbon intermediates when cells grow on acetate
- (D) 4-carbon intermediates during growth on hexose

Q.3 Agar-agar is produced by

- (A) *Gelidium*, *Gracilaria* and *Gigartina*
- (B) *Lamanaria*, *Lessonia* and *Eisenia*
- (C) *Gelidium*, *Batrachospermum* and *Polysiphonia*
- (D) *Polysiphonia*, *Batrachospermum* and *Sargassum*

Q.4 Which of the following pair of tissues has cell walls thickened with lignin?

- (A) Collenchyma and cork
- (B) Collenchyma and sclerenchyma
- (C) Sclerenchyma and cork
- (D) Sclerenchyma and xylem

Q.5 Identify the mismatched compound

- (A) Pectin
- (B) Gum
- (C) Cutin
- (D) Agar

Q.6 The second law of thermodynamics is represented by

- (A) Energy pyramid
- (B) Number pyramid
- (C) Food pyramid
- (D) Biomass pyramid

Q. 7 – Q. 24 carry two marks each.

Q.7 In Krebs cycle which of the following enzyme reactions release CO₂?

- P Malate dehydrogenase
- Q Succinate dehydrogenase
- R Isocitrate dehydrogenase
- S α -ketoglutarate dehydrogenase

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

Q.8 Which of the following statements are features of fasciculated root?

- P An interesting tuberous root found in *Asparagus*
- Q The adventitious roots occur in clusters and all are swollen
- R It is fusiform with abrupt tapering towards the lower end
- S The roots grow from the base of the plumules

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

Q.9 Consider a cross between plants heterozygous for two different genes ($AaBb \times AaBb$), each assorting independently. What fraction of progeny will show the recessive phenotype for at least one gene?

(A) 1/16 (B) 9/16 (C) 7/16 (D) 3/16

Q.10 Global warming is due to excessive emission of

- P Carbon dioxide
- Q Oxides of nitrogen
- R Oxides of sulphur
- S Hydrogen sulphide

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

Q.11 A disease free tomato plant was planted in soil contaminated with *Agrobacterium tumefaciens* harboring Ti plasmid that lacks *VirA* gene. Provided all other conditions are optimum for the bacterial infection, identify the appropriate consequence

- P Octopine synthesis by the bacterium will enhance
- Q Acetylsyringone receptor will not be synthesized
- R The bacteria will fail to transfer the T DNA to the plant
- S A fragmented T-DNA will be transferred to the tomato plant

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

Q.12 Identify the correct statements for plantibodies

- P Plantibodies are antibodies generated by bacteria
- Q Plantibodies are pre made antibodies that are produced in transgenic plants
- R Plantibodies can not uncoat the calcium ion binding sites on the coat protein of the virus
- S Plantibodies are toxins produced by plants

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

- Q.13 Following is a DNA fragment isolated from the beginning of a gene. Identify the correct mRNA sequence with proper polarity.

DNA sequence: -CCC TAC GCC TTT CAG GTT-
-GGG ATG CGG AAA GTC CAA-

- (A) 3' AUG CGG AAA GUU CAA 5'
(B) 5' AUG CGG AAA GUC CAA 3'
(C) 5' UAC GCC UUU GUC CAA 3'
(D) 3' UAC GCC UUU GAG GAA 5'
- Q.14 *Achyranthus aspera* and *Delphinium staphisagria* belong to the following families
- (A) Amaranthaceae and Rutaceae
(B) Amaranthaceae and Ranunculaceae
(C) Amaranthaceae and Tiliaceae
(D) Tiliaceae and Ranunculaceae
- Q.15 Active transport of ions across the membrane of a root hair cell can be assumed to be taking place if
- P The cell produces more glutathione
Q The cell has mitochondria
R The uptake of ions stop when cyanide is added
S The uptake of ions is against the concentration gradient

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

Q 16-22 are matching exercises.

