

# KATTAR NEET 2026

## Botany By Rupesh Chaudhary Sir

### Plant Kingdom

**Q1** How many of the following organisms have cellulose, pectin and polysulphate ester in their cell wall?

*Gelidium, Selaginella, Polytrichum, Polysiphonia, Dictyota, Laminaria, Gracilaria*

- (A) Two (B) Four  
(C) Three (D) Five

**Q2** Select the **correct** sequence of arrangement of reproductive structures for *Cycas*.

- (A) Microspores→Microsporophylls→Microsporangia→ Male cone  
(B) Megaspores→Megasporangia→Megasporophylls→ Female cone  
(C) Sporangia→Sporophylls→Spores→Strobili  
(D) Megasporophylls→Megasporangia→ Megaspores

**Q3** Identify the type of taxonomy/classification for the given criteria or basis.

- A. Only gross superficial morphological characters are considered  
B. Consider external features, internal features, like ultrastructure, anatomy, embryology and phytochemistry  
C. Based on evolutionary relationships between the various organisms  
D. Based on chemical constituents of the plant  
E. Based on all observable characteristics that are assigned with number and codes

Choose the **correct** answer from the options given below:

(A)

A–Artificial Classification, B–Natural Classification, C–Phylogenetic Classification, D–Chemotaxonomy, E–Numerical Taxonomy

(B) A–Natural Classification, B–Phylogenetic Classification, C–Chemotaxonomy, D–Artificial Classification, E–Numerical Taxonomy

(C) A–Phylogenetic Classification, B–Artificial Classification, C–Natural Classification, D–Numerical Taxonomy, E–Chemotaxonomy

(D) A–Chemotaxonomy, B–Numerical Taxonomy, C–Artificial Classification, D–Natural Classification, E–Phylogenetic Taxonomy

**Q4** According to evolutionary point of view which of the following plant's male gametophyte would have number of cells?

- (A) *Polytrichum*  
(B) *Cedrus*  
(C) *Funaria*  
(D) *Equisetum*

**Q5** Identify the **incorrect** statements about algae:

- A. They can be found on stones, soil, and wood.  
B. They may be found in association with animals such as sloth bear.  
C. Zoospore is the most common type of spore produced sexually.  
D. Kelps are profusely branched forms.  
E. Algae are classified into three classes based on the type of pigments possessed and the type of stored food.



Choose the **correct** answer from the options given below:

- (A) A, D and E only
- (B) B, C and D only
- (C) C only
- (D) D and E only

**Q6** In which of the following plants male and female sex organs are present on different plant body?

- A. *Cycas*
- B. *Pinus*
- C. *Selaginella*
- D. *Marchantia*
- E. *Salvinia*

Choose the **correct** answer from the options given below:

- (A) A and B only
- (B) A, C and D only
- (C) B, C and E only
- (D) A, C, D and E only

**Q7** Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R:

**Assertion A:** The spread of living pteridophytes is limited and restricted to narrow geographical regions.

**Reason R:** In pteridophytes, gametophytes require specific restricted requirement such as cool, damp, shady places to grow and need water for fertilisation.

In the light of the above statements, choose the **correct** answer from the options given below:

- (A) A is true but R is false.
- (B) A is false but R is true.
- (C) Both A and R are true and R is the correct explanation of A.
- (D) Both A and R are true but R is not the correct explanation of A.

**Q8** Read the following statements about algae.

A. Algae contribute to nearly half of the total carbon dioxide fixation on Earth through photosynthesis.

B. Chlorella, a small multicellular green alga, is rich in proteins and used as a food supplement, even by space travellers.

C. Algae help increase the level of dissolved carbon dioxide in their immediate environment.

D. Commercially important hydrocolloids like algin and carrageen are obtained from red and brown algae, respectively.

E. Agar, obtained from red algae like *Gelidium* and *Gracilaria*, is used in microbial culture and food industries.

Choose the **correct** answer from the option given below:

- (A) Only B, C and D are incorrect
- (B) Only A, C, D and E are correct
- (C) A, B, C, D and E are correct
- (D) Only A, B and D are incorrect

**Q9** Which of the following plants possess strobilus in their sporophytic stage?

- A. *Selaginella*
- B. *Equisetum*
- C. *Cycas*
- D. *Sphagnum*
- E. *Pinus*

Choose the **correct** answer from the options given below:

- (A) A, B, C and E only
- (B) A, B, D and E only
- (C) C only
- (D) B and C only

**Q10** In which of the following group of plants, gametophytes are free living?

- (A) *Ginkgo*, *Polytrichum* and *Funaria*
- (B) *Cedrus*, *Selaginella* and *Pteris*



- (C) *Lycopodium*, *Adiantum* and *Psilotum*  
 (D) *Marchantia*, *Dryopteris* and *Sequoia*

**Q11** Read the following five statements (A to E) and identify the **correct** statement(s):

- A. Gymnosperms include medium-sized trees or tall trees and shrubs.  
 B. In gymnosperm, roots are generally tap roots.  
 C. Coralloid roots in *Cycas* show mycorrhizal association.  
 D. The stems are unbranched in *Cedrus* or branched *Pinus*.  
 E. In gymnosperms, male gamete and female gamete are present within pollen grain and ovule respectively.

Choose the **correct** answer from the options given below:

- (A) A, D and E only  
 (B) B, C and E only  
 (C) A, B and E only  
 (D) B, C and D only

**Q12** Identify the **correct** statement(s):

- A. *Funaria* possesses unicellular and unbranched rhizoids.  
 B. Gemmae are asexual buds, which develop in small receptacles called gemma cups.  
 C. Peat obtained from *Sphagnum* plants is used as packing material for trans-shipment of living material.  
 D. Mosses reduce the impact of falling rain and prevent soil erosion.  
 E. Some mosses provide food for herbaceous mammals, birds and other animals.

