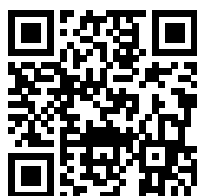


Series: AB411



SESSION – 2

Subject Code: SBO

Roll No.:

Candidates must write the Roll No on the title page of the Question Paper.

Biology | Level 4

Time allowed: 1.5 hours

Maximum Marks: 150

Instructions for Candidates:

1. Please verify that this question paper contains **12** printed pages and Ensure that the paper contains a total of **50** questions.
2. Use of mobile phones, smartphones, ipads during examination is **STRICTLY PROHIBITED**.
3. On the OMR sheet, enter all required information carefully in the space provided **ONLY IN BLOCK CAPITALS** and by properly darkening the corresponding bubbles. Incomplete, incorrect, or careless entries may lead to disqualification.
4. Use only a **BLUE or BLACK BALL POINT PEN** for writing entries and filling bubbles. Pencils or other pens are not permitted.
5. **Marking Scheme:** Each question has four alternatives, only one of which is correct. Select the correct option and darken the respective bubble.
 - Each correct answer carries **3 marks**.
 - Each incorrect answer attracts a penalty of **1 mark**.
 - No marks are awarded for unanswered questions.
6. Use only the space provided in the question paper for rough work.
7. Candidates must remain in the examination hall until the exam is officially over. Early exit is not allowed.
8. Do not make stray marks, symbols, or extra writing on the OMR sheet. Fill only the designated bubbles neatly.
9. Since OMR sheets are machine evaluated, changes in entries are **strictly not allowed**.
10. Avoid scratching, overwriting, or erasing, as these may result in wrong evaluation.
11. **DO NOT write anything on the back side** of the OMR sheet.

Multiple Choice Questions

1. Read the following statements:

- (i) Lichen is a symbiotic association of fungi and algae.
- (ii) In lichen, there are two components i.e., algal partner called mycobiont and fungal partner called phycobiont.
- (iii) Lichens are SO₂ pollution indicator organisms.
- (iv) In lichen, there are two components i.e., algal partner called phycobiont and fungal partner called mycobiont.
- (v) Lichens are indicators of water pollution.

Which of the following statements are **NOT** correct?

- (A) (i) and (iii)
- (B) (ii) and (iv)
- (C) (ii) and (v) only
- (D) (i), (ii), and (iv)

2. Match the class of fungi given in Column-I with their common name given in Column-II and select the correct option.

Column-I	Column-II
P. Phycomycetes	I. Sac fungi
Q. Ascomycetes	II. Algal fungi
R. Basidiomycetes	III. Fungi imperfecti
S. Deuteromycetes	IV. Club fungi

- (A) P – II, Q – I, R – IV, S – III
- (B) P – II, Q – IV, R – I, S – III

(C) P – IV, Q – I, R – II, S – III

(D) P – IV, Q – III, R – II, S – I

3. Ergot of rye is caused by

- (A) Deuteromycetes
- (B) Phycomycetes
- (C) Ascomycetes
- (D) Basidiomycetes

4. Match the following organisms in List-I with their correct phylum in List-II:

List-I	List-II
P. Saccoglossus	I. Mollusca
Q. Sepia	II. Arthropoda
R. Limulus	III. Annelida
S. Hirudinaria	IV. Hemichordata

- (A) P – II; Q – III; R – IV; S – I
- (B) P – IV; Q – I; R – II; S – III
- (C) P – III; Q – I; R – II; S – IV
- (D) P – IV; Q – I; R – III; S – II

5. The following statements describe a certain plant group:

- (i) Ovules are not enclosed by an ovary wall.
- (ii) The giant redwood is a member of this group.
- (iii) Roots are usually of the tap root type.
- (iv) They produce both microspores and megaspores.

Which is the correct group?

- (A) Algae



- (B) Gymnosperms
- (C) Bryophytes
- (D) Angiosperms

6. Cotyledons and testa respectively are edible parts in which of the following plant group?

- (A) Walnut and tamarind
- (B) Cashew nut and litchi
- (C) French bean and coconut
- (D) Groundnut and pomegranate

7. Match the following (Phylum with their characteristic features):

Column-I	Column-II
P. Cnidaria	I. Flame cells for excretion
Q. Platyhelminthes	II. Segmentation with setae
R. Nematoda	III. Muscular foot for locomotion
S. Annelida	IV. Radially symmetrical, stinging cells
T. Mollusca	V. Pseudocoelomate body cavity

- (A) P – IV; Q – V; R – I; S – III; T – II
- (B) P – I; Q – IV; R – II; S – V; T – III
- (C) P – I; Q – IV; R – II; S – III; T – V
- (D) P – IV; Q – I; R – V; S – II; T – III

8. Choose the correct statements:

- (i) Pneumatophores help in gaseous exchange in mangroves.
- (ii) In *Alstonia*, leaves show opposite phyllotaxy.
- (iii) Adventitious roots are present in sweet potato for food storage.

