This Chapter “Assertion-Reason Problems on Plant Kingdom for NEET” is taken from our Book:

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Product Name : Assertion-Reason Question Bank in Biology for AIIMS

Product Description : Assertion-Reason Questions are the most tedious part in the AIIMS examination. They require not only understanding the statements but also the correct and accurate conceptual reasoning. Assertion-Reason Question Bank in Biology for AIIMS provides a comprehensive set of questionnaires to supplement learning from the NCERT textbooks. The book contains, in all, 2000+ questions with 95% + explanations. This book is devised for students to overcome the difficulty faced by them in attempting Assertion and Reason questions. It will help them to refine their concepts and emerge out successful in various competitive medical entrance examinations. This entire book comprises of chapter-wise questions according to the NCERT curriculum. At the end of every chapter, detailed solutions have been provided to help students with self-assessment. The uniqueness of this book lies in the new set of questions providing coverage of the entire NCERT syllabus.
Directions: In the following questions, a statement of assertion is followed by a statement of reason. Mark the correct choice as:
(a) If both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) If Assertion is true but Reason is false.
(d) If both Assertion and Reason are false.

1. **Assertion:** Algae and fungi are grouped in thallophyta.
   **Reason:** Algae and fungi show no differentiation in thallus.

2. **Assertion:** *Chlorella* could be utilised to keep the air pure in space vehicles.
   **Reason:** The space travelers feed on *Chlorella* soup.

3. **Assertion:** Members of phaeophyceae vary in colour from olive green to various shades of brown.
   **Reason:** Phaeophyceae possess chlorophyll a, c, carotenoids and xanthophylls. [AIIMS 2006]

4. **Assertion:** Rhodophyta is red in colour of due to abundant formation of r-phycoerythrin.
   **Reason:** r-phycoerythrin is able to absorb blue green wavelength of light and reflect red colour.

5. **Assertion:** The colour of brown algae varies from olive green to brown.
   **Reason:** In brown algae, fucoxanthin is responsible for colour variation.

6. **Assertion:** Plant body is usually grass green in colour in Chlorophyceae.
   **Reason:** Members of Chlorophyceae possess chlorophyll a, c, carotenoids and xanthophyll.

7. **Assertion:** *Chlorella* and *Spirulina* are used as a food supplement by space travellers.
   **Reason:** These are unicellular algae.

8. **Assertion:** Each group of algae show predominance of one pigment.
   **Reason:** The algae are classified on this basis.

9. **Assertion:** Only red algae are able to flourish at the great depths of sea.
   **Reason:** Red algae has the pigments r-phycoerythrin and r-phycocyanin.

10. **Assertion:** Carpospore of red algae bears trichogyne.
    **Reason:** Trichogyne helps in reproduction.

11. **Assertion:** *Spirogyra* is slippery to touch.
    **Reason:** *Spirogyra* consists of a gelatinous sheath.

12. **Assertion:** Isogamy is a primitive type of sexual reproduction.
    **Reason:** The gametes are of different sizes.

13. **Assertion:** *Chlorella* could serve as a potential source of food and energy.
    **Reason:** *Chlorella* when dried, has 15% protein, 45% fat, 10% carbohydrate, 20% fibre, and 10% minerals and vitamins.

14. **Assertion:** *Spirogyra* shows haplontic life cycle.
    **Reason:** Zygotic meiosis occurs in *Spirogyra*.

15. **Assertion:** Red algae contributes in producing coral reef.
    **Reason:** Some red algae secrete and deposit calcium carbonate over their walls. [AIIMS 2004, 2011]

16. **Assertion:** In rhodophyceae, the cell wall is made of cellulose.
    **Reason:** The flagella number is two in class Rhodophyceae.

17. **Assertion:** Red algae contributes in producing coral reefs.
    **Reason:** Some red algae secrete and deposit calcium carbonate over their walls.