Choose the **correct** answer from the options given below:

- (A) A, B and C only  
 (B) B, C, D and E only  
 (C) A, C and D only  
 (D) B, D and E only

**Q13** Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R:

**Assertion A:** The plant body of bryophytes is more differentiated than that of algae but lacks true roots, stems, or leaves and possesses root-like, leaf-like, or stem-like structures.

**Reason R:** Main plant body in bryophytes is haploid.

In the light of the above statements, choose the **correct** answer from the options given below:

- (A) A is true but R is false.  
 (B) A is false but R is true.  
 (C) Both A and R are true and R is the correct explanation of A.  
 (D) Both A and R are true but R is NOT the correct explanation of A.

**Q14** Out of the given features, identify the **correct** one(s) for *Cycas*.

- A. Multicellular female gametophyte retained within megasporangium  
 B. Roots show enhanced fixed  $N_2$  content due to a symbiotic association  
 C. The pinnate leaves persist for a few years  
 D. Main plant body is sporophyte which bears male and female cones  
 E. Megaspore mother cell is differentiated from one of the cells of the nucellus

Choose the **correct** answer from the options given below:

- (A) A, B, C, and E only  
 (B) A, B, D, and E only  
 (C) A, B, C, D, and E  
 (D) A, C, D, and E only

**Q15** Given below are two statements:

**Statement I:** On the microsporangiate strobili, microsporophylls are arranged spirally along an axis, while in the megasporangiate strobili,



megasporophylls bearing ovules or megasporangia are present.

**Statement II:** In gymnosperm, pollen grains come in contact with the opening of the ovules borne on megasporophylls. The pollen tube carrying the male gametes grows towards archegonia in the ovules and discharge their contents near the mouth of the archegonia.

In the light of the above statements, choose the **most appropriate** answer from the options given below:

- (A) Statement I is correct but Statement II is incorrect.
- (B) Statement I is incorrect but Statement II is correct.
- (C) Both Statement I and Statement II are correct.
- (D) Both Statement I and Statement II are incorrect.

**Q16** Which of the following are **not** common between bryophytes, pteridophytes and gymnosperms?

- A. Production of spores through meiotic division.
- B. Presence of archegonia as female sex organ.
- C. Transfer of male gamete is mediated by water.
- D. Development of gametophyte from spores.
- E. Free living sporophytes.

Choose the **correct** answer from the options given below:

- (A) C and E only
- (B) A, B and D only
- (C) B and D only
- (D) C, D and E only

**Q17** Match **List-I** with **List-II**.

List-I		List-II	
(A)	Floridean starch as stored food	(I)	Many green algae

(B)	2-8 equal size flagella arise apically	(II)	<i>Dictyota</i>
(C)	Gelatinous coating of algin covering cellulosic wall of vegetative cell	(III)	Kelps
(D)	May reach a height of 100 metres	(IV)	<i>Gelidium</i>

Choose the **correct** answer from the option given below:

- (A) A–IV, B–I, C–II, D–III
- (B) A–I, B–IV, C–III, D–II
- (C) A–IV, B–I, C–III, D–II
- (D) A–IV, B–II, C–I, D–III

**Q18** Which of the following are the general features of green algae?

- A. They may be unicellular (*Chlorella*), colonial (*Chara*) or filamentous (*Ulothrix*).
- B. They are usually grass green due to the dominance of pigments chlorophyll a and b.
- C. They usually have a rigid cell wall made of an inner layer of pectose and an outer layer of cellulose.
- D. They possess pyrenoids in cytoplasm that contain protein besides starch.
- E. The chloroplast may be discoid, plate-like, reticulate, cup-shaped, spiral or ribbon-shaped in different species.

Choose the **correct** answer from the option given below:

- (A) B, D and E only
- (B) A, C and D only
- (C) A, D and E only
- (D) B and E only

**Q19** Which of the following statements are **correct** regarding members of class Phaeophyceae?



- A. They are found in marine habitat only.  
 B. The photosynthetic part of their body is called frond.  
 C. Stipe helps in attaching the plant body to substratum.  
 D. They produce pear-shaped spores asexually and pyriform gametes sexually.  
 E. Stored food material is mannitol and laminarin.  
 Choose the **correct** answer from the option given below:

- (A) A and B only  
 (B) D and E only  
 (C) A, B and C only  
 (D) B, D and E only

**Q20** Which of the following statements are **correct** regarding Rhodophyceae?

- A. They appear to be red in colour due to presence of chlorophyll d.  
 B. All of them are marine with greater concentrations found in the warmer areas.  
 C. They can be found at great depths in oceans where relatively little light penetrates.  
 D. The stored food is very similar to amylopectin and glycogen in structure.  
 E. Their sexual reproduction is accompanied by complex post fertilisation developments.

Choose the **correct** answer from the option given below:

- (A) B, C and E only  
 (B) A, D and E only  
 (C) C, D and E only  
 (D) A, B and C only

**Q21** Which of the following features is **not** common in *Volvox* and *Fucus*?

- (A) Sexual reproduction by fusion of a small motile male gamete with a large non motile female gamete.  
 (B) Presence of chlorophyll a pigment.

- (C) Presence of cellulose in cell wall.  
 (D) Presence of lateral unequal size flagella.

