10th Science Lesson 12 Questions in English

12] Plant Anatomy And Plant Physiology

1. Which of the following is not organised correctly?
   1) Molecules into organelles
   2) Cells into tissues
   3) Tissues into organs
      a) 1, 2
      b) 1, 3
      c) 2, 3
      d) None

Explanation

Plants exhibits varying degrees of organization. **Atoms are organized into molecules, molecules into organelles, organelles into cells, cells into tissues and tissues into organs**.

2. Who among the following is known as Father of Plant Anatomy?
   a) Carl Linnaeus
   b) William Brown
   c) Nehemiah Grew
   d) Robert Brown

Explanation

The first account of internal structure of plants was published by English Physician **Nehemiah Grew**. He is known as **Father of Plant Anatomy**. Plant anatomy (Gk Ana = as under; Temnein = to cut) is the study of internal structure of plants.

3. Which of the following statement about Tissues is correct?
   1) Tissues are the group of cells that are similar in structure and origin alone
   2) Plant tissues can be broadly classified into Meristematic tissue and Permanent tissue
      a) 1 alone
      b) 2 alone
      c) 1, 2
      d) None

Explanation

Tissues are the group of cells that are similar or dissimilar in structure and origin, but perform similar function. Plant tissues can be broadly classified into two, based on their ability to divide. They are i) Meristematic tissue ii) Permanent tissue.

4. Who among the following classified tissue system in plants into three types?
   a) Carl Linnaeus
   b) William Brown

c) **Sachs**
d) Robert Brown

Explanation

Sachs (1875) classified tissue system in plants into three types:
i) Dermal or Epidermal tissue system
ii) Ground tissue system
iii) Vascular tissue system

5. Which of the following statement about Dermal Tissue System is correct?
1) It consists of epidermis, stomata and epidermal outgrowths
2) Epidermis is the outer most layer
3) Trichomes and root hairs are the epidermal outgrowths
a) 1, 2
b) 1, 3
c) 2, 3
d) All the above

Explanation

Dermal or Epidermal Tissue System consists of epidermis, stomata and epidermal outgrowths. Epidermis is the outer most layer. It has many minute pores called stomata. Cuticle is present on the outer wall of epidermis to check evaporation of water. **Trichomes and root hairs are the epidermal outgrowths**.

6. Which of the following are the functions of Dermal Tissue System?
1) Protection
2) Regeneration
3) Prevention of water loss
a) 1, 2
b) 1, 3
c) 2, 3
d) All the above

Explanation

Dermal Tissue System	Epidermis and Periderm (in older stems and roots)	• Protection • Prevention of water loss

7. Which of the following are included in Ground Tissue System?
1) Xylem tissue
2) Collenchyma tissue
3) Parenchyma tissue
4) Sclerenchyma tissue
a) 1, 2, 3
b) 2, 3, 4

c) 1, 3, 4
d) All the above

Explanation

Ground Tissue System	Parenchyma tissue Collenchyma tissue Sclerenchyma tissue	• Photosynthesis • Food storage • Regeneration • Support • Protection

8. Which of the following are the functions of Vascular Tissue System?
1) Support
2) Transport of water and minerals
3) Transport of food
a) 1, 2
b) 1, 3
c) 2, 3
d) All the above

Explanation

Vascular Tissue System	Vascular tissues - Xylem tissue - Phloem tissue	• Transport of water and minerals • Transport of food

9. _____ helps in transpiration.
a) Cuticle
b) Root hairs
c) Epidermis
d) Stomata

Explanation

Functions of Epidermal Tissue System:
- Epidermis protects the inner tissues
- **Stomata helps in transpiration**.
- Root hairs help in absorption of water and minerals.

10. Which of the following are not included in Ground Tissue System?
1) Cortex
2) Endodermis
3) Pith
a) 1, 2
b) 1, 3
c) **All the above**
d) None

Explanation

Ground Tissue System includes all the tissues of the plant body **except** epidermal and vascular tissues like **(i) Cortex (ii) Endodermis (iii) Pericycle (iv) Pith**

11. Which of the following statement is correct?

1) Phloem conducts water and minerals to different parts of the plant
2) Xylem conducts food materials to different parts of the plant.
    a) 1 alone
    b) 2 alone
    c) 1, 2
    d) None

Explanation

Vascular Tissue System It consists of xylem and phloem tissues. They are present in the form of bundles called vascular bundles. **Xylem conducts water and minerals to different parts of the plant. Phloem conducts food materials to different parts of the plant**.

