



Previous Year Solved Question Paper
of

G.A.T.E. (XL) 2012

LIFE SCIENCES

XL: J Botany

Examination

(Original Question Paper with Answer Key)

GRADUATE APTITUDE TEST IN ENGINEERING



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GATE XL 2012

J : BOTANY

Q. 1 – Q. 10 carry one mark each.

- Q.1 The swollen base of a petiole is known as
(A) Ligule (B) Hastule (C) Pulvinus (D) Stipule **C**
- Q.2 An estimate of phylogenetic relationships among the taxa is commonly represented in the form of a
(A) Cladogram (B) Idiogram (C) Phenogram (D) Dendrogram **A**
- Q.3 Parenchyma cells associated with sieve tube members are called
(A) Albuminous cells (B) Companion cells (C) Bulliform cells (D) Subsidiary cells **B**
- Q.4 Cytoplasmic male sterility via the chloroplast genome can be induced by the expression of *Pha A* gene encoding
(A) β -Ketothiolase
(B) Acetoacetyl CoA carboxylase
(C) Acetoacetyl CoA reductase
(D) PHB synthase **A**
- Q.5 The number of nucleosomes present in a 30 nm solenoid structure of a chromatin is
(A) 2 (B) 4 (C) 6 (D) 8 **C**
- Q.6 Which one of the following performs normal C_3 photosynthesis when water is available, but switches to crassulacean acid metabolism (CAM) during salt or drought stress?
(A) *Mesembryanthemum crystallinum* (B) *Cynodon dactylon*
(C) *Eleusine coracana* (D) *Hordeum vulgare* **A**
- Q.7 Which one of the following is a free-living photosynthetic nitrogen fixer?
(A) *Frankia* (B) *Clostridium* (C) *Rhodospirillum* (D) *Rhizobium* **C**
- Q.8 Carbon dioxide and other 'greenhouse gases' act by
(A) destroying ozone in the stratosphere
(B) trapping heat in the earth's atmosphere
(C) allowing more visible light to reach the earth's surface
(D) reducing the amount of radiant energy which reaches the surface of the earth **B**
- Q.9 Which of the following best represents the flow of energy through an ecosystem?
(A) Producers \rightarrow Primary consumers \rightarrow Secondary consumers
(B) Sun \rightarrow Producers \rightarrow Secondary consumers \rightarrow Primary consumers
(C) Sun \rightarrow Producers \rightarrow Primary consumers \rightarrow Secondary consumers
(D) Secondary consumers \rightarrow Primary consumers \rightarrow Producers \rightarrow Sun **C**
- Q.10 Which one of the following drugs is obtained from the capsule of *Papaver somniferum*?
(A) Papain (B) Codeine (C) Digoxin (D) Bromelain **B**

Q. 11 - Q. 20 carry two marks each.

Q.11 Which of the following statements are TRUE for plant growth regulators?

- P. The release of cellulase and polygalacturonase into the cell wall is promoted by abscissic acid
- Q. The early biosynthetic steps of gibberellic acid, up to the formation of ent-kaurene take place in the plastid
- R. The naturally occurring zeatin belongs to the aromatic group of cytokinins
- S. Induction of protease inhibitors as a result of wounding and pathogen attack is activated by jasmonic acid

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

B

Q.12 Which of the following statements are TRUE for the transposable elements?

- P. Barbara McClintock discovered the autonomous and non-autonomous transposable elements in Maize
- Q. Variations in flower pigmentation in *Antirrhinum* are due to the presence of transposable elements Ac and Ds
- R. The Ac transposable element is 4563 bp long and has an 11 bp inverted repeats
- S. Ds produces the transposase and mobilize the Ac elements

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

C

Q.13 Match the recombinant proteins produced through molecular farming with their applications.