18. **Assertion:** Only anisogamous type of reproduction is seen in algae.
    **Reason:** Gametes can never be non-flagellated in algae.
19. **Assertion**: The peristome is a fringe of tooth-like projections found at the mouth of the capsule.
   **Reason**: It may be of two types nematodontous and orthodontus.
20. **Assertion**: Mosses are of great ecological importance.
    **Reason**: They prevent soil erosion by forming dense mat on the soil.
21. **Assertion**: Mosses are evolved from algae.
    **Reason**: Protonema of mosses is similar to some green algae.
22. **Assertion**: In mosses, spores are contained within the capsule.
    **Reason**: The spores are formed by mitotic division in mosses.
23. **Assertion**: Bryophytes are claimed to be terrestrial amphibians.
    **Reason**: They require an external layer of water on the soil surface for their existence.
24. **Assertion**: Bryophytes and trachophytes have an embryo stage in their life cycle.
    **Reason**: Embryophyta are terrestrial plants.
25. **Assertion**: The sex organs in bryophytes are jacketed.
    **Reason**: Bryophytes are land plants.
26. **Assertion**: Bryophytes are mostly land dwellers.
    **Reason**: Water is necessary to complete their life-cycle.
27. **Assertion**: The bryophytes exist in two phases gametophyte and sporophyte.
    **Reason**: The sporophyte is nutritionally independent.
28. **Assertion**: Bryophytes, unlike thallophytes, show formation of embryo.
    **Reason**: The embryo gives rise to gametophyte of bryophytes.
29. **Assertion**: Archegonium is the female sex organ in bryophytes.
    **Reason**: Algae also possess the archegonium.
30. **Assertion**: Bryophyte has an independent embryo.
    **Reason**: The zygote of thallophyte is dependent.
31. **Assertion**: Liverworts fail to spread to a new locality through fragmentation.
    **Reason**: Gemmae are helpful in propagating liverworts in different locality.
32. **Assertion**: Sperms of *Riccia* are biflagellate.
    **Reason**: The sperms can swim.
33. **Assertion**: Among the liverworts, the sporogonium of *Riccia* is the simplest.
    **Reason**: Sporophyte consists of capsule only.
34. **Assertion**: In *Funaria*, the young stem is photosynthetic.
    **Reason**: It contain hydroids.
35. **Assertion**: *Funaria* multiplies vegetatively by means of bulbils.
    **Reason**: Bulbils and tubers are two distinct structures.
36. **Assertion**: In *Funaria*, gemmae formation occurs in unfavourable condition.
    **Reason**: The gemmae form on the stem and leaves.
37. **Assertion**: In *Funaria* is monocious.
    **Reason**: Cross fertilization occurs in *Funaria*.
38. **Assertion**: In *Funaria*, the antheridia are projected from surface.
    **Reason**: Its antheridial cluster is surrounded by perigonal leaves.
39. **Assertion**: Mosses are used as indicators of pollution.
    **Reason**: They absorb metals.
40. **Assertion**: Bryophytes and pteridophytes contain well-developed antheridia.
    **Reason**: Biflagellate sperms are formed by their antheridia.
41. **Assertion**: In Liverworts, both male and female sex organs may be present on same thalli or different thalli.
    **Reason**: A sporophyte is formed from the zygote which is differentiated into foot, seta and capsule.
42. **Assertion**: Bryophytes are known as the amphibians of plant kingdom.
    **Reason**: They are found in swamps and the areas where land and water meet.
43. **Assertion**: Zygote produces a multicellular sporophyte in pteridophytes.
    **Reason**: The dominant phase in life cycle of pteridophytes is sporophyte.
44. **Assertion**: *Selaginella* and *Salvinia* are homosporous.
    **Reason**: In *Selaginella* and *Salvinia*, similar kind of spores are produced.
45. **Assertion**: The sorus of *Pteridium* is of coenosorus type.
    **Reason**: *Pteridium* lacks sori.
46. **Assertion:** Coenosorus lacks true indusium.  
**Reason:** Indusium covers sori.

47. **Assertion:** The scales which cover young rhizome and leaves of Dryopteris are called ramenta.  
**Reason:** Pteridium lacks ramenta.

48. **Assertion:** The scale leaves present on the long shoots are called cataphylls.  
**Reason:** Cataphylls lack mid rib.

49. **Assertion:** Water is required for fertilization process in ferns.  
**Reason:** Malic acid of archegonial neck attracts antherozoids.

50. **Assertion:** Sporophytes of pteridophyta are dominant individuals.  
**Reason:** They do not show the formation of true root.

51. **Assertion:** Adiantum caudatum is called walking fern.  
**Reason:** It can reproduce by its leaf tips.