12. How many types of vascular bundles are there in Vascular Tissue System?

a) 5
b) 3
c) 2
d) 6

Explanation

In Vascular Tissue System, there are **three different types of vascular bundles** namely (i) Radial (ii) Conjoint (iii) Concentric

13. Which of the following statement is correct?

1) In Radial Bundles, Xylem and phloem are present in different radii alternating with each other
2) In Conjoint bundles, Xylem and phloem lie on the same radius.
    a) 1 alone
    b) 2 alone
    c) 1, 2
    d) None

Explanation

Radial Bundles:

Xylem and phloem are **present in different radii alternating with each other**. e.g. roots

Conjoint bundles:

Xylem and phloem **lie on the same radius**. There are two types of conjoint bundles.

14. Which of the following statement about Collateral conjoint bundles is correct?

1) Xylem lies towards the centre and phloem lies towards the periphery.

2) When cambium is present in collateral bundles, it is called open.
3) When collateral bundle without cambium is called closed.
    a) 1, 2
    b) 1, 3
    c) 2, 3
    d) All the above

Explanation

Collateral conjoint bundles:

Xylem lies towards the centre and phloem lies towards the periphery. When **cambium is present** in collateral bundles, it is called **open**. e.g. dicot stem and collateral bundle **without cambium** is called **closed**. e.g. monocot stem

15. Which of the following is an example of Bicollateral Conjoint bundles?
    a) Onion
    b) Rice
    c) Cucurbita
    d) Garlic

Explanation

In Bicollateral type of bundle, the phloem is present on both outer and inner side of xylem. e.g. **Cucurbita**

16. Which of the following statement is correct?
    1) In Dracaena, Xylem surrounds phloem.
    2) In Ferns, Phloem surrounds xylem
        a) 1 alone
        b) 2 alone
        c) 1, 2
        d) None

Explanation

In Concentric Vascular bundle is one in which xylem completely surrounds the phloem or vice-versa is called concentric vascular bundle. It is of two types:

1. Amphivasal: **Xylem surrounds phloem. e.g. Dracaena**
2. Amphicribral: **Phloem surrounds xylem. e.g. Ferns**

17. In which of the following, Protoxylem lies towards the centre and metaxylem lies towards the periphery?
    a) Roots
    b) Stem
    c) Leaf
    d) All the above

Explanation

Endarch: **Protoxylem lies towards the centre** and metaxylem lies towards the periphery. e.g. **stem**.
Exarch: Protoxylem lies towards the periphery and metaxylem lies towards the centre. e.g. **roots**.

18. Which of the following are absent in Epiblema of Dicot Root?

1) Cuticle
2) Stomata
3) Unicellular root hairs

a) 1, 2
b) 1, 3
c) 2, 3
d) All the above

Explanation

A thin transverse section of dicot root shows the following structures:
Epiblema: It is the outermost layer. **Cuticle and stomata are absent**. Unicellular root hairs are present. It is also known as Rhizodermis or Piliferous layer

19. Which of the following stores food and water?

a) Cortex
b) Endodermis
c) Epiblema
d) Stele

Explanation

Cortex is a multi-layered large zone made of thin-walled parenchymatous cells with intercellular spaces. It **stores food and water**.

20. Which of the following statement about Endodermis is correct?

1) It is the innermost layer of cortex.
2) It helps in the movement of water and dissolved salts from cortex into xylem
3) The cells are barrel - shaped, closely packed

a) 1, 2
b) 1, 3
c) 2, 3
d) All the above

Explanation

Endodermis is the **innermost layer of cortex**. The cells are barrel - **shaped, closely packed**, and show band like thickenings on their radial and inner tangential walls called casparian strips. It helps in the **movement of water and dissolved salts from cortex into xylem**

21. Which of the following includes pericycle and vascular bundle?

a) Cortex
b) Endodermis

c) Epiblema
d) Stele

Explanation

Stele is a part of dicot root. All tissues inner to endodermis constitute stele. It includes **pericycle and vascular bundle**

22. _____ is the site of origin of lateral roots.

a) Pericycle
b) Vascular bundle
c) Pith
d) All the above

Explanation

Pericycle: Inner to endodermis lies a single layer of pericycle. It **is the site of origin of lateral roots**.
Pith: Young root contains pith whereas in old root pith is absent.

23. The tissue present between xylem and phloem is called_____

a) Piliferous layer
b) Rhizo-dermis
c) Conjunctive tissue
d) None

Explanation

Vascular bundle is radial. Xylem is exarch and tetrach. **The tissue present between xylem and phloem is called conjunctive tissue**. In dicot root, it is made up of parenchyma.

