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(Most Important Questions on Plant Physiology)

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Sahi Prep Hai Toh Life Set Hai

1. Which among the following is the uncoupler of chemiosmotic hypothesis in mitochondrial ATP synthesis?

A. Puromycin and Erythromycin

B. 2,4 dinitrophenol and FCCP

C. Genistein and flavonoids

D. Tannins and phenolic acid

2. Plant hormone responsible for the closure of stomata in the epidermis

A) Abscissic acid

B) Gibberellins

C) Auxin

D) Cytokinin

3. Genetic analysis has identified several classes of genes in the Control of flowering. some statements on floral development are given below. Identify correct ones.

A) Two major categories of gene regulate floral development , Floral meristem identity genes encode transcription factors that are necessary for the initial induction of floral organ identity genes. Floral organ identity genes directly control floral organ identity.

B) The proteins encoded by these genes are transcription factors that interact with other protein cofactors to control the expression of downstream genes whose products are involved in the formation or function of floral organs

C) Five key genes were identified in Arabidopsis that specify floral organ identity:APETALA1(AP1),APETALA2(AP2),APETALA3(AP3),PISTILLATA(PI),and AGAMOUS(AG).

D) In quadruple-mutant Arabidopsis plants (ap1, ap2, ap3/pi, and ag) floral meristems produce floral organs and does not produce green leaf-like structures.

Which of the following combination of statements is correct?

A) A,B and C

B) B,C,D

C) A and D only

D) A, B and D

4. From the given statement which of the following claims are correct about the MAD box gene?

A.MAD box gene belongs to the homeotic class of gene for floral development.

B. MAD box is acronym of MCM1, AGAMOUS, DEFICIENS, and SRF.

C. MAD box gene transcription factors form tetramers that bind to $CC(A/T)_6GG$ sequence.

A) A only

B) A and C

C) A and B

D) all of the above

5. The photoreceptor in plants commonly involved in photoperiodic flowering and the circadian clock is

A) Phytochrome B) Rhodopsin

C) cryptochrome D) carotenoid

6. Gravitropism is caused by

A) Gibberellins B) auxins

C) statoliths D) cryptochromes

7. Photoreceptors that play a major role in daylight perception and circadian rhythm

A) Zeitlupe B) cryptochromes

C) phototropin D) UVR8

8. Light perception is very important for plants. Following are the statements regarding photoreceptors in *Arabidopsis thaliana*. which one of the following combination statements is correct?

A) phot1 is the primary phototropic receptor in Arabidopsis and mediates phototropism in response to low and high fluence rates of blue light

B) phot2 mediates phototropism in response to high light intensities.

C) Phototropin contains two light-sensing LIGHT-OXYGEN-VOLTAGE (LOV) domains, LOV1 and LOV2, each binding a chromophore NAD+.

A) A, C B) C only

C) A,B D) B only

9. Some facts are given about vernalisation below. Identify the incorrect statements.

A) Vernalization means in some plant species, cold temperature is required for flowering.

B) Vernalization appears to take place primarily in the root apical meristem.

C) In Arabidopsis FLC gene acts as a repressor of flowering and in winter cereals VRN2 gene acts as a repressor.

D) Activation of VRN1 leads to inactivation of the FLC gene which activates flowering genes FD, FT and SOC1 gene which leads to flowering.

A) B only B) A, C, D

C) C only D) C and D

10. Which fatty acid acts as the precursor in the jasmonic acid pathway?

A) Palmitic acid B) oleic acid

C) stearic acid D) linolenic acid

Answer key:

1. B
2. A
3. A
4. D
5. C
6. C
7. A
8. C
9. A
10. D

Solutions:

Solution 1: · Chemiosmotic hypothesis is the mechanism whereby the electrochemical gradient of protons established across a membrane by an electron transport process that is used to drive energy-requiring ATP synthesis. It operates in mitochondria and chloroplasts.

· Uncouplers are a wide range of chemically unrelated artificial compounds that decrease mitochondrial ATP synthesis and increase the rate of electron transport. Eg: 2,4-dinitrophenol and FCCP(p-trifluoromethoxy carbonyl cyanide phenylhydrazone).