52. **Assertion:** Pinus displays the alternation of generations.  
**Reason:** The gametophyte is dependent upon the sporophyte phase.

53. **Assertion:** Conifer trees produce a large quantity of wind borne pollen grains.  
**Reason:** The pollen grains have wings.

54. **Assertion:** Gymnosperms do not produce fruit.  
**Reason:** Ovules of gymnosperms are enclosed within the ovaries.

55. **Assertion:** Gametophyte is dominant in diplontic life cycle.  
**Reason:** In diplontic life cycle, free living sporophyte is absent.

56. **Assertion:** In gymnosperms, stomata are found on the surface of leaves.  
**Reason:** Cuticle of leaves is thin in gymnosperms.

57. **Assertion:** Pinus shows the alternation of generations.  
**Reason:** The gametophyte is dependent upon the sporophyte phase.

58. **Assertion:** Pinus embryo has many cotyledons.  
**Reason:** It shows polyembryony.

59. **Assertion:** The female cones take a long time to mature.  
**Reason:** The seeds are shed when the cone is 22 months old.

60. **Assertion:** The female cones are same in number as the male cones.  
**Reason:** Male and female cones appear alternately on the same branch of the Pinus.

61. **Assertion:** Pinus is monoecious.  
**Reason:** Each sporophyll bears only one microsporangia.

62. **Assertion:** The mesophyll of Pinus shows no distinction as mesophyll and palisade.  
**Reason:** Parenchymatous cells are present in mesophyll of Pinus.

63. **Assertion:** Pinus shows formation of annual rings.  
**Reason:** It grows in areas of environmental fluctuation.

64. **Assertion:** In gymnosperms, plants lack well-developed vessels and fibres.  
**Reason:** Companion cells are absent in gymnosperm.

65. **Assertion:** Gymnosperms seeds are naked.  
**Reason:** They lack ovary wall.

66. **Assertion:** Pinus has a pyramidal appearance.  
**Reason:** The older parts of long shoot have scars of fallen dwarf shoots.

67. **Assertion:** The female cone of Cycas is not a true cone.  
**Reason:** Its formation checks the growth of the stem.

68. **Assertion:** All living species of Cycas are dioecious.  
**Reason:** Cycas contains male and female cones on the separate plant.

69. **Assertion:** The male of Cycas changes in size when the microspores became mature.  
**Reason:** The microspores are dispersed by wind.

70. **Assertion:** The leaves in gymnosperm are well adapted to withstand extremes of temperature, humidity and wind.  
**Reason:** Unlike bryophytes and pteridophytes, in gymnosperms, the male and female gametophytes do not have an independent free living existence.

71. **Assertion:** The male and female gametophytes do not have independent existence in gymnosperms.  
**Reason:** They remain within the sporangia retained on the sporophyte.
72. **Assertion**: Angiosperm and Gymnosperms both form spermatophyta.  
**Reason**: Angiosperm and Gymnosperms both form triploid endosperm.

73. **Assertion**: Stamens are comparable to microsporophylls.  
**Reason**: Ovules are comparable to megasporophylls.

74. **Assertion**: Biennial plants flower in two years.  
**Reason**: Biennial plants live for two years.

75. **Assertion**: Flagellate male gametes are absent in angiosperms.  
**Reason**: For fertilization, sperms are not dependent on water.

76. **Assertion**: Ovules form seeds upon fertilization.  
**Reason**: Ripened ovary forms fruit.

77. **Assertion**: Pyrenoids are utilised during starvation.  
**Reason**: Pyrenoids are proteinaceous bodies.

78. **Assertion**: The eye-spot is present in the cell in green algae.  
**Reason**: Eye-spot is meant for respiration.

79. **Assertion**: Flower is an aggregation of sporophylls.  
**Reason**: In angiosperms, sporophylls are modified.

80. **Assertion**: Plants show alternation of generation [between haploid gametophytic (n) phase and diploid sporophytic (2n) phase].  
**Reason**: Plantae includes eukaryotic, heterotrophic, chlorophyll containing organism.