**Q22** Which of the following is **not** a common feature for *Sphagnum* and *Equisetum*?

- (A) They grow in damp and shady places.  
 (B) The gametophytes bear male and female sex organs called antheridia and archegonia.  
 (C) They require water for transfer of antherozoids to the mouth of archegonium.  
 (D) They possess rhizome.

**Q23** Match List-I with List-II.

List-I		List-II	
(A)	Predominant gametophytic stage	(I)	<i>Salvinia</i>
(B)	Have an elaborate mechanism of spore dispersal	(II)	<i>Marchantia</i>
(C)	Event precursor to the seed habit	(III)	Ferns
(D)	Macrophyllous leaves	(IV)	<i>Polytrichum</i>

Choose the **most appropriate** answer from the option given below:

- (A) A–II, B–IV, C–I, D–III  
 (B) A–IV, B–II, C–I, D–III  
 (C) A–IV, B–III, C–II, D–I  
 (D) A–III, B–IV, C–II, D–I

**Q24** Which of the following parts are haploid structures?

- A. Secondary protonema of *Funaria*  
 B. Prothallus of *Dryopteris*  
 C. Nucellus of *Cycas*  
 D. Archegonia of *Pinus*  
 E. Foot of *Marchantia*

Choose the **correct** answer from the option given below:

- (A) B, D and E only  
 (B) A, C and E only



- (C) A, B and D only  
(D) B, C and E only

**Q25** Given below are two statements:

**Statement I:** In bryophytes, zygotes do not undergo reduction division immediately; instead, they develop into a multicellular body called a sporophyte, in which meiosis occurs to produce spores.

**Statement II:** The sporophyte in liverworts is not free-living but attached to the photosynthetic gametophyte and derives nourishment from it.

In the light of the above statements, choose the **most appropriate** answer from the options given below:

- (A) Statement I is correct but Statement II is incorrect.  
(B) Statement I is incorrect but Statement II is correct.  
(C) Both Statement I and Statement II are correct.  
(D) Both Statement I and Statement II are incorrect.

**Q26** Which of the following is **not** correct for pteridophytes?

- A. They are used for medicinal purposes and as soil-binders.  
B. Some may flourish well in sandy-soil conditions.  
C. Like bryophytes, they live on land but require water for fertilisation.  
D. Spores are formed through meiosis inside capsule.  
E. These are first terrestrial vascular plant.

Choose the **correct** answer from the option given below:

- (A) B only  
(B) C and E only  
(C) D only  
(D) A and D only

**Q27** A student observes a plant with cone-like structures growing in moist, shady areas. On closer observation, the cone bears compact clusters of sporangia subtended by leaf-like structures. Which of the following plants is it most likely to be?

- (A) *Polytrichum* (B) *Cycas*  
(C) *Equisetum* (D) Ferns

**Q28** According to evolution point of view which plant groups shows retention of the female gametophyte and embryo development on the sporophyte?

- (A) Algae and Pteridophytes only  
(B) Bryophytes and pteridophytes only  
(C) Some pteridophytes, gymnosperms and angiosperms  
(D) Gymnosperms and angiosperms only

**Q29** Identify the incorrect statement about bryophytes.

- (A) They are primarily terrestrial plants.  
(B) They depend on water for asexual reproduction.  
(C) The primary plant body produces haploid gametes.  
(D) Only some cells of sporophyte undergo meiosis to produce haploid spores.

**Q30** Given below are two statements:

**Statement I:** In *Porphyra*, sexual reproduction involves fusion of a large and non-motile female gamete with smaller and non-motile male gamete.

**Statement II:** In *Spirogyra*, sexual reproduction involves fusion of non-flagellated gametes. In the light of the above statements, choose the **most appropriate** answer from the options given below:

- (A)





Statement I is correct but Statement II is incorrect.

- (B) Statement I is incorrect but Statement II is correct.  
 (C) Both Statement I and Statement II are correct.  
 (D) Both Statement I and Statement II are incorrect.

- Q31** Heterospory in *Selaginella* and *Salvinia* is evolutionarily significant because;  
 (A) It results in production of free-living gametophytes that are independent.  
 (B) It leads to the development of the embryo within the female gametophyte.  
 (C) It allows spores to develop into multicellular sporophytes immediately.  
 (D) It leads to development of vascular tissues in the sporophyte.

- Q32** Gymnosperm leaves are well adapted to withstand extremes of temperature, humidity, and wind. All the following are correct reasons for this adaptation, **except**:  
 (A) They have small surface area due to needle-like shape.  
 (B) They are associated with mycorrhiza which obtains water and minerals for them.  
 (C) They are evergreen and not shed during autumn-winter period.  
 (D) Their sunken stomata reduce loss of water due to transpiration.

- Q33** A member of rhodophyceae will not;  
 (A) have r-phycoerythrin in body.  
 (B) be present in warmer areas of oceans.  
 (C) reproduce asexually by motile spores.  
 (D) survive in dark depths of oceans.

- Q34** Which of the following statements is a key evolutionary advancement seen in gymnosperms

but absent in majority of pteridophytes and bryophytes?

- (A) Development of multicellular sporophyte  
 (B) Presence of independent gametophyte  
 (C) Retention of female gametophyte within megasporangium  
 (D) Production of flagellated male gametes

- Q35** Given below are two statements:

**Statement I:** The gametophyte is large, photosynthetic and dominant in pteridophytes.

**Statement II:** In pteridophytes, the zygote undergoes meiotic divisions to give rise to sporophyte.

In the light of the above statements, choose the *most appropriate* answer from the options given below:

- (A) Statement I is correct but Statement II is incorrect.  
 (B) Statement I is incorrect but Statement II is correct.  
 (C) Both Statement I and Statement II are correct.  
 (D) Both Statement I and Statement II are incorrect.

