M : BOTANY

Q. 1 – Q. 6 carry one mark each.

Q.1 C_4 photosynthesis is a biochemical and structural syndrome that enhances

(A) Concentration of CO_2 in the bundle sheath cells
(B) Photorespiration
(C) Requirement of water and nitrogen
(D) Lower radiation use efficiency

Q.2 Pioneering work conducted in green revolution

(A) C. Subramanium
(B) M. S. Swaminathan
(C) E. C. Cocking
(D) Norman Bourlag

Q.3 'Bordeaux mixture' contains

(A) Copper nitrate and ferric chloride
(B) Copper sulphate and slaked lime
(C) Copper sulphate and ferric chloride
(D) Ferric chloride and slaked lime

Q.4 The 'Kornberg's enzyme' is now known as

(A) DNA polymerase III
(B) DNA polymerase II
(C) DNA polymerase I
(D) DNA ligase

Q.5 Genome sequencing of rice will help to

(A) Characterize genes present in the rice genome
(B) Validate the genes available in other plants
(C) Control agri-business
(D) Control rice germplasm

Q.6 Identify the correct statement

(A) Cytokinin does not regulate cell division in plants
(B) Kinetin was discovered as a breakdown product of DNA
(C) Osmotic adjustment of cells does not help water balance in plants
(D) Cytokinin enhances leaf senescence

Q. 7-Q. 24 carry two marks each.

Q.7 Identify the correct statements

P Caryopsis, one-seeded dry indehiscent fruit of Gramineae
Q Lithocyst, a cell containing starch
R Aleurone layer contains protein granules and enzymes
S Embryo development is not of a single cell origin

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

Q.8 NADH $\rightarrow$ Q $\rightarrow$? $\rightarrow$ Cyt$c_1 \rightarrow$? $\rightarrow$ Cyt $_{(a + a_3)} \rightarrow O_2$

Sequence of electron transfer in oxidative phosphorylation is given above. Complete the missing sequence

(A) Cyt*a* and Cyt*b*
(B) Cyt*a* and Cyt*c*
(C) Cyt*b* and Cyt*c*
(D) Cyt*b* and Cytb_1

Q.9 Which of the following statements are true on phytoremediation point of view ?

P An effective technology that uses plants to tolerate and accumulate metals from the environment

Q Detoxification of soil phenolic pollutants by plant secretory enzymes

R Using RT-PCR to quantify gene expression in plants

S Studies on plant phylogeny and exploiting the biodiversity

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

Q.10 Identify the correct statements

P The second law of thermodynamics is also known as the law of conservation of energy

Q 'Entropy' is a measure of the available energy resulting from transformations

R The transfer of energy through the food chain of an ecosystem is termed as 'energy flow'

S The second law of themodynamics deals with the transfer of energy towards more available state

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

Q.11 Red flower (R) dominant to white flower (r) and short pollen grain (l) recessive to long pollen grain (L) are two genes on chromosome no. 2 of sweet pea. Plants with red flower and long pollen grains were crossed with plants with white flower and short pollen grains. The hybrids were test crossed and the following progenies were obtained in the F_2.

a. : Red flower with long pollen grain
ss. : Red flower with short pollen grain
35 : White flower with long pollen grain
350 : White flower with short pollen grain

What would be the map distance between R and L ?

(A) 16 cM (B) 8 cM (C) 10 cM (D) 30cM

Q.12 *Oryza sativa* and *Michelia champaca* belong to the following families.

P Gramineae and Chenopodiaceae

Q Brassicaceae and Malvaceae

R Gramineae and Magnoliaceae

S Cyperaceae and Myristicaceae

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

Q.13 Identify the correct statements

P Agar is manufactured from *Gelidium* of Rhodophyceae and algenic acid from Laminaria of *Pheophyceae*

Q All mushrooms are edible and coloured mushrooms are poisonous

R *Dioscorea sp.* produce diosgenin used as antifertility drugs

S *Gossypium* produce high quality jute fibre

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

Q.14 Identify the correct statements

P Heterosis is a proven way of increasing productivity of many crop plants

Q Weed caused considerable yield loss and reduce farmer's income

R PR (Pathogenesis related) proteins protect plants against bacteria

S Marker assisted selection can improve crops in field

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

Q.15 Which of the following statements are true on ecological point of view ?