81. **Assertion**: Each cell of the embryo sac is haploid in angiosperms.  
**Reason**: In angiosperms, meiosis precedes embryo sac formation.
Plant Kingdom

1. (a) On the basis of
   (i) Thallus like non-vascular plant body.
   (ii) Simple, unicellular non-jacketed sex organs and
   (iii) No embryo development after gametic union, the algae and fungi have long been grouped together in thallophyta.
   The algae and fungi are the result of parallel development and do not indicate any phylogenetic relationship.

2. (b) *Chlorella* could be utilised to keep the air in space vehicles pure and supply food in space stations and prolonged space flight trips. The space travellers could feed on *Chlorella* soup. It is nourishing but not appetizing food.

3. (a) Phaeophyceae possesses chlorophyll a, c, carotenoids and xanthophylls. Members of phaeophyceae show variations in colour from olive green to different shades of brown depending upon the amount of xanthophyll pigments.

4. (a) The red colour of Rhodophyta is due to abundance of the pigment r-phycoerythrin. Phycoerythrin absorbs blue green wavelengths of light and reflects red light where a imparts red colour to algae.

5. (b) Brown algae show a range of colour from olive green to various shades of brown depending upon the amount of fucoxanthin the xanthophyll pigment, present in them.

6. (c) Chlorophyceae are commonly called green algae. The plant body may be unicellular, colonial or filamentous. They are usually grass green in colour due to the dominance of pigments, chlorophyll a and b.

7. (b) Unicellular algae *Chlorella* and *Spirullina* are rich source of proteins and hence are used as food supplement by space travellers.

8. (a) The colour of the algal thallus is due to the presence of definite chemical compounds in their cells and varies in different classes of algae. These are called pigments. Each pigment has its own characteristic colour. The particular colour of an alga is due to the predominance of one pigment in a combination of several others. Each group of algae has its own particular combination of pigments and a characteristic colour which is not found in other algal groups.

9. (a) The red algae flourish and occur in abundance at great depths of sea where other plants do not. The sunlight, as it penetrates water, portions of spectrum such as red, orange, yellow and green light rays which are of short wavelengths are filtered out. Only the blue and violet rays of greater wavelengths remain and penetrate to great depths. The green pigment chlorophyll cannot trap these light rays of great wavelength and the green plants are thus, unable to carry on photosynthesis at these depths. The red pigment r-phycoerythrin and a blue pigment γ-phycocyanin which are characteristic pigments of all the red algae, can utilize wavelengths of light (blue and violet rays) not absorbed by chlorophyll.

10. (a) The carpogonium (female sex organ) in one of the simplest red alga *Nemalion*, consists of a swollen base containing the female nucleus and an elongated terminal hair-like structure called the trichogyne. During fertilization, the spermatium (male gamete) discharges its contents into the latter. The spermatium nucleus migrates downwards to fuse with the egg nucleus in the basal swollen part of the carpogonium. Soon after fertilization, the trichogyne disintegrates.

11. (a) The outermost portion of pectose changes into pectin in *Spirogyra*. The latter dissolves in water to form a gelatinous sheath which is slimy. It envelopes the entire filament. This makes filament slippery to touch.
12. (c) The fusing gametes in the lower forms of algae are similar in size, structure and behaviour. They are indistinguishable with respect to sex. Such gametes are called isogametes. Sexual reproduction involving the fusion of isogametes is termed isogamous. It is a primitive type of sexual reproduction.

13. (c) *Chlorella* could serve as a potential source of food and energy because of its photosynthetic efficiency. When dried, it has about 45% protein, 20%, fat, 20% carbohydrate, 5% fibre and 10% minerals and vitamins.

14. (a) Haplontic life cycle is characterized by a haploid thallus and zygotic meiosis. It is also called as haplobiontic because only a single type of free living individual is involved in the life cycle. *Spirogyra* shows haplontic life cycle and therefore, it shows zygotic nucleus as well.

15. (a) In some species of red algae, the cell walls become hardened with calcium carbonate. These algae are hence, important for the formation of coral reefs. Coral reefs are formed through the accumulation of calcareous exoskeletons of coral animals, calcareous red algae and molluscs. They form the foundation of reefs by secreting a calcium carbonate skeleton and provide protection for the coral polyps. Calcium carbonate is continuously secreted by the coral colony.

16. (c) Flagella is absent in class Rhodophyceae.

17. (a) Red algae generally grow attached to rocky stones. Some deep water red algae are calcareous and build up hard stony thalli responsible for the production of lime stones and coral reefs.