24. Which of the following statement about Rhizo-dermis of monocot root is correct?

1) It is the outermost layer of the root, and is made up of single layer of thin walled, parenchymatous cell.
2) Stomata and cuticle are present
3) The root hair helps in absorption of water and minerals from the soil

a) 1, 2
b) 1, 3
c) 2, 3
d) All the above

Explanation

Epiblema or Rhizo-dermis is the outermost layer of the root, and is made up of single layer of thin walled, parenchymatous cell. **Stomata and cuticle are absent**. The root hair helps in absorption of water and minerals from the soil. This layer also protects the inner tissues.

25. The cortex of monocot root is composed of_____ cells

a) Chlorenchyma
b) Pollenchyma

c) Parenchymatous
d) None

Explanation

Cortex is multi-layered large zone, composed of **parenchymatous cells** with intercellular spaces. It stores water and food material.

26. Casparian strips of Endodermis are band like thickening made of_____

a) Suberin
b) Cutin
c) Stomata
d) Lignin

Explanation

Endodermis is the innermost layer of cortex with characteristic casparian strips and passage cells. **Casparian strips are band like thickening made of suberin**.

27. Which of the following statement about internal Structure of Monocot Root is correct?

1) Pericycle is a single layer of thin-walled cells
2) Vascular tissues consist of many patches of xylem and phloem arranged radially
3) Stele includes pericycle, vascular tissues and pith.

a) 1, 2
b) 1, 3
c) 2, 3
d) All the above

Explanation

Stele of Monocot Root: All the tissues inner to endodermis constitute stele. It **includes pericycle, vascular tissues and pith**.

Pericycle: It is a **single layer of thin-walled cells**. The lateral roots originate from this layer.

Vascular tissues: It consists of many patches of **xylem and phloem arranged radially**. The xylem is exarch and poly-arch. The conjunctive tissue is made up of sclerenchyma.

28. _____ contains abundant amount of starch grains

a) Endodermis
b) Stele
c) Pith
d) Cortex

Explanation

Pith is present at the centre. It is made up of parenchyma cells with intercellular spaces. It **contains abundant amount of starch grains**. It stores food.

29. Which of the following statement is correct about internal Structure of Dicot Stem?

1) Epidermis is the outermost layer

2) It is made up of single layer of Collenchyma cells
3) It is protective in function.
    a) 1, 2
    b) 1, 3
    c) 2, 3
    d) All the above

Explanation

Epidermis in internal Structure of Dicot Stem (Sunflower) is the **outermost** layer. It is made up of single layer of **parenchyma cells**, its outer wall is covered with cuticle. It is **protective in function**.

30. Which of the following statement correct about Cortex of Dicot Stem?
1) It is divided into three regions
2) Hypodermis consists of 3 - 6 layers of collenchyma cells
3) Hypodermis gives mechanical support
    a) 1, 2
    b) 1, 3
    c) 2, 3
    d) All the above

Explanation

Cortex is divided into three regions.

1) **Hypodermis** consists of **3 - 6 layers of collenchyma cells**. It gives **mechanical support**.
2) Middle cortex is made up of few layers of chlorenchyma cells. It is involved in photosynthesis due to the presence of chloroplast.
3) Inner cortex is made up of few layers of parenchyma cells. It helps in gaseous exchange and stores food materials.

31. _____ is the inner most layer of cortex
a) Epidermis
b) Endodermis
c) Ectodermis
d) Hypodermis

Explanation

Endodermis is the inner most layer of cortex it consists of a single layer of barrel shaped cells, these cells contain starch grains. So, it is also called starch sheath.

32. Which of the following are the parts of Stele?
1) Pericycle
2) Vascular bundle
3) Pith
    a) 1, 2
    b) 1, 3

c) 2, 3
d) All the above

Explanation

The central part of the stem inner to endodermis is known as stele. It consists of **pericycle, vascular bundle and pith**.

33. Pericycle is made of_____ kind of cells

1) Parenchymatous
2) Sclerenchyma
3) Collenchyma

a) 1, 2
b) 1, 3
c) 2, 3
d) All the above

Explanation

Pericycle occurs between vascular bundle and endodermis. It is multi-layered, **parenchymatous** with alternating patches of **sclerenchyma**.

34. Which of the following statement is correct?

1) Vascular bundles are conjoint, collateral, endarch and open.
2) The large central parenchymatous zone with intercellular spaces is called pith

a) 1 alone
b) 2 alone
c) 1, 2
d) None

Explanation

Vascular bundles are **conjoint, collateral, endarch and open**. They are arranged in the form of a ring around the pith. The **large central parenchymatous zone with intercellular spaces is called pith**. It helps in the storage of food materials.