- Q36** A newly discovered aquatic organism had chlorophyll, lacked flagellated stages in its life cycle, and stored food in the form of a compound having structural similarity with amylopectin and glycogen. Which class should this organism should be placed into?

- (A) Sphenosida (B) Rhodophyceae  
 (C) Phaeophyceae (D) Lycopsida

- Q37** Match List I with List II.

List-I		List-II	
(A)	Alga rich in proteins	(I)	<i>Selaginella</i>
(B)	Asexual reproductive	(II)	<i>Ginkgo</i>



	structures are gemmae		
(C)	Microphyllous leaves	(III)	<i>Chlorella</i>
(D)	Living fossil	(IV)	<i>Marchantia</i>

Choose the **correct** answer from the options given below:

- (A) A-IV, B-I, C-II, D-III
- (B) A-II, B-III, C-IV, D-I
- (C) A-III, B-IV, C-I, D-II
- (D) A-I, B-III, C-II, D-IV

- Q38** A plant is found to have a gelatinous coating of algin around its cells, biflagellate zoospores with unequal flagella, and stores food as laminarin. Which of the following is likely to be true for it?
- (A) Complex post fertilization events
  - (B) Cup-shaped chloroplast
  - (C) Frond with holdfast and stipe
  - (D) Spiral chloroplast

- Q39** Given below are two statements: One is labelled as Assertion (A) and the other is labelled as Reason (R):

**Assertion (A):** All gymnosperms produce the same type of spores.

**Reason (R):** The spores in gymnosperms are produced within sporangia that are borne on sporophylls which are arranged spirally along an axis to form lax or compact strobili or cones.

In the light of the above statements, choose the **correct** answer from the options given below:

- (A) A is true but R is false
- (B) A is false but R is true
- (C) Both A and R are true and R is the correct explanation of A
- (D) Both A and R are true but R is NOT the correct explanation of A

**Q40**

Read the following statements about green algae.

- A. They store food in the form of mannitol or laminarin.
- B. Chlorophyll *a* and *b* are localized in definite chloroplasts.
- C. Pyrenoids are storage bodies in cytoplasm that contain proteins and starch.
- D. Vegetative reproduction is by zoospores.
- E. *Volvox* and *Chara* are examples of Chlorophyceae.

Choose the **correct** option.

- (A) A, C, D are incorrect
- (B) B, C, and E are correct
- (C) B, C, D, and E are incorrect
- (D) C, D and E are correct

- Q41** Which of the following reflects the major life cycle transition when moving from bryophytes to pteridophytes?

- (A) Dominance of gametophyte with multicellular rhizoids
- (B) Sporophyte becoming independent and differentiated
- (C) Sporophyte remaining nutritionally dependent on gametophyte
- (D) Gametophyte showing elaborate structures like strobili

- Q42** Given below are two statements:

**Statement I:** Large amounts of water holding substances (hydrocolloids) are produced by green algae.

**Statement II:** The algae produce energy-rich compounds which form the basis of the food cycles of all aquatic animals.

In the light of the above statements, choose the *most appropriate* answer from the options given below:

- (A)





Statement I is correct but Statement II is incorrect.

- (B) Statement I is incorrect but Statement II is correct.  
 (C) Both Statement I and Statement II are correct.  
 (D) Both Statement I and Statement II are incorrect.

**Q43** The zoospores of brown algae have all the following characteristics, **except** that;

- (A) they are asexual reproductive structures.  
 (B) they have unequal flagella.  
 (C) their flagella are apically attached.  
 (D) they are pear-shaped.

**Q44** Given below are two statements: One is labelled as Assertion (A) and the other is labelled as Reason (R):

**Assertion (A):** Mosses are ecological pioneers and help in soil formation.

**Reason (R):** They prevent growth of higher plants on newly formed rocks.

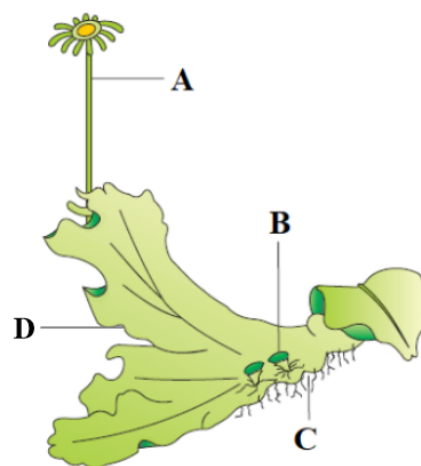
In the light of the above statements, choose the **correct** answer from the options given below:

- (A) A is true but R is false  
 (B) A is false but R is true  
 (C) Both A and R are true and R is the correct explanation of A  
 (D) Both A and R are true but R is NOT the correct explanation of A

**Q45** A gymnosperm has coralloid roots. Which of the following should also be true for it?

- (A) Its stems are branched.  
 (B) It is monoecious.  
 (C) Its leaves persist for few years.  
 (D) The roots are very large.

**Q46** Go through the following diagram.



Choose the **incorrect** statement.

- (A) 'D' is closely appressed to the substratum.  
 (B) Green, multicellular, asexual buds develop in 'B'.  
 (C) The multicellular structure 'A' produces biflagellate antherozoids.  
 (D) 'C' are unicellular.