· Puromycin and erythromycin are protein synthesis inhibitors, Genistein and flavonoids are naturally occurring auxin efflux inhibitors. Tannins and phenolic acids are secondary metabolites in dormant seeds and cause seed dormancy and inhibit germination. hence the correct answer is 2,4DNP and FCCP.

Solution 2:

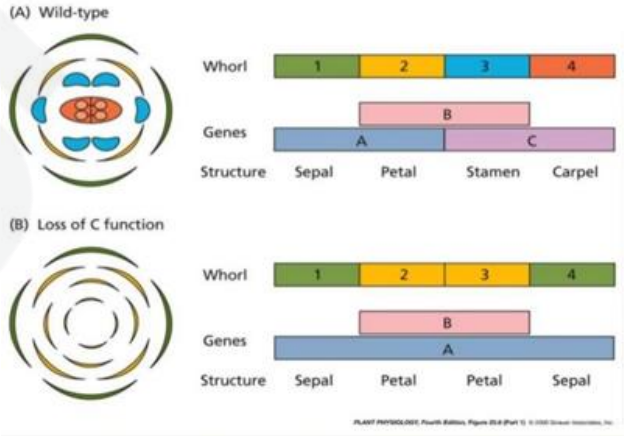
· Abscisic acid (ABA) also called plant stress hormone is responsible for opening and closure of stomata. This hormone is responsible for seed dormancy and also aids in the abscission or falling of fruits, flowers and leaves at the end of the growing season.

· Gibberellins aids in stem elongation, germination of seeds and transition to flowering.

· Auxin promotes cell growth and elongation of plant and root growth. cytokinin stimulate shoot growth and stimulate cell division.

Solution 3:

· First 3 statements mentioned are true as 2 genes that have been identified in floral development are floral meristem identity genes and floral organ identity genes. Most of the floral mutation studies has been conducted in Arabidopsis thaliana and the ABC model explains the floral identity genes. Statement D is wrong as mutation of AP1 and AP2 gene causes loss of floral development in plant. The quadruple mutant plant lacking ap1,ap2 ap3 and ag produce the only leaf-like structures.



Solution 4:

Genes encoding a family of transcription factors containing a conserved sequence id called the MADS-box. It is the family that includes most floral homeotic genes and some of the genes involved in regulating flowering time.

Solution 5:

· Cryptochrome is blue light-absorbing or photoreceptor of plant, cryptochrome plays a major role in maintaining biological clock or circadian rhythm, it also helps in anthocyanin production.

Phytochrome is a photomorphogenesis pigment that absorbs red and far-red light. Rhodopsin is a light-sensitive visual pigment in the retina of eye. Carotenoids are pigments in plants, algae, and photosynthetic bacteria. These pigments produce bright yellow, red, and orange colours in plants, vegetables, and fruits.

Solution: Statoliths are cellular inclusions such as amyloplasts that act as gravity sensors by having a high-density relative to the cytosol and sedimenting to the bottom of the cell.

Solution 7:

ZEITLUPE (ZTL) is a blue light photoreceptor that regulates day length perception (photoperiodism) and circadian rhythms. Recently, a unique photoreceptor system has been isolated from Arabidopsis that is specific for the perception of ultraviolet radiation (UV RESISTANCE LOCUS 8, or UVR8) and is responsible for several UV-B-induced photomorphogenic responses. phototropin primarily regulate phototropism, chloroplast movements, and stomatal opening.

Solution 8:

Phot 1 and phot 2 are important photoreceptors in response to blue light in A.thaliana and is controlled by PHOT1 and PHOT2 genes. The LOV2 domain is primarily responsible for kinase activation in response to blue light. LOV1 and LOV2 each noncovalently bind a chromophore FMN. Upon blue light activation FMN molecule bind to cysteine forming cysteine- Flavin covalent adduct.

Solution 9:

Vernalization always occurs in shoot apical meristem and not root apical meristem. Shoot apical meristem is the site to perceive cold temperature. During cold temperatures, a hypothetical plant hormone called vernalin is thought to be involved in the vernalization response.

Solution 10:

Jasmonic acid (JA) biosynthesis in plants occurs in 2 organelles chloroplast and peroxisomes, and the precursor is linolenic acid which is released from membrane lipids. JA and its methyl ester are also involved in plant defence against insects and disease. 12-oxo-Phytodienoic acid is reduced by β-oxidation to produce JA.

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