35. _____ provides mechanical support to plant

a) Parenchyma
b) Collenchyma
c) Sclerenchyma
d) Chlorenchyma

Explanation

Hypodermis of internal Structure of Monocot Stem is made up of few layers of sclerenchyma cells interrupted by chlorenchyma. **Sclerenchyma provides mechanical support to plant**.

36. Which of the following is absent in Internal Structure of Monocot Stem?

a) Stomata

b) Cuticle
c) Multicellular hairs
d) None

Explanation

Epidermis of internal Structure of Monocot Stem is the outermost layer. It is made up of single layer of parenchyma cells. It is covered with thick cuticle. **Multicellular hairs** are absent and stomata are also less in number.

37. Xylem vessels in Monocot Stem is arranged in____ shape

a) X
b) V
c) Y
d) X or Y

Explanation

Xylem consists of metaxylem and protoxylem. **Xylem vessels are arranged in V or Y shape**. In mature vascular bundle, the lower most protoxylem disintegrates and form a cavity. This is called protoxylem lacuna.

38. Which of the following are absent in phloem in Monocot Stem?

1) Sieve tube elements
2) Companion cells
3) Phloem parenchyma
4) Phloem fibers

a) 1, 2
b) 2, 4
c) 3, 4
d) All the above

Explanation

Phloem of monocot stem consists of sieve tube elements and companion cells. **Phloem parenchyma, and phloem fibers are absent**.

39. Which of the following is not differentiated in monocot stems?

a) Vascular Bundle
b) Cortex
c) Pith
d) Protoxylem lacuna

Explanation

In Ground tissue of the monocot stem, the entire mass of parenchyma cells next to hypodermis and extending to the centre is called ground tissue. It is not differentiated into endodermis, cortex, pericycle and pith. **Pith is not differentiated in monocot stems**.

40. Which of the following is not correctly matched?

a) Number of Xylem in dicot root is Tetrarch
b) Cambium in dicot root is absent
c) Cambium in monocot root is absent
d) Pith is absent in dicot root

Explanation

S. No	Tissues	Dicot Root	Monocot Root
1	Number of Xylem	Tetrarch	Polyarch
2	Cambium	Present(During secondary growth only)	Absent
3	Secondary Growth	Present	Absent
4	Pith	Absent	Present

41. Match the following tissues with their presence in monocot stem:

I.	Hypodermis	1. Present
II.	Vascular bundles	2. Collenchymatous
III.	Ground tissue	3. Uniform in size
IV.	Pith	4. Differentiated

a) 2, 1, 3, 4
b) 2, 3, 4, 1
c) 4, 1, 2, 3
d) 3, 1, 2, 4

Explanation

S. No	Tissues	Dicot Stem	Monocot Stem
1	Hypodermis	Collenchymatous	Sclerenchymatous
2	Ground tissue	Differentiated into cortex, endodermis, pericycle and pith	Undifferentiated
3	Vascular bundles	(i) Less in number (ii) Uniform in size (iii) Arranged in a ring (iv) Open (v) Bundle sheath absent	(i) Numerous (ii) Smaller near periphery, bigger in the centre (iii) Scattered (iv) Closed (v) Bundle sheath present
4	Secondary growth	Present	Mostly absent
5	Pith	Present	Absent
6	Medullary rays	Present	Absent

42. Which of the following statement about upper epidermis of Dicot leaf is correct?

1) They are single layered parenchymatous cells without intercellular spaces

2) Stomata are less in number
3) The outer wall of the cells are cuticularized
    a) 1, 2
    b) 1, 3
    c) 2, 3
    d) All the above

Explanation

Upper epidermis in dicot leaf is the outermost layer made of single layered **parenchymatous cells without intercellular spaces**. The outer walls of the cells are **cuticularized**. **Stomata are less** in number.

43. Which of the following statement about Lower epidermis of dicot leaf is incorrect?
1) It contains numerous stomata.
2) The loss of water vapour is facilitated through this chamber
3) The lower epidermis helps in the exchange of gases
    a) 1, 2
    b) 1, 3
    c) 2, 3
    d) None

Explanation

Lower epidermis of dicot leaf is a single layer of **parenchymatous cells with a thin cuticle**. It contains numerous stomata. Chloroplasts are present only in guard cells. The **lower epidermis helps in the exchange of gases**. The **loss of water vapour is facilitated through this chamber**

44. The tissue present between the upper and lower epidermis is called_____
a) Esonophil
b) Mesophyll
c) Epiphyll
d) Exophyll

Explanation

The **tissue present between the upper and lower epidermis** is called **mesophyll**. It is differentiated into Palisade parenchyma and Spongy parenchyma.