(iv) Corolla and calyx are reproductive parts of a flower.

(v) Reticulate venation means veins form a network.

- (A) (i), (ii), (iii), (v)
- (B) (i), (iii), (v)
- (C) (ii), (iii), (iv)
- (D) (i), (ii), (iv), (v)

9. Floral features are mainly used in angiosperm identification because

- (A) flowers are of various colours.
- (B) flowers can be safely pressed.
- (C) reproductive parts are more stable and conservative than vegetative parts.
- (D) flowers are good materials for identification.

10. Match Column-I (types of aestivations) with Column-II (examples):

Column-I	Column-II
P. Valvate	I. Pea
Q. Vexillary	II. Gulmohar
R. Quincuncial	III. Cotton
S. Twisted	IV. Calotropis
T. Imbricate	V. Cassia

- (A) P – IV; Q – I; R – V; S – III; T – II
- (B) P – IV; Q – V; R – I; S – III; T – II
- (C) P – I; Q – IV; R – II; S – V; T – III
- (D) P – I; Q – IV; R – II; S – III; T – V

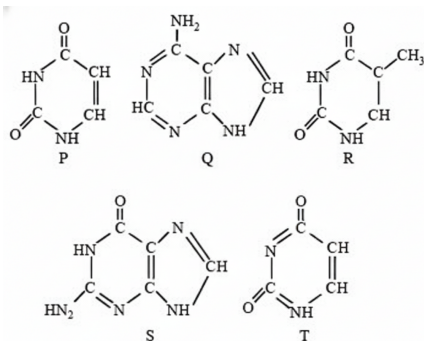
11. Heartwood differs from sapwood in:

- (A) Presence of rays and fibres
- (B) Presence of vessels and parenchyma



- (C) Having dead and non-conducting elements
 (D) Being susceptible to pests and pathogens

12. The diagrams provided depict the nitrogenous bases present in nucleic acid molecules. Identify the accurate combination.



- (A) P – Uracil, Q – Guanine, R – Cytosine, S – Adenine, T – Thymine
 (B) P – Uracil, Q – Guanine, R – Thymine, S – Adenine, T – Cytosine
 (C) P – Thymine, Q – Guanine, R – Uracil, S – Adenine, T – Cytosine
 (D) – Uracil, Q – Adenine, R – Thymine, S – Guanine, T – Cytosine

13. **Assertion (A):** Sclerenchyma cells are dead at maturity and lack protoplasts.

Reason (R): Thick, lignified cell walls make them provide mechanical strength.

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

14. In the structure of root, the protoxylem is located towards the _____, while the metaxylem is positioned towards the _____ of the root.

- (A) Center; outer edge
 (B) Outer edge; center
 (C) Outer edge; outer edge
 (D) Center; center

15. Match Column–I with Column–II and choose the correct option:

Column–I

- P. Sclerenchyma
 Q. Meristem
 R. Epidermal tissue
 S. Collenchyma

Column–II

- I. Mechanical support
 II. Sclereids
 III. Stomata
 IV. Actively dividing cells

- (A) P – II; Q – III; R – IV; S – I
 (B) P – III; Q – II; R – I; S – IV
 (C) P – II; Q – IV; R – III; S – I
 (D) P – III; Q – II; R – IV; S – I

16. Wood that is devoid of vessels (tracheae) is a characteristic of:

- (A) *Bougainvillea*
 (B) *Eugenia*
 (C) Palm
 (D) Pine

17. All the following are correct features of the modified fluid mosaic model except:

- (A) Proteins diffuse laterally in the lipid bilayer
 (B) Proteins may be confined within certain membrane regions
 (C) Proteins exhibit flip-flop movement across the bilayer