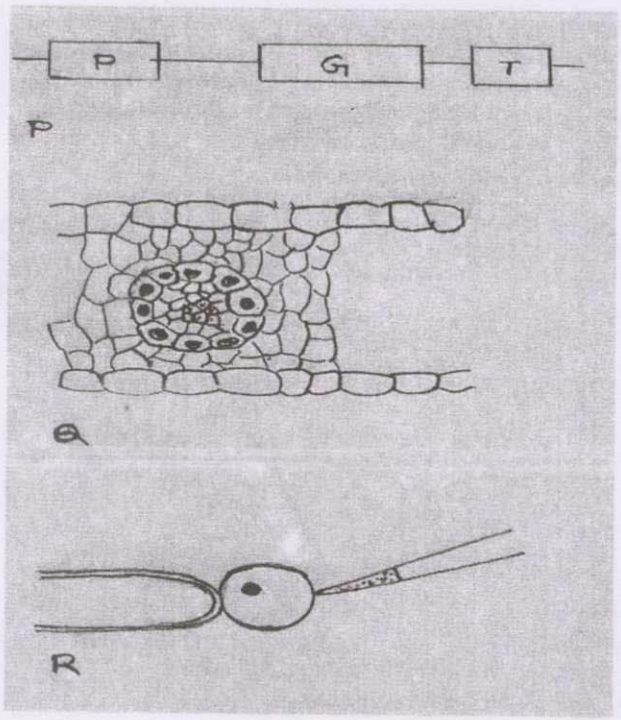
P Biodiversity is affected by environmental pollution
Q Alternative agriculture is designed to sustain crop yield while enhancing inputs of fossil fuel, pesticides, etc.
R Global climate change is caused by human activities
S Acid rain is caused by excessive CO_2 in the air

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

Q. 16 - Q. 22 are matching exercises. In each question, each item P, Q, R and S in Group I matches one of the items in Group II. Choose the correct match from the alternatives A, B, C and D.

Q.16

Group I



S $Fe^{3+} + K_4[Fe(CN)_6 \rightarrow Fe_4\,[Fe(CN)_6]_3 + 4K^+$

Group II

1.Kranz anatomy
2. Single protoplast culture
3. Binary vector
4. Microinjection
5. Partial plasmid map
6. Ferric-Ferro-Cyanide complex

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

Q.17

Group-I		Group- II
P	Foliaceous bracts	1. A large and commonly boat shaped bract enclosing a cluster of flowers
Q	Spathe	2. One or more whorls of bracteoles developing at the base of a calyx
R	Petaloid bracts	3. Green, flat and leaf like in appearance
S	Involucre	4. Brightly coloured bracts looking somewhat like petals
		5. Special bracts- small, dry and scaly
		6. One or more whorls of bracts, normally green in colour present around a cluster of flowers

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

Q.18

Group-I		Group- II
P	Atropin	1. *Digitalis purpurea*
Q	Cocaine	2. *Triticum aestivum*
R	Digitalis	3. *Erythroxylon coca*
S	Hops	4. *Humulus lupulus*
		5. *Atropa belladonna*
		6. *Datura stramonium*

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

Q.19

Group-I		Group- II
P	Late blight of potato	1. *Synchytrium endobioticum*
Q	Early blight of potato	2. *Rhizoctonia solani*
R	Black scurf of potato	3. *Alternaria solani*
S	Wart diseases of potato	4. *Phytophthora colocasiae*
		5. *Phytophthora arecaceae*
		6. *Phytophthora infestans*