**Q47** Given below are two statements:

**Statement I:** The plant body is thalloid in case of algae and bryophytes.

**Statement II:** Gymnosperms are the first terrestrial plants to possess xylem and phloem.

In the light of the above statements, choose the *most appropriate* answer from the options given below:

- (A) Statement I is correct but Statement II is incorrect.  
 (B) Statement I is incorrect but Statement II is correct.  
 (C) Both Statement I and Statement II are correct.  
 (D) Both Statement I and Statement II are incorrect.

**Q48** In which of the following options all the listed genera belong to the same class of algae?

- (A) *Chara*, *Fucus*, *Polysiphonia*  
 (B) *Volvox*, *Spirogyra*, *Chlamydomonas*  
 (C) *Porphyra*, *Ectocarpus*, *Ulothrix*



(D) *Sargassum*, *Laminaria*, *Gracilaria*

**Q49** In order to ship a living material, the product of a plant was used. Choose the **incorrect** feature for that plant.

- (A) It has elaborate mechanism of spore dispersal.
- (B) It is used for medicinal purposes.
- (C) Its sporophyte is differentiated into foot, seta and capsule.
- (D) Spores are formed by meiosis.

**Q50** Read the following statements.

- (A) Both gymnosperms and angiosperms produce seeds, but gymnosperms have naked

seeds.

(B) *Cycas* and *Pinus* bear male and female cones on the same plant.

(C) Pollen tube helps in internal fertilization in both gymnosperms as well as angiosperms.

(D) Ovules develop in specialised structures called flowers in angiosperms.

(E) Gymnosperms rely on water currents for pollen transfer.

In the light of above statements, choose the **correct** answer from the options given below:

- (A) A, B, C, and D correct
- (B) A, C, and D are correct
- (C) B, C, D, and E are incorrect
- (D) C, D and E are incorrect



## Answer Key

Q1 (C)  
Q2 (D)  
Q3 (A)  
Q4 (B)  
Q5 (C)  
Q6 (D)  
Q7 (C)  
Q8 (A)  
Q9 (A)  
Q10 (C)  
Q11 (C)  
Q12 (B)  
Q13 (D)  
Q14 (A)  
Q15 (C)  
Q16 (A)  
Q17 (A)  
Q18 (D)  
Q19 (D)  
Q20 (C)  
Q21 (D)  
Q22 (D)  
Q23 (A)  
Q24 (C)  
Q25 (C)

Q26 (C)  
Q27 (C)  
Q28 (C)  
Q29 (B)  
Q30 (C)  
Q31 (B)  
Q32 (B)  
Q33 (C)  
Q34 (C)  
Q35 (D)  
Q36 (B)  
Q37 (C)  
Q38 (C)  
Q39 (B)  
Q40 (A)  
Q41 (B)  
Q42 (B)  
Q43 (C)  
Q44 (A)  
Q45 (C)  
Q46 (C)  
Q47 (A)  
Q48 (B)  
Q49 (B)  
Q50 (B)



## Hints & Solutions

### Q1 Text Solution:

Red algae (*Gelidium*, *Gracilaria*, *Polysiphonia*) have cell walls with cellulose, pectin, and polysulphate esters. Brown algae (*Dictyota*, *Laminaria*) have cellulose and algin. *Selaginella* (pteridophyte) and *Polytrichum* (bryophyte) lack polysulphate esters.

### Q2 Text Solution:

The gymnosperms are heterosporous; they produce haploid microspores and megaspores. The two kinds of spores are produced within sporangia that are borne on sporophylls which are arranged spirally along an axis to form lax or compact strobili or cones. In *Cycas* male cones and megasporophylls are borne on different trees.

### Q3 Text Solution:

Artificial system of classification is based only on gross superficial morphological characters such as habit, colour, number and shape of leaves, etc. Natural classification systems are based on natural affinities among the organisms and consider not only the external features, but also internal features, like ultrastructure, anatomy, embryology and phytochemistry.

Phylogenetic classification systems based on evolutionary relationships between the various organisms.

Chemotaxonomy uses the chemical constituents of the plant for classification.

Numerical Taxonomy which is now easily carried out using computers is based on all observable characteristics. Number and codes are assigned to all the characters and the data are then processed.

### Q4 Text Solution:

Male gametophyte in gymnosperm is highly reduced and is confined to only a limited number of cells. *Cedrus* is a gymnosperm.

### Q5 Text Solution:

Asexual reproduction in algae is by the production of different types of spores, the most common being the zoospores. They are flagellated (motile) and on germination gives rise to new plants.

### Q6 Text Solution:

In *Cycas*, male cones and megasporophylls are borne on different trees. The male and female cones (or strobili) in *Pinus* are borne on the same tree. In heterosporous pteridophytes such as *Selaginella* and *Salvinia*, microspores develop into male gametophytes bearing antheridia (male sex organs), while megaspores develop into female gametophytes bearing archegonia (female sex organs). In *Marchantia*, the male sex organs (antheridia) and female sex organs (archegonia) develop on different thalli, i.e., on the male and female gametophytes, respectively.

### Q7 Text Solution:

Gametophytes of pteridophyte require cool, damp, shady places to grow. Because of this specific restricted requirement and the need for water for fertilisation, the spread of living pteridophytes is limited and restricted to narrow geographical regions.

### Q8 Text Solution:

*Chlorella*, a unicellular alga rich in proteins, is used as food supplement even by space travellers. Being photosynthetic, algae increase the level of dissolved oxygen in their immediate environment. Commercially important



hydrocolloids like algin and carrageen are obtained from brown and red algae, respectively.