- (D) Some proteins are embedded within the lipid bilayer
18. All of the following statements are true except:
- (A) Polysomes carry out translation of mRNA in prokaryotic cell.
 - (B) Mitochondria contain their own DNA and ribosomes similar to eukaryotic cells.
 - (C) Cells arise only from pre-existing cells.
 - (D) Phosphoglycerides are the main membrane lipids.
19. **Assertion (A):** Chloroplasts and leucoplasts are both involved in photosynthesis.
Reason (R): Plastids like chloroplasts contain pigments essential for trapping light.
- (A) Both A and R are true, and R explains A.
 - (B) Both A and R are true, but R does not explain A.
 - (C) A is false but R is true.
 - (D) A is true but R is false.
20. Which of the following statements are correct?
- (I) In prokaryotes, an inward extension of the plasma membrane forming a specialized structure is called a mesosome.
 - (II) Smooth endoplasmic reticulum (SER) is the main site for glycoprotein synthesis.
 - (III) RuBisCO is the most abundant protein found in the entire biosphere.
 - (IV) Mitochondria, chloroplasts, and peroxisomes are not included in the endomembrane system.
- (A) III and IV
 - (B) II and IV
 - (C) I and IV
 - (D) II and III
21. Which of the following is true about facilitated diffusion?
- (A) It requires energy in the form of ATP.
 - (B) It allows molecules to move along the concentration gradient.
 - (C) It is an active process.
 - (D) It can transport substances against their gradient.
22. Identify the correct statements:
- (i) Lysine is a basic amino acid.
 - (ii) Saturated fatty acids do not have any double bond while unsaturated fatty acids have one or more double bonds.
 - (iii) Essential fatty acids are some polyunsaturated acids.
 - (iv) Fat is a group of natural esters of glycerol and various fatty acids.
 - (v) A nucleotide is a compound made of a nitrogen base, a pentose sugar and phosphate all linked together by a ionic bond.
- (A) (i), (ii), (iii) and (iv)
 - (B) (i), (ii), (iv) and (v)
 - (C) (ii), (iii) and (v)
 - (D) (i), (iv) and (v)



23. **Assertion:** Unsaturated fats are more reactive compared with the saturated fats.
Reason: Unsaturated fats have only single bonds in their structure.
- (A) Both A and R are true, and R explains A.
(B) Both A and R are true, but R does not explain A.
(C) A is false but R is true.
(D) A is true but R is false.
24. The effect of substrate concentration on enzyme activity typically gives which type of graph?
- (A) A straight line, where velocity increases indefinitely with substrate concentration.
(B) A hyperbolic curve, showing rapid rise in velocity at low substrate concentration and a plateau at high concentration.
(C) A parabolic curve, with activity rising and then falling.
(D) A constant line showing no change with substrate concentration.
25. Why do enzymatic reactions occur much faster than non-enzymatic reactions?
- (A) Enzymes provide additional energy to the reactants.
(B) Enzymes eliminate the energy barrier completely.
(C) Enzymes stabilize the transition state, thereby lowering activation energy.
(D) Enzymes increase the entropy of the system.
26. Which of the following sets is correctly matched with the category given?
- (A) Phenylalanine, glycine, thiamine — Amino acids.
(B) Arachidonic acid, acetic acid, palmitic acid — Fatty acids.
(C) Thymidine, uridine, cytidilic acid — Nucleosides.
(D) Cellulose, starch, glycogen, chitin — Polysaccharides.
27. Identify the incorrectly matched pair between the sub-stage of Prophase I and its characteristic feature
- (A) Zygotene — Formation of synaptonemal complex
(B) Pachytene — Pairing
(C) Diplotene — Presence of chiasmata
(D) Diakinesis — Terminalization
28. Consider the following statements regarding major discoveries in photosynthesis, identify the incorrect statement
- (A) Van Niel proposed that photosynthesis is essentially a redox process where H_2S or H_2O act as hydrogen donors.
(B) Priestley discovered that oxygen is released only during night.
(C) Ingenhousz proved that oxygen is released only in sunlight and by green parts of plants.
(D) Calvin elucidated the complete C_3 pathway of carbon fixation.
29. Which of the following plant-related factors influence the rate of photosynthesis?
- (A) Number, age, size and orientation of leaves, mesophyll cells, chloroplasts, internal CO_2 concentration, and chlorophyll content.
(B) Leaf characteristics, size of mesophyll cells, and availability of light.