18. (a) In algae, sexual reproduction takes place by fusion of two gametes. These gametes can be flagellated and similar in size (*Chlamydomonas*) or non-flagellated (non-motile) but similar in size (*Spirogyra*). Such reproduction is called isogamous. Fusion of two gametes that are dissimilar in size, as in some species of *Chlamydomonas* is termed as anisogamous. Fusion between one large, non-motile female gamete and a smaller, motile male gamete is termed oogamous.

19. (b) The peristome teeth are present at the mouth of capsule. The teeth may be solid cellular tissue or composed only of the thickened portions of the cell walls of adjacent cells. When the teeth of peristome are solid structures composed of bundles of dead cells, it is termed nematodontous peristome. It is found in *Polytrichum*, *Pogonatum* and *Tetraphis*. If peristome composed of thin, membranous, transversely barred teeth, each tooth is made up of the thickened portions of the cell walls of adjacent cells. Such a peristome is called orthodontous.

20. (b) Mosses and lichens are the first organisms to colonise rocks and hence, are of great ecological importance. They cause decomposition of rocks making the substrate suitable for the growth of higher plants. Mosses form dense mats on the soil, and reduce the impact of falling rain and prevent soil erosion.

21. (a) According to some botanists, mosses originated from algae. Protonema of mosses is similar to certain algae.

22. (c) In mosses, vegetative reproduction takes place by fragmentation and budding in the secondary protonema. The zygote develops into a sporophyte after fertilisation and consists of a foot, seta and capsule. The sporophyte in mosses is more elaborate as compared to that in liverworts. The capsule contains spores. Spores are formed after meiosis and develop into new gametophyte.

23. (a) Bryophytes require an external layer of water on the soil surface for their existence and thus are called terrestrial amphibians. The external supply of water is required for (a) dehiscence of antheridia and archegonia.
Plant Kingdom

23. (b) swimming of male gametes to reach archegonia
(c) protection from transpiration and desiccation as the plant body is not covered by cuticle
(d) supply of water to all plants through capillarity in the absence of vascular tissues.

24. (b) Bryophytes and tracheophytes possess an embryo stage and are collectively called embryophyta. They are terrestrial plants. Bryophytes are nonvascular while tracheophytes possess vascular tissue.

25. (a) Bryophytes are a group of non-vascular land plants. The sex organs in the bryophytes are multicellular and jacketed. The jacket of sterile cells around the sperms and eggs is an adaptation to a land habitat. It protects the sex cells against the drying effects of air.

26. (b) Majority of the bryophytes are land dwellers and inhabit damp, shaded and humid localities. A few of them live in or float on water. The bryophytes cannot carry on their reproductive activities without sufficient moisture. Presence of water is necessary.

27. (c) The bryophytes have evolved a life which comprises of two phases—gametophyte and sporophyte. The gametophyte (haploid) is concerned with sexual reproduction and constitutes the most conspicuous, nutritionally independent phase in the life cycle. The sporophyte is partly or wholly dependent on the gametophyte for nutritional purpose.

28. (c) In thallophytes (algae and fungi), the formation of embryo is absent. In bryophytes, the zygote, on germination, does not produce the gametophyte plant. It undergoes segmentation to form an embryo. The embryo (diploid) by further segmentation and differentiation gives rise to sporophyte. The sporophyll obtains its nourishment directly from the parent gametophyte to which it is organically attached.

29. (c) Archegonium is the female sex organ of the bryophytes. It appears for the first time in the liverworts and mosses and continues in the pteridophytes. Archegonium is absent in thallophytes (algae and fungi). Sex organs in them are male gametes and female gametes.

30. (d) In bryophytes, the zygote, on germination, does not produce the gametophytic plant. It undergoes segmentation to form an embryo. But the embryo formation and its development to sporogonium and sporophyte are dependent on gametophyte plant as the sporophyte is dependent on the gametophyte for nutrition. They organically remain attached to the gametophytic plant. In algae, the zygote is independent and it does not form the sporophyte.

31. (b) Fragmentation leads to an increase in the number of plants in a locality but it does not permit the spread of the plant to an entirely new locality. Gemmae are easily carried as they are small and sufficiently buoyant. They spread by water and wind currents to new habitats when detached, where each grows into a new individual immediately.