45. Which of the following statement about Palisade parenchyma is correct?
1) It is found just below the upper epidermis.
2) The cells do not have intercellular spaces and they take part in photosynthesis
3) The cells are elongated
    a) 1, 2
    b) 1, 3
    c) 2, 3
    d) All the above

Explanation

Palisade parenchyma is found just **below the upper epidermis**. The cells are elongated. These cells have more number of chloroplasts. The cells **do not have intercellular spaces** and they take part in **photosynthesis**

46. Which of the following statement about Spongy parenchyma is correct?

1) It is found below the palisade parenchyma tissue
2) It helps in gaseous exchange
3) Cells are almost spherical or oval and are regularly arranged

a) 1, 2
b) 1, 3
c) 2, 3
d) All the above

Explanation

Spongy parenchyma is found below the palisade parenchyma tissue. **Cells are almost spherical or oval and are irregularly arranged**. Cells have intercellular spaces. It helps in gaseous exchange.

47. In vascular bundle of Dicot leaf xylem lies towards____ and phloem lies towards____

a) Lower epidermis, upper epidermis
b) Upper epidermis, Lower epidermis
c) Lower epidermis, Lower epidermis
d) Upper epidermis, Upper epidermis

Explanation

Vascular bundle (Dicot leaf) of mid-rib is larger. Vascular bundles are conjoint, collateral and closed. Each vascular bundle is surrounded by a sheath of parenchymatous cells called bundle sheath. **Each vascular bundle consists of xylem lying towards the upper epidermis and phloem towards the lower epidermis**.

48. Which of the following statement about epidermis of monocot leaf is correct?

1) Monocot leaf has upper and lower epidermis.
2) Epidermis is made up of Collenchyma cells.
3) Some cells of upper epidermis are large and thin walled they are known as bulliform cells

a) 1, 2
b) 1, 3
c) 2, 3
d) All the above

Explanation

Monocot leaf has upper and lower epidermis. **Epidermis is made up of parenchyma cells**. Cuticle is present on the outer wall stomata are present on both upper and lower epidermis. Some cells of upper epidermis are large and thin walled they are known as bulliform cells.

49. Which of the following statement about Mesophyll of Monocot leaf is correct?
1) It is the ground tissue that is present between both epidermal layers.
2) These cells contain chloroplasts
3) Mesophyll is not differentiated into palisade and spongy parenchyma
   a) 1, 2
   b) 1, 3
   c) 2, 3
   d) All the above

Explanation

Mesophyll of monocot leaf is the ground tissue that is **present between both epidermal layers**. **Mesophyll is not differentiated into palisade and spongy parenchyma**. The cells are irregularly arranged with inter-cellular spaces. **These cells contain chloroplasts**.

50. Which of the following is Isobilateral leaf?
a) Monocot leaf
b) Dicot leaf
c) Both a and b
d) a or b

Explanation

S. No	Dicot Leaf	Monocot Leaf
1	Dorsiventral leaf	Isobilateral leaf
2	Mesophyll is differentiated into palisade and spongy parenchyma	Mesophyll is not differentiated into palisade and spongy parenchyma

51. Which of the following is responsible for preparation and storage of food?
a) Mitochondria
b) Plastids
c) Stele
d) Stomata

Explanation

Plastids are double membrane bound organelles found in plants and some algae. They **are responsible for preparation and storage of food**.

52. Match the following:

I.	Chloroplast	1. Colourless
II.	Chromoplast	2. Green coloured

III. Leucoplast 3. yellow, red, orange coloured

a) 1, 3, 2
b) 2, 1, 3
c) 2, 3, 1
d) 3, 1, 2

Explanation

There are three types of plastids:
Chloroplast - **green coloured** plastids
Chromoplast **- yellow, red, orange**-coloured plastids
Leucoplast - **colourless** plastids

53. Which of the following statement about Chloroplast is correct?

1) Chloroplasts are green plastids containing green pigment called chlorophyll
2) Their thickness is about 1-2 micro-meter
3) Chloroplasts are oval shaped organelles

a) 1, 2
b) 1, 3
c) 2, 3
d) All the above

Explanation

Chloroplasts are **green plastids containing green pigment called chlorophyll**. Chloroplasts are **oval** shaped organelles having a diameter of 2-10 micro-meter and a **thickness of 1-2 micro-meter**.