- (C) Structure of mesophyll cells, their distribution, and surrounding temperature.
- (D) Amount of chlorophyll, leaf size, and carbon dioxide concentration.
30. If the Respiratory Quotient (RQ) is less than 1.0, it indicates that:
- (A) Carbohydrates are being used as the respiratory substrate.
- (B) Organic acids are being used as the respiratory substrate.
- (C) The substrate oxidation requires more oxygen than the amount of CO_2 released.
- (D) The substrate oxidation requires less oxygen than the amount of CO_2 released.
31. Which of the following is wrongly matched?
- (A) Auxin — Induces parthenocarpic fruit development
- (B) Gibberellin — Stimulates seed germination by breaking dormancy
- (C) Cytokinin — Promotes cell division
- (D) Absciscic acid — Promotes stomatal opening under stress conditions
32. The pneumotaxic centre, which regulates and moderates the activity of the respiratory rhythm centre, is situated in:
- (A) Dorsal region of medulla oblongata
- (B) Ventral region of medulla oblongata
- (C) Aortic arch and carotid bodies
- (D) Pons varolii
33. Cardiac cycle in man takes about
- (A) 0.5 sec
- (B) 0.8 sec
- (C) 1.2 sec
- (D) 1.8 sec
34. Which of the following statements is correct?
- (A) Uremia — Excess of protein in urine
- (B) Hematuria — Presence of ketone bodies in urine
- (C) Glycosuria — Presence of glucose in urine
- (D) Proteinuria — Excess of urea in blood
35. Identify the autoimmune disorder from the options below
- (A) Rheumatoid arthritis
- (B) Osteoarthritis
- (C) Gout
- (D) Osteoporosis
36. Which of the following statements about bonds in protein structures is correct?
- (A) Hydrogen bonds stabilize the secondary structure of proteins, such as alpha-helices and beta-sheets.
- (B) Disulfide bonds are ionic links formed between the side chains of cysteine residues, providing stability to the protein's tertiary structure.
- (C) Disulphide bonds can form between positively and negatively charged side chains, contributing to the protein's overall stability.
- (D) Peptide bonds are formed between amino acids.
37. Spot the wrongly matched statement regarding male reproductive cells
- (A) Primary spermatocyte — Diploid cell that divides to form secondary spermatocytes



- (B) Sertoli cell — Secretes inhibin to regulate FSH levels.
- (C) Leydig cell — Produces androgen-binding protein (ABP) to concentrate testosterone in seminiferous tubules.
- (D) Acrosome — Derived from Golgi apparatus and contains hyaluronidase and proteolytic enzymes.
38. Which of the following statements correctly describe a typical female gametophyte (embryo sac) in flowering plants?
- At maturity, it is 7-nucleate and 8-celled.
 - Its development involves a free-nuclear stage.
 - It is located inside the integuments but outside the nucellus.
 - The egg apparatus is positioned at the micropylar end.
- (A) (i) and (ii)
- (B) (ii) and (iv)
- (C) (ii), (iii) and (iv)
- (D) (iii) and (iv)
39. Find the incorrect match for assisted reproductive techniques
- (A) GIFT — Gametes are placed in the fallopian tube for fertilization to occur naturally.
- (B) ZIFT — Fertilization occurs in vitro, and zygote is transferred to the fallopian tube.
- (C) IUT — Transfer of embryo into the uterus for implantation
- (D) ICSI — Multiple sperms are directly injected into the egg to achieve fertilization.
40. Which of the following statements about the drugs heroin, cocaine, and morphine is incorrect?
- (A) Heroin is synthesized from morphine and is known for its high potential for addiction.
- (B) Cocaine is derived from the leaves of the coca plant and acts as a powerful stimulant.
- (C) Morphine is an opioid used primarily for pain relief and has a high risk of causing respiratory depression.
- (D) Cocaine is a depressant that slows down brain function and heart rate.
41. A cross is performed between $AaBbCC \times aaBbCC$. How many different phenotypes are possible among the offspring.
- (A) 4
- (B) 8
- (C) 12
- (D) 16
42. Identify the incorrect statement based on findings from the HGP
- (A) Less than 2% of the genome encodes proteins.
- (B) SNPs can be used to trace human evolutionary history
- (C) Repetitive sequences constitute a large portion of the human genome
- (D) Repetitive sequences in the human genome are stretches of RNA
43. The finches of the Galapagos Islands serve as evidence for
- (A) Biogeographical evolution
- (B) Special creation
- (C) Evolution driven by mutation



