J : BOTANY

Q.1 – Q.10 carry one mark each.

Q.1. When changes in the phenotype or gene expression occur without changes in the underlying DNA sequence, the phenomenon is called

(A) Mutation (B) Eugenics (C) Epigenetics (D) Epistasis

Q.2. A population growing exponentially can be described by the differential equation $dN/dt = rN$, where dN/dt represents the rate at which the whole population grows, N is the size of the population, r is the intrinsic rate of increase, and t is time. According to this equation, the per capita rate of growth is

(A) Highest at large N
(B) Constant
(C) Lowest at large N
(D) Highest at small N

Q.3. Which one of the following is **NOT** a plant hormone?

(A) Abscisic acid (B) Brassinosteroid (C) Ethylene (D) Cytokine

Q.4. *Arabidopsis* and rice have diploid chromosome numbers of 10 and 24, respectively. Assuming no crossing over taking place, genetic variation among F_2 individuals in a genetic cross is likely to be

(A) Same in both species but not zero
(B) More in *Arabidopsis*
(C) More in rice
(D) Zero in both the species

Q.5. Which of the following statements is **CORRECT**?

(A) Plants adapted to cold environment have **higher** ratio of "unsaturated to saturated" fatty acids in their membrane compared to those adapted to hot environment
(B) Plants adapted to cold environment have **lower** ratio of "unsaturated to saturated" fatty acids in their membrane compared to those adapted to hot environment
(C) Plants adapted to cold environment have **same** ratio of "unsaturated to saturated" fatty acids in their membrane compared to those adapted to hot environment
(D) Plants do not have any unsaturated fatty acids in the membrane

Q.6. A sign is hammered into a tree trunk 2 meters above the tree's base. If the tree is 10 meters tall and elongates 1 meter each year, how high will the sign be after 10 years?

(A) 12 meters (B) 7 meters (C) 4 meters (D) 2 meters

Q.7. In the arrangement of floral parts in a bud, identify the **INCORRECT** statement

(A) Valvate: where the petals or sepals do not overlap but simply touch one another by their Margins
(B) Scabrous: petals rough and harsh to touch
(C) Epicalyx: an extra calyx found in some flowers outside the calyx
(D) Imbricate: where sepals and petals overlap each other at the margin

Q.8. The possible genotypes of endosperms borne on a heterozygous (Rr) plant will be

(A) RRR, RRr, Rrr, rrr
(B) RRr, Rrr
(C) RR, Rr, rr
(D) Rr

Q.9. The amount of chemical energy available to consumers in an ecosystem is best represented by

(A) Gross primary production
(B) Net primary production
(C) Respiration
(D) Photosynthesis

Q.10. Free radical scavenging activity of a medicinally important plant extract can be quantified by

(A) ABTS (2.2'-azino-bis-(3-ethyl benzothiozoline-6-sulphonic acid)) method
(B) Bradford method
(C) Walkley and Black method
(D) Kjeldahl method

Q.11 – Q.20 carry two marks each.

Q.11. Identify the **CORRECT** statements from the following

P. Lenticels are the small pores present on the surface of the stem or branches of woody plants
Q. Glyoxysomes contain chlorophyll molecules in their thylakoid membranes
R. The enzyme ribulose 1, 5 bisphosphate carboxylase is otherwise known as carboxydehydratase
S. 18 ATP and 12 NADPH molecules are utilized for fixing 6 molecules of CO_2 in the dark reaction of photosynthesis

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

Q.12. Match the following

Group I	Group II	Group III
P. Sorghum	1. Gossypol	i. Protein
Q. Castor	2. Strychnine	ii. Glycosidic conjugate
R. Mushroom	3. Dhurrin	iii. Alkaloid
S. Cotton	4. Bungarotoxin	iv. Polyphenol
	5. Ricin	v. Lipid
	6. α-Amanitin	vi. Cyclic peptide

(A) P-3-ii, Q-5-i, R-6-vi, S-1-iv
(B) P-2-iii, Q-4-iv, R-1-ii, S-6-v
(C) P-2-vi, Q-5-v, R-1- iv, S-6-ii
(D) P-2-i, Q-3-iii, R-4-iv, S-1-v

Q.13. Identify the correct match

Group I (Anther)