**Q9 Text Solution:**

In some pteridophytes, sporophylls may form distinct compact structures called strobili or cones (*Selaginella*, *Equisetum*). The male or female cones or strobili may be borne on the same tree (*Pinus*). However, in *Cycas* male cones and megasporophylls are borne on different trees. *Sphagnum* is a moss; bryophytes do not possess strobilus.

**Q10 Text Solution:**

Gametophyte is free-living in bryophytes and pteridophytes

→ *Marchantia*, *Funaria*, *Polytrichum* (Bryophytes)

→ *Lycopodium*, *Selaginella*, *Adiantum*, *Pteris*, *Psilotum*, *Dryopteris* (Pteridophytes)

Gametophyte is dependent in gymnosperms

→ *Sequoia*, *Ginkgo*, *Cedrus*

**Q11 Text Solution:**

Roots in some genera have fungal association in the form of mycorrhiza (*Pinus*), while in some others (*Cycas*) small specialised roots called coralloid roots are associated with  $N_2$  - fixing cyanobacteria. The stems are unbranched (*Cycas*) or branched (*Pinus*, *Cedrus*).

**Q12 Text Solution:**

Moss possesses multicellular and unbranched rhizoids. *Funaria* is a moss.

**Q13 Text Solution:**

The main plant body in bryophytes is haploid, but this is not the reason why bryophytes lack true roots, stems, or leaves and instead possess root-like, leaf-like, or stem-like structures.

**Q14 Text Solution:**

In *Cycas*, male cones and megasporophylls are borne on different trees. Female cone is not found.

**Q15 Text Solution:**

The gymnosperms are heterosporous; they produce haploid microspores and megaspores. The two kinds of spores are produced within sporangia that are borne on sporophylls which are arranged spirally along an axis to form lax or compact strobili or cones. The strobili bearing microsporophylls and microsporangia are called microsporangiate or male strobili. The pollen grain is released from the microsporangium. They are carried in air currents and come in contact with the opening of the ovules borne on megasporophylls. The pollen tube carrying the male gametes grows towards archegonia in the ovules and discharge their contents near the mouth of the archegonia.

**Q16 Text Solution:**

In all three groups, the diploid sporophyte produces spores by meiosis. The female sex organ in bryophytes, pteridophytes and gymnosperms is archegonium. Transfer of male gamete is mediated by water in bryophytes and pteridophytes, but in gymnosperms, pollen tube carries male gamete (no water needed). Spores give rise to gametophyte in all three. In bryophytes sporophyte is dependent on gametophyte. In bryophytes, the sporophyte is not free-living but attached to the gametophyte. In pteridophytes and gymnosperms, the sporophyte is free-living.

**Q17 Text Solution:**

Red algae (*Gelidium*) mainly store food as floridean starch which is very similar to amylopectin and glycogen in structure. 2–8



equal-sized flagella arise apically in many green algae.

The vegetative cells in brown algae have a cellulosic wall usually covered on the outside by a gelatinous coating of algin.

Profusely branched forms of algae are represented by kelps, which may reach a height of 100 metre.

**Q18 Text Solution:**

*Chara* is not a colonial form. Green algae usually have a rigid cell wall made of an inner layer of cellulose and an outer layer of pectose. Most of the members have one or more storage bodies called pyrenoids located in the chloroplasts. Pyrenoids contain protein besides starch.

**Q19 Text Solution:**

The members of phaeophyceae or brown algae are found primarily in marine habitats. The plant body is usually attached to the substratum by a holdfast, and has a stalk, the stipe and leaf like photosynthetic organ – the frond.

**Q20 Text Solution:**

The members of rhodophyceae are commonly called red algae because of the predominance of the red pigment, r-phycoerythrin in their body. Majority of the red algae are marine with greater concentrations found in the warmer areas.

**Q21 Text Solution:**

Members of Chlorophyceae (*Volvox*) possess 2-8 equal size flagella while members of Phaeophyceae (*Fucus*) possess 2 unequal size flagella.

**Q22 Text Solution:**

Rhizome is found in *Equisetum* not in *Sphagnum*.

**Q23 Text Solution:**

The predominant stage of the life cycle of a bryophyte is the gametophyte.

The mosses (*Polytrichum*) have an elaborate mechanism of spore dispersal. *Selaginella* and *Salvinia* are heterosporous, producing micro- and megaspores that give rise to male and female gametophytes.

Retention of the female gametophyte and embryo development on the parent plant is a precursor to the seed habit.

The leaves in pteridophyta are small (microphylls) as in *Selaginella* or large (macrophylls) as in fern.

**Q24 Text Solution:**

Secondary protonema (n) in mosses is formed from a spore (n). The prothallus (gametophyte) (n) in pteridophytes develops from spores (n). The nucellus (2n) is a part of the sporophyte (2n) in the ovule. Archegonia are formed in the female gametophyte (n), which develops from a megaspore (n) in gymnosperms. Foot, seta, and capsule are parts of the sporophyte (2n) in liverworts and mosses.

**Q25 Text Solution:**

In bryophytes, zygotes do not undergo reduction division immediately; instead, they develop into a multicellular body called a sporophyte, in which meiosis occurs to produce spores. The sporophyte in liverworts is not free-living but attached to the photosynthetic gametophyte and derives nourishment from it.

**Q26 Text Solution:**

The sporophytes bear sporangia that are subtended by leaf-like appendages called sporophylls. In some cases sporophylls may form distinct compact structures called strobili or cones (*Selaginella*, *Equisetum*). The sporangia produce spores by meiosis in spore mother cells.

**Q27 Text Solution:**

Cone or strobilus are found in some pteridophytes. Pteridophytes grow in cool, damp,





shady places. The sporophytes bear sporangia that are subtended by leaf-like appendages called sporophylls. In some cases sporophylls may form distinct compact structures called strobili or cones (*Selaginella*, *Equisetum*).