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

- | Q.16 | Group I (Plant disease) | Group II (Causal organism) |
|------|----------------------------|----------------------------------|
| P | Nigrospora disease of rice | 1. <i>Ustilago nuda</i> |
| Q | Loose smut of wheat | 2. <i>Cercospora concors</i> |
| R | Ring spot of sugarcane | 3. <i>Septoria tritici</i> |
| S | Leaf blotch of wheat | 4. <i>Pyricularia oryzae</i> |
| | | 5. <i>Leptosphaeria sacchari</i> |
| | | 6. <i>Nigrospora oryzae</i> |
| (A) | (B) | (C) |
| P-6 | P-6 | P-6 |
| Q-1 | Q-1 | Q-4 |
| R-3 | R-4 | R-3 |
| S-2 | S-3 | S-2 |

Q.17 Group I (Fungal toxin)

- P Tabtoxin
Q Phascolotoxin
R Tentotoxin
S Hv toxin

Group II (Causal disease)

1. Canker
2. Leaf blight
3. Chlorosis
4. Halo blight
5. Wild fire
6. Wheat rust

(A)

P-1

Q-2

R-3

S-6

(B)

P-5

Q-4

R-3

S-2

(C)

P-2

Q-4

R-6

S-3

(D)

P-4

Q-5

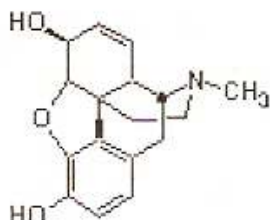
R-6

S-1

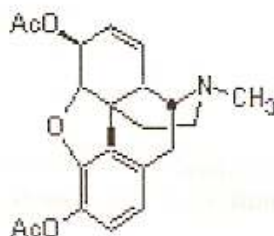
Q.18 Identify the compounds from the given structure

Group I (Structure)

P



Q



Group II (Alkaloids)

1. Morphine
2. Vincristine
3. Heroin
4. Cocaine

(A)

P-1

Q-2

(B)

P-4

Q-3

(C)

P-3

Q-1

(D)

P-1

Q-3

Q.19 Group I

- P Filamentous fungi
Q Gram staining of bacteria
R Agarose gel
S Amino acid

Group II

1. Malachite green
2. Silver staining
3. Lactophenol-cotton blue
4. Crystal violet-safranin
5. Ethyidium bromide
6. Ninhydrin reagent

(A)

P-2

Q-4

R-5

S-1

(B)

P-3

Q-6

R-2

S-5

(C)

P-6

Q-1

R-3

S-2

(D)

P-3

Q-4

R-5

S-6

Q.20 Group I

- P Polysymbiosis
- Q Helotism
- R Mycobiont
- S Crustose lichen

(A)

P-1

Q-2

R-3

S-4

(B)

P-4

Q-6

R-2

S-5

Group II

1. Algal component of a lichen
2. Fungal component of a lichen
3. Pendant forms
4. A combination of algae, fungi and nitrogen fixing bacteria in a lichen thallus
5. Lichen which form a crust closely adpressed to the substrate
6. A partnership between two organisms in which the association is decided at the expense of one

(C)

P-2

Q-6

R-3

S-4

(D)

P-6

Q-5

R-1

S-3

Q.21 Group I (Meiosis I)

P Zygonema

Q Diplonema

R Dikinesis

S Metaphase I

(A)

P-6

Q-2

R-4

S-5

(B)

P-1

Q-2

R-5

S-4

Group II (Event)

1. Nucleolus and nuclear membrane disappear
2. Replicated chromosomes become visible
3. Assembly of spindle completed
4. Chromatids become fully visible, chiasmata becomes visible
5. Homologous chromosomes pair, crossing over occurs
6. Homologous chromosomes pair

(C)

P-5

Q-2

R-1

S-6

(D)

P-6

Q-4

R-1

S-3

Q.22 Group I (Stress-induced biomolecules)

P Phytochelatin

Q Scytonemin

R Proline

S Chaperonin

(A)

P-2

Q-5

R-6

S-1

(B)

P-3

Q-4

R-6

S-2

Group II (Stress)

1. Heat shock
2. Phosphate limitation
3. Carbon limitation
4. Metal stress
5. UV radiation
6. Osmotic stress

(C)

P-4

Q-5

R-6

S-1

(D)