P

Q

R

S

Group II (Type of fixation)

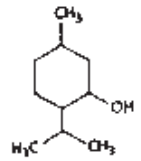
1 Basified
2 Longitudinal
3 Dorsifixed
4 Adenate
5 Porous
6 Versatile

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

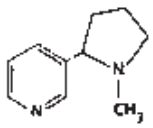
Q.14. From the structures given below, identify the compounds

Group I (Structure)

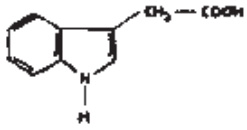
P



Q



R



S

$CH_2 = CH_2$

Group II (Compound)

1 Ethylene
2 Indole butyric acid
3 Nicotine
4 Indole acetic acid
5 Gibberellic acid
6 Menthol

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

Q.15. Regarding the relationships between two organisms in an ecosystem, match the following

Group I (Relationship)

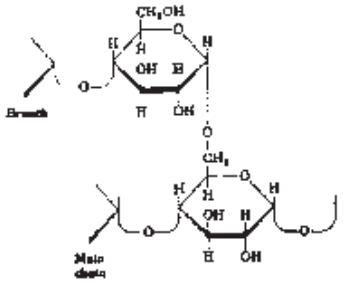
P. Commensalism
Q. Mutualism
R. Parasitism
S. Amensalism

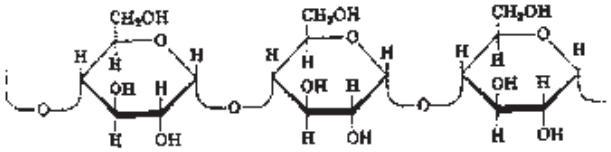
Group II (Definition)

1 Both organisms are benefited
2 One impeding the success of the other
3 One organism benefits but the other is unaffected
4 One benefited, other is harmed

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

Q.16. Name the structures given below in the order of their appearance and identify corresponding glycosidic linkages





(A) Amylose, Cellulose; (α1→4), (β1→6)
(B) Cellulose, Dextran; (β2→4), (α3→6)
(C) Starch, Cellulose; (α1→6), (α1→4)
(D) Amylopectin, Amylose; (α1→6), (α1→4)

Q.17. Identify the **CORRECT** statements

In *Arabidopsis*, vernalization is associated with

P. Chromatin modification at the *FLC* (*FLOWERING LOCUS C*) locus
Q. Degradation of the FLC protein
R. Inactivating the FLC protein by post-translational modification
S. Down-regulation of *FLC* transcript

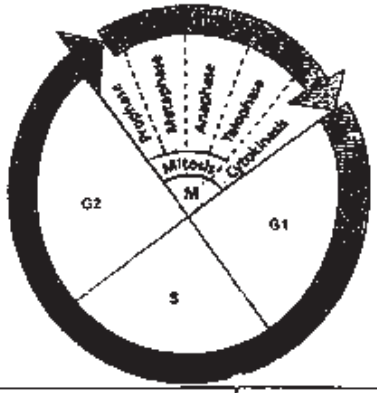
(A) Q, S (B) P, S (C) P, R (D) Q, R

Q.18. Which of the following statements in plant respiration are **CORRECT**?

P. The oxidative Pentose Phosphate Pathway can accomplish the oxidation of glucose in the stroma of mitochondria
Q. ATP is produced in the reaction step of TCA cycle catalyzed by succinyl CoA synthatase
R. In addition to Cytochrome *c* oxidase, an alternative oxidase enzyme resistant to cyanide reduces oxygen molecule in the electron transport system
S. In Glyoxylate cycle acetyl CoA reacts with citrate to form α-keto glutarate

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

Q.19. Study the following diagram depicting the plant cell cycle and match the following



Stages of cell cycle	Type of cyclin
P. Late G1-phase	1. Cyclin B
Q. Beginning of S-phase	2. Cyclin E
R. Prior to mitotic phase	3. S-Cyclin
S. Early G1-phase	4. Cyclin D

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

Q.20. In the context of plant development, which of the following statements are **CORRECT**?

P. Cell migration is absent
Q. Apoptosis plays a major role
R. Pattern formation continues throughout life
S. Homeotic changes are caused by mutations in non-homeodomain proteins

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

END OF SECTION – J