**Q28 Text Solution:**

Heterosporous pteridophytes like *Selaginella* and *Salvinia* show retention of the female gametophyte on the parent sporophyte, where zygote develops into an embryo — considered a precursor to seed habit. This evolutionary trend is fully established in Gymnosperms and Angiosperms, where the female gametophyte remains inside ovule, and embryo develops within the parent sporophyte tissue.

**Q29 Text Solution:**

**(B)**

Bryophytes are also called amphibians of the plant kingdom because these plants can live in soil but are dependent on water for sexual reproduction. The plant body of bryophytes is more differentiated than that of algae. It is thallus-like and prostrate or erect, and attached to the substratum by unicellular or multicellular rhizoids. They lack true roots, stem or leaves. They may possess root-like, leaf-like or stem-like structures. The main plant body of the bryophyte is haploid. It produces gametes, hence is called a gametophyte. The sex organs in bryophytes are multicellular. The male sex organ is called antheridium. They produce biflagellate antherozoids. The female sex organ called archegonium is flask-shaped and produces a single egg. The antherozoids are released into water where they come in contact with archegonium. An antherozoid fuses with the egg to produce the zygote. Zygotes do not undergo reduction division immediately. They produce a

multicellular body called a sporophyte. The sporophyte is not free-living but attached to the photosynthetic gametophyte and derives nourishment from it. Some cells of the sporophyte undergo reduction division (meiosis) to produce haploid spores. These spores germinate to produce gametophyte.

**Q30 Text Solution:**

**(C)**

Sexual reproduction in algae takes place through fusion of two gametes. These gametes can be flagellated and similar in size (as in *Ulothrix*) or non-flagellated (non-motile) but similar in size (as in *Spirogyra*). Such reproduction is called isogamous. Fusion of two gametes dissimilar in size, as in species of *Eudorina* is termed as anisogamous. Fusion between one large, non-motile (static) female gamete and a smaller, motile male gamete is termed oogamous, e.g., *Volvox*, *Fucus*. The red algae reproduce asexually by non-motile spores and sexually by non-motile gametes. Sexual reproduction is oogamous and accompanied by complex post fertilisation developments. The common members are: *Polysiphonia*, *Porphyra*, *Gracilaria* and *Gelidium*.

**Q31 Text Solution:**

**(B)**

Genera like *Selaginella* and *Salvinia* which produce two kinds of spores, macro (large) and micro (small) spores, are known as heterosporous. The megaspores and microspores germinate and give rise to female and male gametophytes, respectively. The female gametophytes in these plants are retained on the parent sporophytes for variable periods. The development of the zygotes into young embryos take place within the female gametophytes. This



event is a precursor to the seed habit considered an important step in evolution.

**Q32 Text Solution:**

(B)

The mycorrhizal associations in some gymnosperms are present in roots, not in leaves.

**Q33 Text Solution:**

(C)

The members of rhodophyceae are commonly called red algae because of the predominance of the red pigment, r-phycoerythrin in their body. Majority of the red algae are marine with greater concentrations found in the warmer areas. They occur in both well-lighted regions close to the surface of water and also at great depths in oceans where relatively little light penetrates. They reproduce asexually by non-motile spores and sexually by non-motile gametes.

**Q34 Text Solution:**

(C)

Unlike bryophytes and pteridophytes, in gymnosperms, the male and the female gametophytes do not have an independent free-living existence. They remain within the sporangia retained on the sporophytes.

**Q35 Text Solution:**

(D)

The spores in pteridophytes germinate to give rise to inconspicuous, small but multicellular, free-living, mostly photosynthetic thalloid gametophytes called prothallus. Fusion of male gamete with the egg present in the archegonium result in the formation of zygote. Zygote thereafter produces a multicellular well-differentiated sporophyte which is the dominant phase of the pteridophytes.

**Q36 Text Solution:**

(B)

In the members of rhodophyceae, food is stored as floridean starch which is very similar to amylopectin and glycogen in structure. They possess chlorophyll a, d and phycoerythrin, and lack flagellated stages in its life cycle.

**Q37 Text Solution:**

(C)

*Chlorella*, a unicellular alga rich in proteins, is used as food supplement even by space travellers. Asexual reproduction in liverworts (E.g., *Marchantia*) takes place by fragmentation of thalli, or by the formation of specialised structures called gemmae (sing. gemma). The leaves in pteridophyta are small (microphylls) as in *Selaginella* or large (macrophylls) as in ferns. *Ginkgo* is called the living fossil.

**Q38 Text Solution:**

(C)

In brown algae, the vegetative cells have a cellulosic wall usually covered on the outside by a gelatinous coating of algin. The protoplast contains, in addition to plastids, a centrally located vacuole and nucleus. The plant body is usually attached to the substratum by a holdfast, and has a stalk, the stipe and leaf like photosynthetic organ – the frond. Sexual reproduction is oogamous and accompanied by complex post fertilisation developments in red algae. The chloroplasts may be discoid, plate-like, reticulate, cup-shaped, spiral or ribbon-shaped in different species of green algae.

**Q39 Text Solution:**

(B)

The gymnosperms are heterosporous; they produce haploid microspores and megaspores. The two kinds of spores are produced within sporangia that are borne on sporophylls which



are arranged spirally along an axis to form lax or compact strobili or cones.