54. What type of ribosome does Stroma have?

a) 70 S
b) 65 S
c) 50 S
d) 80 S

Explanation

Matrix present inside to the membrane is called stroma. **It contains DNA, 70 S ribosomes and other molecules required for protein synthesis**.

55. Thylakoids forms a stack of disc like structures called a_____

a) Stroma
b) Envelope
c) Grana
d) Stele

Explanation

Thylakoids consists of thylakoid membrane that encloses thylakoid lumen**. Thylakoids forms a stack of disc like structures called a grana** (singular-granum).

56. Which of the following are the functions of Chloroplast?

1) Photosynthesis
2) Storage of lipids
3) Synthesis of fatty acids
    a) 1, 2
    b) 1, 3
    c) 2, 3
    d) All the above

Explanation

Functions of Chloroplast:

1. **Photosynthesis**
2. **Storage of starch**
3. **Synthesis of fatty acids**
4. **Storage of lipids**
5. Formation of chloroplasts

57. Which of the following statement is correct?

1) Photosynthesis (Photo = light; synthesis = to build)
2) It is a process by which autotrophic organisms like green plants, algae and chlorophyll containing bacteria utilize the energy from sunlight to synthesize their own food
3) During this process oxygen is released as a by-product
    a) 1, 2
    b) 1, 3
    c) 2, 3
    d) All the above

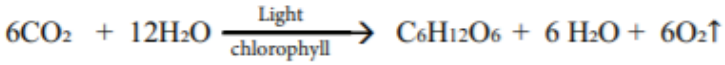
Explanation

Photosynthesis (Photo = light; synthesis = to build) is a process by which autotrophic organisms like **green plants, algae and chlorophyll containing bacteria utilize the energy from sunlight to synthesize their own food**. In this process, carbon dioxide combines with water in the presence of sunlight and chlorophyll to form carbohydrates. During this process **oxygen is released as a by-product**.

58. Carbon dioxide + Water →

1) Starch
2) Glucose
3) Water
4) Oxygen
    a) 1, 2, 4
    b) 2, 3, 4
    c) 1, 3, 4
    d) All the above

Explanation



$$6CO_2 + 12H_2O \xrightarrow[\text{chlorophyll}]{\text{Light}} C_6H_{12}O_6 + 6H_2O + 6O_2\uparrow$$

Carbon dioxide + Water ⟶ Glucose + Water + Oxygen

59. Which of the following are accessory pigments?

1) Chlorophyll a
2) Chlorophyll b
3) Carotenoids

a) 1, 2
b) 1, 3
c) 2, 3
d) All the above

Explanation

Other pigments such as chlorophyll b and carotenoids are called accessory pigments as they pass on the absorbed energy to chlorophyll a (Chl.a) molecule. Reaction centres (Chl. a) and the accessory pigments (harvesting centre) together are called photosystems.

60. Which of the following is/are primary pigment?

a) Chlorophyll a
b) Chlorophyll b
c) Carotenoids
d) Chlorophyll c

Explanation

Pigments involved in photosynthesis are called Photosynthetic pigments. Photosynthetic pigments are of two classes namely, the primary pigments and accessory pigments. **Chlorophyll a is the primary pigment that traps solar energy and converts it into electrical and chemical energy**. Thus, it is called the reaction centre.

61. The entire process of photosynthesis takes place inside_____

a) Mitochondria
b) Ribosome
c) Chloroplast
d) All the above

Explanation

The **entire process of photosynthesis takes place inside the chloroplast**. The structure of chloroplast is such that the light dependent (Light reaction) and light independent (Dark reaction) take place at different sites in the organelle.

62. Photosynthetic pigments absorb the light energy and convert it into_____

1) ATP
2) ADP
3) NAD
4) NADPH2
    a) 1, 3
    b) 2, 3
    c) 1, 4
    d) All the above

Explanation

Photosynthetic pigments absorb the light energy and convert it into chemical energy ATP and NADPH2. These products of light reaction move out from the thylakoid to the stroma of the chloroplast.

63. Who discovered Light reaction?

a) Robert Brown
b) Robert Hill
c) Robert Whitaker
d) Thomas Roe

Explanation

Light dependent photosynthesis was discovered by Robin Hill (1939). This reaction takes place in the presence of light energy in thylakoid membranes (grana) of the chloroplasts.