- (D) Retrogressive evolution
44. Select the correct order of geological time scale of earth
- (A) Palaeozoic → Archaeozoic → Coenozoic
- (B) Archaeozoic → Palaeozoic → Proterozoic
- (C) Palaeozoic → Mesozoic → Coenozoic
- (D) Mesozoic → Archaeozoic → Proterozoic
45. Which of the following pairs is incorrectly matched
- (A) *Culex pipiens* — Filariasis
- (B) *Aedes aegypti* — Yellow fever
- (C) Female *Anopheles* — Leishmaniasis
- (D) *Glossina palpalis* — Sleeping sickness
46. Microbe used for biocontrol of pest butterfly caterpillars is
- (A) *Streptococcus*
- (B) *Trichoderma*
- (C) *Agrobacterium tumefaciens*
- (D) *Bacillus thuringiensis*
47. Identify the incorrect statement regarding restriction enzymes:
- (A) They are used in recombinant DNA technology to cut DNA molecules at specific sequences.
- (B) Some produce blunt ends, while others produce sticky ends depending on where they cut.
- (C) All restriction enzymes cut DNA at palindromic sequences leaving identical ends.
- (D) They are classified as endonucleases because they cleave DNA internally.
48. If Mr. Z is eating a salad that contains various vegetables, which trophic level does he occupy in a food chain?
- (A) First trophic level
- (B) Second trophic level
- (C) Third trophic level
- (D) Fourth trophic level
49. In-situ conservation techniques are primarily focused on:
- (A) Protecting species in their natural habitats
- (B) Maintaining genetic diversity in controlled environments
- (C) Establishing wildlife migration routes
- (D) Restoring damaged ecosystem
50. Which of the following correctly describes a codon?
- (A) A sequence of three nucleotides that codes for a specific amino acid.
- (B) A sequence of three nucleotides that codes for a single protein.
- (C) A sequence of amino acids that forms a protein.
- (D) A sequence of nucleotides that signals the end of translation.



Space for Rough Work

Explore ScienceX Biology for Classes 11–12

Advanced Bio Lab-in-a-Box

A hands-on **practical kit for Class 11–12.**

- Microscope slides (mitosis, meiosis, plant & animal tissues).
- Genetics kit: Punnett squares, DNA models, heredity charts.
- Human physiology models: respiratory, circulatory, neural.
- Ecology kit: quadrats, soil testing strips, charts.

- ✓ Covers NCERT/CBSE **practicals & viva prep.**
- ✓ Guided manuals with diagrams.

Biology Planner & Record Diary

A study **planner for Classes 11–12.**

- Daily log with record file checklist.
- Key formulas (Mendelian ratios, Hardy–Weinberg).
- Diagram index with space for teacher's remarks.

- ✓ Supports **systematic board + NEET prep.**

Discovery & Innovation Box

Monthly **challenges in biology.**

- Case studies: genetic disorders, biotech applications.
- Ecology puzzles & biodiversity mapping.
- Innovation tasks: build a 3D DNA helix, food web projects.

- ✓ Promotes **critical thinking & inquiry.**

Practice Worksheets & Bio Notes

Structured for **daily/weekly biology revision.**

- Diagram practice: cell structure, tissues, organ systems.
- Short notes: biomolecules, enzymes, plant physiology.
- Genetics problem sets & human health case studies.

- ✓ Includes **exam-style and NEET-level** questions.

Young Biologist Journal

A quarterly **science showcase for senior biology.**

- Publish research projects, field studies, biology art.
- “BioTech Corner”: student experiments with photos.
- QR links to lab demos, dissections, science fair videos.

- ✓ Celebrates **creativity and research.**



Scan the QR to explore & order online

ScienceX Olympiad — Post-Exam Add-On Page

Make this page useful for reflection, family engagement, and classroom reuse.

1) Reflection & Self-Assessment

My Performance Tracker

- Questions I found **easy**:

- Questions I found **tough**:

- One concept to revise:

Confidence Rating:

- ☐ Fully confident ☐ Partly confident ☐ Guessed the answer

2) Challenge Your Parent / Friend

Pick **any 3 questions** from this paper and ask your parent/sibling/friend to solve them.

Q. No.	Solved? (Y/N)	Time Taken	Who explained better?

3) Teacher's Corner

Teachers can reuse this paper for continued learning:

- Select 5 questions for a **weekly quiz**.
- Discuss the **most missed** question in class.
- Post one “**Question of the Week**” on the noticeboard.

4) Next Steps for Students

- File this paper in your **ScienceX Portfolio**. Reattempt it in **2 weeks** and compare scores.
- Submit your best written explanation (any one question) to your teacher or ScienceX.
- Top student explanations may feature in the **ScienceX Young Innovators Journal**.