**Q40 Text Solution:**

(A)

The members of chlorophyceae are commonly called green algae. The plant body may be unicellular, colonial or filamentous. They are usually grass green due to the dominance of pigments chlorophyll *a* and *b*. The pigments are localised in definite chloroplasts. Most of the members have one or more storage bodies called pyrenoids located in the chloroplasts. Pyrenoids contain protein besides starch. Vegetative reproduction usually takes place by fragmentation. Asexual reproduction is by flagellated zoospores produced in zoosporangia. Some commonly found green algae are: *Chlamydomonas*, *Volvox*, *Ulothrix*, *Spirogyra* and *Chara*.

**Q41 Text Solution:**

(B)

In bryophytes the dominant phase in the life cycle is the gametophytic plant body. However, in pteridophytes, the main plant body is a sporophyte which is differentiated into true root, stem and leaves.

**Q42 Text Solution:**

(B)

Algae are useful to man in a variety of ways. At least a half of the total carbon dioxide fixation on earth is carried out by algae through photosynthesis. Being photosynthetic, they increase the level of dissolved oxygen in their immediate environment. They are of paramount importance as primary producers of energy-rich compounds which form the basis of the food cycles of all aquatic animals. Certain marine brown and red algae produce large amounts of

hydrocolloids (water holding substances), e.g., algin (brown algae) and carrageen (red algae) which are used commercially.

**Q43 Text Solution:**

(C)

Asexual reproduction in most brown algae is by biflagellate zoospores that are pear-shaped and have two unequal laterally attached flagella.

**Q44 Text Solution:**

(A)

Mosses along with lichens are the first organisms to colonise rocks and hence, are of great ecological importance. They decompose rocks making the substrate suitable for the growth of higher plants. Since mosses form dense mats on the soil, they reduce the impact of falling rain and prevent soil erosion.

**Q45 Text Solution:**

(C)

Roots in some gymnosperm genera have fungal association in the form of mycorrhiza (*Pinus*), while in some others (*Cycas*) small specialised roots called coralloid roots are associated with  $N_2$ -fixing cyanobacteria. The stems are unbranched (*Cycas*) or branched (*Pinus*, *Cedrus*). The leaves may be simple or compound. In *Cycas* the pinnate leaves persist for a few years. The male or female cones or strobili may be borne on the same tree i.e. monoecious (*Pinus*). However, in *Cycas* male cones and megasporophylls are borne on different trees i.e. dioecious.

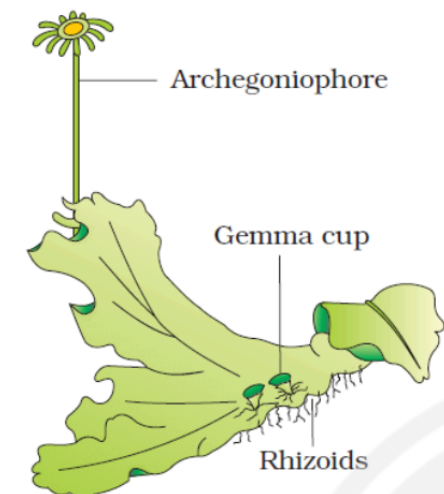
**Q46 Text Solution:**

(C)

The plant body of a liverwort is thalloid, e.g., *Marchantia*. The thallus is dorsiventral and closely appressed to the substrate. The sex organs in bryophytes are multicellular. The male sex organ is called antheridium. They produce biflagellate



antherozoids. The female sex organ called archegonium is flask-shaped and produces a single egg. Gemmae are green, multicellular, asexual buds, which develop in small receptacles called gemma cups located on the thalli.



*Marchantia* (a) Female thallus

**Q47 Text Solution:**

(A)

Algae are chlorophyll-bearing, simple, thalloid, autotrophic and largely aquatic (both fresh water and marine) organisms. The plant body of bryophytes is more differentiated than that of algae. It is thallus-like and prostrate or erect, and attached to the substratum by unicellular or multicellular rhizoids. Evolutionarily, the pteridophytes are the first terrestrial plants to possess vascular tissues – xylem and phloem.

**Q48 Text Solution:**

(B)

Green algae – *Chara*, *Volvox*, *Spirogyra*, *Chlamydomonas*, *Ulothrix*

Brown algae – *Fucus*, *Ectocarpus*, *Sargassum*, *Laminaria*

Red algae – *Polysiphonia*, *Porphyra*, *Gracilaria*

**Q49 Text Solution:**

(B)

The Pteridophytes include horsetails and ferns. Pteridophytes are used for medicinal purposes and as soil-binders. For sexual reproduction in mosses, the sex organs antheridia and archegonia are produced at the apex of the leafy shoots. After fertilisation, the zygote develops into a sporophyte, consisting of a foot, seta and capsule. The sporophyte in mosses is more elaborate than that in liverworts. The capsule contains spores. Spores are formed after meiosis. The mosses have an elaborate mechanism of spore dispersal. Common examples of mosses are *Funaria*, *Polytrichum* and *Sphagnum*. Species of *Sphagnum*, a moss, provide peat that have long been used as fuel, and as packing material for trans-shipment of living material because of their capacity to hold water.

**Q50 Text Solution:**

(B)

Unlike the gymnosperms where the ovules are naked, in the angiosperms or flowering plants, the pollen grains and ovules are developed in specialised structures called flowers. In angiosperms, the seeds are enclosed in fruits. The male or female cones or strobili are borne on the same tree in *Pinus*. However, in *Cycas* male cones and megasporophylls are borne on different trees. Pollen tube in gymnosperms as well as angiosperms helps in internal fertilization. In gymnosperms, the pollen grains are carried in air currents and come in contact with the opening of the ovules borne on megasporophylls.