P-1

Q-6

R-4

S-3

- Q.20 **Group I**
 P Polysymbiosis
 Q Helotism
 R Mycobiont
 S Crustose lichen

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

- Q.21 **Group I (Meiosis I)**
 P Zygonema
 Q Diplonema
 R Dikinesis
 S Metaphase I

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

- Q.22 **Group I (Stress-induced biomolecules)**
 P Phytochelatin
 Q Scytonemin
 R Proline
 S Chaperonin

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

- Group II**
 1. Algal component of a lichen
 2. Fungal component of a lichen
 3. Pendant forms
 4. A combination of algae, fungi and nitrogen fixing bacteria in a lichen thallus
 5. Lichen which form a crust closely adpressed to the substrate
 6. A partnership between two organisms in which the association is decided at the expense of one

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

- Group II (Event)**
 1. Nucleolus and nuclear membrane disappear
 2. Replicated chromosomes become visible
 3. Assembly of spindle completed
 4. Chromatids become fully visible, chiasmata becomes visible
 5. Homologous chromosomes pair, crossing over occurs
 6. Homologous chromosomes pair

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

Group II (Stress)

- Heat shock
- Phosphate limitation
- Carbon limitation
- Metal stress
- UV radiation
- Osmotic stress

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

Common Data Questions

Common Data for Questions 23, 24:

Nucleotide composition of four molecules is given below:

Molecule	% A	% G	% T	% U	% C
P	33	17	33	0	17
Q	33	33	17	0	17
R	26	24	0	26	24
S	30	20	0	20	30

Q.23 From the above table identify the single stranded RNA molecule

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

Q.24 From the above data find out the double stranded nucleic acid molecule with the lowest T_m

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

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

Statement for Linked Answer Questions 25 & 26:

Sucrose and maltose are two disaccharides which have the glycosidic linkages and play important role in living system.

Q.25 Which of the following combinations represent the correct structure of maltose and sucrose?

- (A) O- α -D glucopyranosyl-(1 \rightarrow 4)- β -D-glucopyranose and
O- β -D-galactopyranosyl-(1 \rightarrow 4)- β -D-glucopyranose
- (B) O- β -D-fructofuranosyl-(2 \rightarrow 1)- α -D glucopyranoside and
O- β -D-galactopyranosyl-(1 \rightarrow 4)- β -D-glucopyranose
- (C) O- α -D glucopyranosyl-(1 \rightarrow 4)- β -D-glucopyranose and
O- β -D-fructofuranosyl-(2 \rightarrow 1)- α -D glucopyranoside
- (D) O- α -D glucopyranosyl-(1 \rightarrow 6)- β -D-glucopyranose and
O- β -D-fructofuranosyl-(2 \rightarrow 1)- α -D glucopyranoside

- Q.26 From the above structure, identify the correct statement for the reducing sugars
- (A) Maltose is a reducing sugar because the second glucose possesses anomeric carbon atom and its ring can open to give an aldehyde, and sucrose is non-reducing as it has anomeric hydroxyl of α -D glucose which is condensed with the anomeric hydroxyl of β -D-fructose
 - (B) Maltose is a non-reducing sugar as it has anomeric hydroxyl of α -D glucose which is condensed with β -D-fructose, and sucrose is non reducing because the second glucose possesses anomeric carbon atom and its ring can open to give an aldehyde
 - (C) Maltose and sucrose are insoluble in water and thus non-reducing
 - (D) The formation of a glycosidic bond is a condensation reaction in which water molecule is produced which makes the compound non-reducing

Statement for Linked Answer Questions 27 & 28:

The plant *Arabidopsis thaliana* has five pairs of chromosomes AA, BB, CC, DD and EE and the plant is self fertilized.

- Q.27 Identify the correct chromosomal complement present in the root cells of the offspring
- (A) A B C D E
 - (B) AAAA BBBB CCCC DDDD EEEE
 - (C) AA BB CC DD EE
 - (D) AAA BBB CCC DDD EEE
- Q.28 If the offsprings are selfed, identify the correct genotype of pollen mother cell of F_2 generation
- (A) AAAA BBBB CCCC DDDD EEEE
 - (B) AA BB CC DD EE
 - (C) A B C D E
 - (D) AAA BBB CCC DDD EEE