64. Light independent reactions are carried out in_____

a) Stomata
b) Stroma
c) Chloroplast
d) Ribosome

Explanation

The second steps (dark reaction or biosynthetic pathway) is carried out in the stroma. During this reaction CO2 is reduced into carbohydrates with the help of light generated ATP and NADPH2. This is also called as Calvin cycle and is carried out in the absence of light.

65. What is the input of Calvin cycle?

a) O2
b) CO2
c) H2O
d) COOH

Explanation

In **Calvin cycle the inputs are CO2 from the atmosphere** and the ATP and NADPH2 produced from light reaction.

66. When was Melvin Calvin awarded with Nobel Prize?

a) 1962
b) 1961
c) 1991
d) 1999

Explanation

Melvin Calvin, an American biochemist, discovered chemical pathway for photosynthesis. The cycle is named as Calvin cycle. **He was awarded with Nobel Prize in the year 1961 for his discovery.**

67. Which of the following internal factors affect Photosynthesis?

1) Accumulation of carbohydrates
2) Hormones
3) Light
4) Leaf age

a) 1, 2
b) 1, 3
c) 1, 2, 4
d) All the above

Explanation

Factors Affecting Photosynthesis:

a) Internal Factors:

i) Pigments ii) Leaf age iii) Accumulation of carbohydrates iv) Hormones

b) External Factors:

i) Light ii) Carbon dioxide iii) Temperature iv) Water v) Mineral elements

68. Who was awarded Bharat Ratna for his work in Artificial photosynthesis?

a) M.S. Swaminathan
b) C.N.R. Rao
c) Verghese Kurien
d) B.R. Ambedkar

Explanation

Artificial photosynthesis is a method for producing renewable energy by the use of sunlight**. Indian scientist C.N.R. Rao who was conferred the Bharat Ratna (2013) is also working on similar technology of artificial photosynthesis to produce** - Hydrogen fuel (renewable energy).

69. Which of the following statement about Mitochondria is correct?

1) Mitochondria are filamentous or granular cytoplasmic organelles present in cells.
2) The mitochondria were first discovered by Kolliker in 1857
3) Mitochondria are organelles within eukaryotic cells that produce adenosine triphosphate

a) 1, 2

b) 1, 3
c) 2, 3
d) All the above

Explanation

Mitochondria are **filamentous or granular cytoplasmic organelles present in cells**. The **mitochondria were first discovered by Kolliker in 1857** as granular structures in striated muscles. Mitochondria (singular: mitochondrion) are organelles within eukaryotic cells that produce adenosine triphosphate (ATP) which form the energy currency of the cell, for this reason, the mitochondria is referred to as the "Power house of the cell".

70. Match the composition of mitochondria:

I.	Protein	1. 5-7%
II.	Lipids	2. 60-70%
III.	RNA	3. 25-30%

a) 1, 3, 2
b) 2, 1, 3
c) 3, 2, 1
d) 2, 3, 1

Explanation

Mitochondria vary in size from 0.5 µm to 2.0 µm. Mitochondria contain **60-70% protein, 25-30% lipids, 5-7% RNA** and small amount of DNA and minerals.

71. Which of the following statement about Mitochondria is correct?

1) It consists two membranes called inner and outer membrane.
2) Each membrane is 60-70A˚ thick
3) It has porin molecules (proteins) which form channels for passage of molecules through it.

a) 1, 2
b) 1, 3
c) 2, 3
d) All the above

Explanation

Mitochondrial Membranes consists **two membranes called inner and outer membrane**. Each membrane is **60-70A˚ thick**. Outer mitochondrial membrane is smooth and freely permeable to most small molecules. It contains enzymes, proteins and lipids. It has **porin molecules (proteins) which form channels for passage of molecules through it**.

72. What % of proteins and lipids does Inner mitochondrial membrane has?

a) 40
b) 80
c) 99
d) 30

Explanation

Inner mitochondrial membrane is semi permeable membrane and regulates the passage of materials into and out of the mitochondria. It is rich in enzymes and carrier proteins. It **consists of 80% proteins and lipids**.

73. The finger like projections of inner mitochondrial membrane are called as_____

a) Stelle
b) Pith
c) Cristae
d) Stroma

Explanation

The **inner mitochondrial membrane gives rise to finger like projections called cristae**. These cristae increase the inner surface area (fold in inner membrane) of the mitochondria to hold variety of enzymes.