Recombinant proteins**Applications**

- P. Hirudine
- Q. Trichosanthin
- R. Somatotrophin
- S. β -Interferon

1. HIV therapy
2. Anticoagulant
3. Growth hormone
4. Hypertension
5. Cystic fibrosis
6. Treatment for hepatitis-B

(A) (B) (C) (D)

P-2 P-4 P-1 P-2
 Q-3 Q-1 Q-5 Q-1
 R-4 R-5 R-3 R-3
 S-1 S-2 S-2 S-6

D

Q.14 Which of the following statements are CORRECT for somatic cell hybridization?

- P. For fusion of protoplast, dimethylsulfoxide (DMSO) is used as a fusogen
- Q. The enzyme 'Cellulase Onozuka' used for protoplast isolation is sourced from *Trichoderma viride*
- R. The first report of somatic hybrid plants resulted from the fusion of protoplasts of *Nicotiana glauca* and *N. tabacum*
- S. Viability of isolated protoplasts can be determined by Evan's blue staining

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

MARKS TO ALL

Q.15 Which of the following statements are TRUE on transgene approach?

- P. T-DNA integration occurs mainly through non-homologous recombination
- Q. The Gateway cloning depends on recombination technology as opposed to standard uses of restriction enzymes and DNA ligase
- R. The localization of β -glucuronidase (GUS) activity as a result of expression of GUS reporter gene can be visualized in a histochemical assay using the X-gal
- S. The green fluorescent protein gene (GFP) is isolated from the bacterium *Photinus pyralis*

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

A

Q.16 Identify the free radicals (marked as '?') in sequence from the inter-conversion of reactive oxygen species as shown below.



- P. $\text{O}_2^{\bullet -}$
- Q. OH^-
- R. HO_2^-
- S. $^1\text{O}_2$

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

A

Q.17 With respect to adhesion and cohesion of stamens, identify the INCORRECT statements.

- P. Adnation of stamens to petals is described as epiphyllous stamens
- Q. In *Calotropis*, stamens and carpels are united to form gynostegium
- R. In syngenesious stamens, filaments are united to form a bundle while the anthers are free
- S. Syandrous stamens found in *Cucurbita* represent the union of filaments as well as anthers

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

B

Q.18 Identify the CORRECT statements in plant secondary metabolism.

- P. Tropane alkaloids in *Atropa belladonna* are synthesized from tyrosine
- Q. Antioxidative food ingredient rosmarinic acid is obtained from cell suspension cultures of *Coleus blumei*
- R. Thiophenes are produced from hairy root cultures of *Tagetes patula*
- S. Cyanidin, the principal anthocyanin responsible for red color in *Rosa hybrida* is produced from cinnamaldehyde

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

D

Q.19 Which of the following statements are TRUE for respiration?

- P. The conversion of one molecule of pyruvate to three molecules of CO_2 generates four molecules of NADH
- Q. Fructose 6-phosphate is the principal substrate for glycolysis
- R. The oxidation of glucose 6-phosphate to 6-phosphogluconate is the first step in the oxidative pentose phosphate pathway
- S. The mitochondrial 'alternative oxidase' provides an alternative pathway for transfer of electrons from ubiquinone to oxygen utilizing proton pumping complex of the respiratory chain

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

A

Q.20 Match the name of the disease with the causal organism.

Disease

- P. Black rot of sugarcane
- Q. Stem rot of jute
- R. Tikka disease of groundnut
- S. Crown gall of grapes

Causal organism

- 1. *Cercospora personata*
- 2. *Macrophomina phaseolina*
- 3. *Ceratocystis adiposa*
- 4. *Synchytrium endobioticum*
- 5. *Agrobacterium tumefaciens*
- 6. *Colletotrichum corchorum*

(A)

- P-1
- Q-3
- R-6
- S-5

(B)

- P-2
- Q-3
- R-1
- S-5

(C)

- P-3
- Q-2
- R-1
- S-5

(D)

- P-2
- Q-6
- R-3
- S-4

C

END OF SECTION - J

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