32. (a) Each sperm of Riccia is a minute, slender and curved structure. It bears a pair of whiplash flagella at its anterior end. The sperms do not leave the antheridium until enough moisture is present that allow them to swim about.

33. (a) The sporogonium (capsule) of Riccia is the simplest among the liverworts. It lacks the foot and the seta. Elaters are absent. Unlike other liverworts, in Riccia, the embryo, sporogonium and spore mother cells develop no chloroplasts. Thus, no photosynthesis occurs there. The sporophyte is totally dependent upon the gametophytic thallus.

34. (b) The cortical cells in young stems of Funaria, contain chloroplasts, and thus, they are photosynthetic. The central cylinder forms the core of the stem. It
consists of vertically elongated, thin-walled, narrow, compactly arranged cells lacking protoplasm. These thin walled, elongate, dead cells with non-lignified walls are commonly called as hydroids.

35. (c) In some mosses, the formation of small, underground resting, bud-like structures called the tubers has also been reported. Formerly, these underground bud-like structures were called the bulbils. The tubers develop singly on stem, leaves and rhizoids as small, spherical storage organs containing starch. These serve as means of perennation and enable the plant to survive over periods unfavourable for vegetative growth.

36. (b) In Funaria, the gemmae develop on the stem and leaves of the gametophore at the onset of conditions unfavourable for growth or during injury. These detached gemmae directly develop into new leafy gametophores under conditions favourable for vegetative growth.

37. (b) Funaria is monoecious. The antheridia (male sex organ) are formed at the summit of a relatively small, main leafy shoot which develops first from the parent plant. The female branch arises later as a lateral outgrowth from the base of the parent male shoot. When the two kinds of the sex organs are borne in separate clusters on two distinct branches of the same plant, the arrangement is called monoecious.

38. (b) In Funaria, the antheridia project from the surface of the receptacle and are aggregated to form a cluster. The leaves surrounding the antheridial cluster are known as the perigonal leaves. The antheridial cluster with the surrounding perigonal leaves is called the perigonium.

39. (a) Rubling and Tyler (1979) showed that air dried mosses can absorb metals. The accumulation of heavy metal cations in mosses enables them to be used as pollution indicators.

40. (d) In bryophytes, antheridia are well developed and often possess a stalk. In pteridophytes, antheridia are less developed and are generally devoid of a stalk. Pteridophytes have multiflagellate sperm formed from androcyte cell of antheridium. Bryophytes have biflagellate sperm.

41. (b) In Liverworts, antheridia (male) are produced on antheridiophore and archegonia (female) are borne on special stalked structure called archegoniophore. Both male and female sex organs may be present on same thalli or different thalli. Sporophyte is formed from the zygote which is differentiated into foot, seta and capsule.

42. (b) Bryophytes are the dwellers of transitional habitat between the aquatic and terrestrial habitats. It is represented by the swamps and the areas where water and land meet. Bryophytes usually grow in amphibious situation and cannot complete their life cycle without external water.

43. (b) Gametophytes bear male and female sex organs called antheridia and archegonia, respectively in pteridophytes. Water is required for transfer of the male gametes released from the antheridia, to the mouth of archegonium. Fusion of male gamete with the egg present in the archegonium results in the formation of zygote. Zygote thereafter produces a multicellular well-differentiated sporophyte, the dominant phase of the pteridophytes.

44. (d) All the spores are of similar kinds in majority of the pteridophytes; such plants are called homosporous. Genera like Selaginella and Salvinia produce two kinds of spores i.e. macro (large) spores and micro (small) spores, hence, are known as heterosporous.

45. (c) The sporangia of Pteridium are not grouped together in small separate sori, but the sorus is continuous along the under margin of the pinnules, often for considerable distances. This type of sorus is known as continuous linear sorus (coenosorus).
46. (b) Indusium is a membranous epidermal outgrowth covering the sori in some ferns. The coenosorus is surrounded by two well formed indusial lips, between which the receptacle lies. The outer indusial lip is well-developed and is formed by the reflexed margin of the pinnule, which overlaps the coenosorus and its sporangia. This is commonly called the false indusium.