74. Which of the following statement about Oxysomes is incorrect?

1) They involve in ATP synthesis.
2) They are present in outer mitochondrial membrane

a) 1 alone
b) 2 alone
c) 1, 2
d) None

Explanation

The inner mitochondrial membrane bear minute regularly spaced tennis racket shaped particles **known as oxysomes (F1particle)**. They **involve in ATP synthesis**

75. Which of the following are the functions of Mitochondria?

1) ATP factory of the cell.
2) It helps the cells to maintain normal concentration of calcium ions
3) It regulates the metabolic activity of the cell.

a) 1, 2
b) 1, 3
c) 2, 3
d) All the above

Explanation

Functions of Mitochondria:

- Mitochondria is the main organelle of cell respiration. They produce a large number of ATP molecules. So, they are called as power houses of the cell or **ATP factory of the cell**.
- It helps the cells to **maintain normal concentration of calcium ions**.
- It **regulates the metabolic activity** of the cell.

76. Which of the following statement is correct?
    1) Respiration involves exchange of gases between the organism and the external environment
    2) Biochemical process occurs within cells where the food is oxidized to obtain energy, this is known as cellular respiration
        a) 1 alone
        b) 2 alone
        c) 1, 2
        d) None

Explanation

Respiration involves exchange of gases between the organism and the external environment. The plants obtain oxygen from their environment and release carbon dioxide and water vapour. This exchange of gases is known as external respiration. It is a physical process. **Biochemical process occurs within cells where the food is oxidized to obtain energy, this is known as cellular respiration**.

77. What is the by-product of Aerobic respiration?
    1) Carbon dioxide
    2) Water
    3) Oxygen
    4) ATP
        a) 1, 2, 3
        b) 1, 3, 4
        c) 1, 2, 4
        d) None

Explanation

Aerobic respiration is the type of cellular respiration in which organic food is completely oxidized with the help of oxygen into carbon dioxide, water and energy. It occurs in most plants and animals.

$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + ATP$

78. Breaking down of glucose into pyruvic acid is called as____
    a) Glycolysis
    b) Krebs Cycle
    c) Calvin cycle
    d) None

Explanation

Glycolysis (Glucose splitting) is the breakdown of one molecule of glucose (6 carbon) into two molecules of pyruvic acid (3 carbon). Glycolysis takes place in cytoplasm of the cell. It is the first step of both aerobic and anerobic respiration.

79. Which of the following is also known as Tricarboxylic Acid Cycle?
    a) Glycolysis

b) Krebs Cycle
c) Calvin cycle
d) Photochemical cycle

Explanation

Krebs Cycle occurs in mitochondria matrix. At the end of glycolysis, 2 molecules of pyruvic acid enter into mitochondria. The oxidation of pyruvic acid into CO2 and water takes place through this cycle. **It is also called Tricarboxylic Acid Cycle (TCA)**.

80. What is the by-product of Anaerobic respiration glucose?

a) Acetic acid
b) Formic acid
c) Lactic acid
d) Lactate

Explanation

Anaerobic respiration takes place without oxygen. **Glucose is converted into ethanol (in plants) or lactate (in some bacteria)**

$C_6H_{12}O_6 \rightarrow 2CO_2 + 2C_2H_5OH$ + Energy (ATP)

81. Respiratory quotient =

a) Volume of CO2 liberated/ Volume of O2 consumed
b) Volume of O2 liberated/ Volume of CO2 consumed
c) Volume of CO liberated/ Volume of O2 consumed
d) Volume of CO2 liberated Volume of H2O consumed

Explanation

Respiratory quotient is the ratio of volume of carbon dioxide liberated and the volume of oxygen consumed during respiration. It is expressed as

RQ = Volume of CO2 liberated/ Volume of O2 consumed

82. Which of the following statement about Electron Transport Chain is correct?

1) This is accomplished through a system of electron carrier complex called electron transport chain (ETC) located on the inner membrane of the mitochondria
2) NADH2 and FADH2 molecules formed during glycolysis and Krebs cycle are oxidised to NAD+ and FAD+ to release the energy via electrons
3) This is accomplished through a system of electron carrier complex called electron transport chain (ETC) located on the inner membrane of the mitochondria

a) 1, 2
b) 1, 3
c) 2, 3
d) All the above

Explanation

Electron Transport Chain is accomplished through a system of electron carrier complex called electron transport chain (ETC) located on the inner membrane of the mitochondria. NADH2 and FADH2 molecules formed during glycolysis and Krebs cycle are oxidised to NAD+ and FAD+ to release the energy via electrons. The electrons, as they move through the system, release energy which is trapped by ADP to synthesize ATP. This is called oxidative phosphorylation. In this process, O_2 the ultimate acceptor of electrons gets reduced to water.