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

Q.20

Group-I		Group- II
P	Insect Resistance Rice	1. *psy*
Q	Non-antibiotic selection system	2. *cry1*Ab
R	Antibiotic marker gene	3. *hpt*
S	C_4 photosynthesis	4. PEPC
		5. PMI
		6. Rubisco

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

Q.21

Group-I		Group- II
P	P. Maheshwari	1. Plant embryology
Q	E. Hood	2. Genetics
R	B. McClintock	3. *Agrobacterium* transformation
S	S. M. Sarkar	4. Growth hormone
		5. Molecular biology
		6. Systematic botany

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

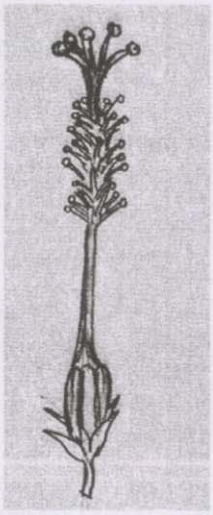
Q.22

Group-I		Group- II
P	IPR	1. Intellectual property rights
Q	Selectable reporter gene	2. International plant registration
R	Vectorless DNA transfer	3. Protoplast system
S	Selectable marker gene	4. *Agrobacterium* system
		5. Neomycin phosphotranferase
		6. Green fluorescent protein

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

Common Data Questions

Common Data for Questions 23 and 24:
Union of stamens may involve adhesion or cohesion. Arrangement of stamens of a flower is given below:



Q.23 Identify the type of stamen

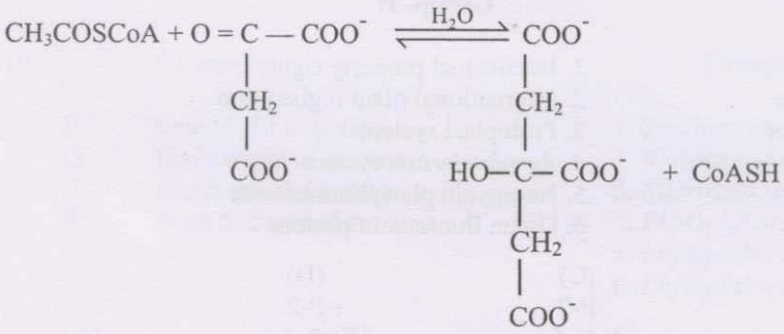
(A) Diadelphous
(B) Monadelphous
(C) Polydelphous
(D) Syngenesious

Q.24 Identify the family from the type of stamens

(A) Malvaceae (B) Solanaceae (C) Compositae (D) Apiaceae

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

Statement for Linked Answer Questions 25 and 26:
The following reaction is taking place in aerobic organisms



Q.25 Identify the products from the above reaction

(A) Isocitrate and Coenzyme A
(B) Citrate and Coenzyme A
(C) Pyruvate and acetyl CoA
(D) Succinate and acetyl CoA

Q.26 Identify the enzyme and the type of reaction

(A) Citrate synthase and condensation reaction
(B) Citrate synthatase and condensation reaction
(C) Isocitrate dehydrogenase and oxidative decarboxylation
(D) Aconitase and dehydration reaction

Statement for Linked Answer Questions 27 and 28:
The visible spectrum of light lies between 400-700 nm. The correlation of expression of wavelength is given below:
$1m \rightarrow 10^3$ mm $\rightarrow 10^6 \mu m \rightarrow 10^9$ nm $\rightarrow 10^{10}$ A°

	Colour Spectrum	*Wavelength (nm)*
P	Blue	1. 500-550
Q	Green	2. 450-500
R	Yellow	3. 650-700
S	Red	4. 550-600

Q.27 Identify the correct combination from the above options

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

Q.28 For conversion of wavelength from nm to A° and μm

(A) Divide the wavelength by 10 and 10^{-3}
(B) Multiply the wavelength by 10 and 10^{-3}
(C) Divide the wavelength by 10 and 10^{-4}
(D) Multiply the wavelength by 10 and 10^{-5}

END OF SECTION - M