47. (b) In Dryopteris, young rhizome and leaves are covered with dry, brown, chaffy scales known as ramenta. In Pteridium, the rhizome and the leaves especially while young, are covered by a felt of simple hairs, and the scales are conspicuously absent.

48. (d) The scale leaves are present both on the long and dwarf branches. They fall off as the branches mature. The scale leaves on the dwarf shoots are called the cataphylls and possess a distinct midrib.

49. (c) In ferns, fertilization usually takes place if the prothalli are watered from above as they would be by rain in the ordinary course of nature. They possess flagella for swimming towards archegonia through water. The discharged matter at the mouth of the opened archegonial neck probably contains some chemical substance, e.g. malic acid, which by positive chemotaxis attracts the free swimming antherozoids, that penetrate the neck and reach the ovum which is deeply seated.

50. (c) In the pteridophytes, the sporophyte gains physiological independence and develops into the dominant, typically photosynthetic phase of the life cycle. It is organized into stem, leaves and roots. Psilophyta (a pteridophyte division) lack true roots.

51. (c) Leaf tips of Adiantum caudatum, develop adventitious buds for vegetative propagation. Leaf tip when reaches the ground, develops into new plant, therefore, it appears that the plant is walking.

52. (b) Pinus show alternation of generations. The sporophyte phase is of long duration and is represented by the huge pine tree, which bears the staminate and ovulate cones since meiotic divisions occur at the same time of the differentiation of the pollen grains and megaspores.

53. (a) In Pinus, a conifer tree, the microspores are produced by microsporogenesis in microsporangium. Each microsporangium has an inner nourishing layer known as tapetum. A large number of dusty and two winged microspores are present. On maturity, the microsporangium wall bursts and microspores are released in the air which is called "shower of sulphur." They are dispersed by wind due to presence of wings.

54. (c) The gymnosperms are plants in which the ovules are not enclosed by any ovary wall and remain exposed, before and after fertilization as well. The seeds that develop post-fertilisation, are not covered or are naked. After fertilization, zygote develops into an embryo and ovules into naked seeds.

55. (d) The diploid sporophyte is the dominant, photosynthetic and independent phase of the plant gametophyte in diplontic lifecycle. It is highly reduced and is retained within sporangia.

56. (d) In gymnosperms, the leaves are well-adapted to withstand extreme conditions of temperature, humidity and wind. The needle-like leaves reduce the surface area. Their thick cuticle and sunken stomata help in reducing water loss.

57. (b) Pinus shows alternation of generations. The sporophyte phase is long and represented by the huge pine tree bearing the staminate and ovulate cones. Meiotic divisions occur at the same time as the differentiation of the pollen grains and megaspores.

58. (b) The embryo in Pinus is straight and consists of a short axis bearing a ring of about ten slender, yellow cotyledons at the end that is away from the micropylar end. In Pinus, more than one embryo is developed from a single egg by the splitting of the product of a single fertilization termed as cleavage polyembryony.
59. (b) The ovulate or female cones take about three years to mature. The mature cones are hard, woody and very large in size. Many important changes take place in the female cone during the interval of about thirteen months between pollination and the actual act of fertilization.

60. (d) Female cones or ovulate cones are less in number and arise as single or in a small clusters of two to four, each as a bud in the axial of a scale leaf towards the end of the new shoots of unlimited growth (long shoots) which do not bear the male cones.

61. (c) *Pinus* is monoecious for it bears both types of cones on the same tree on separate branches. The male cone comprises of a number of small spirally arranged microsporophylls. Each microsporophyll bears two microsporangia or pollen sacs on the lower surface of its horizontal position.

62. (c) The parenchymatous mesophyll is present within the hypodermis of *Pinus* leaf. It is compact and shows no differentiation into palisade and spongy tissues. It consists of thin walled cells which contain numerous chloroplasts and abundant starch. The mesophyll thus function as the chlorophyll bearing tissue which manufactures food for plants.

63. (a) The secondary wood shows well marked growth rings which are formed annually due to environmental fluctuations. Each annual ring possesses a zone of spring and an autumn wood. Spring wood is formed during spring season under availability of enough water and minerals. It possess large polygonal, thin walled and wide tracheids with large bordered pits. Autumn wood is formed during autumn season. It possesses smaller, thick walled and narrow tracheids with small bordered pits. It is evident that the size of tracheids shows a marked variation with regards to amount of moisture available in the respective season.

64. (c) In gymnosperms, xylem lacks true vessels and wood fibres. It consists of tracheids that are arranged in uniform radial rows and xylem parenchyma only. The phloem contains sieve tubes and parenchyma cells. There are no companion cells.

65. (a) The gymnosperms have their ovules freely exposed before and after fertilization. They are not enclosed by any ovary wall. The seeds formed by them lack seed coat. Hence, due to absence of ovary wall and seed coat, their seeds are naked.

66. (b) Long branches of *Pinus* gradually become shorter towards the apex. Hence, the pine tree has a conical or pyramidal appearance. Long branches bear short branches and older portion of long branches display the scars of fallen short branches.

67. (c) There is no true and compact or properly organised female cone in *Cycas*. Megasporophylls are loosely arranged and thus, form a loose female strobilus. The growing point of the stem is unaffected by their development and continues its growth through the loose strobilus.

68. (a) All living species of *Cycas* are dioecious as the male and female structures occur on separate plants. The microsporophylls are aggregated into large compact male strobili or cones. The megasporophylls are loosely arranged. They do not form a true cone.

69. (a) When the microspores mature, the male cone elongates considerably and rapidly. The scales separate from one another so that sporangia are exposed. The sporangia lose water and with the loss of water from its cells, the exothecium shrinks. The sporangia thus, opens by a slit on its outer face. The spores fall out and the liberated spores are dispersed by wind.

70. (b) The leaves in gymnosperm are well adapted to withstand extremes of temperature, humidity and wind. In conifers, the needle like leaf reduce the surface area. Their thick cuticle and sunken stomata also help to reduce the water loss. Unlike bryophytes and pteridophytes, in gymnosperms, the
male and female gametophytes do not have an independent free living existence. They remain within the sporangia retained on the sporophytes.

71. (a) Gametophytes are retained within sporangia in gymnosperms.

72. (c) In angiosperms, endosperm is formed through triple fusion (fusion of sperms with two polar nuclei of the central cell) and is triploid. In gymnosperms, endosperm is formed before fertilization and therefore, it is haploid.

73. (b) Stamens are specialized microsporophylls. Each stamen has a narrow stalk or filament and a broader tip called anther. Anther develops four microsporangia or pollen grains. Carpels are specialized megasporophylls.Each carpel has a swollen base named ovary. The interior of ovary contains one or more placentae for bearing ovules.

74. (b) Biennial plants survive for two favourable seasons. During the first season, the plants grow in size and store food. In the second season, they bear flowers that form fruits.

75. (a) Angiosperms is the most highly evolved group of plant kingdom. It is adapted for terrestrial habitats. Swimming habit of sperms is completely absent in angiosperm. The pollen grains reach the stigma by an external agency and deliver the male gamete in the ovule through pollen tube.

76. (b) Fertilized ovules ripen to form seeds. The seeds are covered by fruits. Technically, a fruit is a ripened ovary. Gymnosperms contain ovules but they lack ovary, therefore, seeds are formed but are not fruits. Angiosperms contain both ovule and ovary and therefore, are seed bearing and fruit forming plants.

77. (b) The chloroplasts of green algae contain one or more distinct, rounded, proteinaceous bodies called the pyrenoids. These diminish in size and ultimately disappear if the plant is under conditions of starvation. They reappear when the conditions become favourable.

78. (c) The eye spot is usually associated with the chloroplast in green algae. It is considered as a photoreceptive organ.

79. (b) Sporophylls are organised into flowers in angiosperm. Both microsporophylls and megasporophylls are specialised. A microsporophyll or stamen consists of a filament and an anther. A megasporophyll or carpel is rolled and partly sterilised to produce a stigma, style and ovary containing ovules.

80. (c) The plant cell wall have eukaryotic structure with prominent chloroplast. Life cycle consists of alternating haploid gametophyte and diploid sporophyte generations. Plantae includes eukaryotic, autotrophic, chlorophyll containing organisms.

81. (a) Pistil consists of an ovary enclosing one to many ovules in angiosperms. Highly reduced female gametophytes termed embryo sacs are present within ovules. The embryo-sac formation is preceded by meiosis and thus, each of the cells of an embryo-sac is haploid.