CLASS XI

BIOLOGY (044)

Maximum Marks: 70 **Time: 3 hours**

General Instructions:

(i) All questions are compulsory.
(ii) The question paper has five sections and 33 questions.
(iii) Section–A has 16 questions of 1 mark each; Section–B has 5 questions of 2 marks each; Section– C has 7 questions of 3 marks each; Section– D has 2 case-based questions of 4 marks each; and Section–E has 3 questions of 5 marks each.
(iv) There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
(v) Wherever necessary, neat and properly labelled diagrams should be drawn.

SECTION A

1. A taxonomist discovers a new flowering plant species. To correctly place it in the biological system, she first observes its features and compares them with known plants. Then she assigns it a scientific name following binomial rules.This process best demonstrates the interrelationship among which of the following elements of taxonomy?
    A. Classification → Nomenclature → Identification
    B. Identification → Classification → Nomenclature
    C. Nomenclature → Classification → Identification
    D. Identification → Nomenclature → Classification

2. The feature which makes Euglenoids like *Euglena* difficult to classify strictly as plants or animals is:
    A. They are unicellular without a nucleus
    B. They reproduce only by binary fission
    C. They show both autotrophic and heterotrophic modes of nutrition
    D. They remain inactive in the absence of light

3. A plant cell is placed in a solution where the concentration of glucose is higher inside the cell than in the surrounding medium. Yet, glucose continues to enter the cell. The best explanation for the observation is:
    A. Glucose moves by passive diffusion due to a concentration gradient.
    B. Glucose enters the cell through osmosis.
    C. Glucose is transported actively using energy from ATP.
    D. Glucose is transported by facilitated diffusion without using energy.

4. The feature which is absent in monocot leaves but is present in dicot leaves-
    A. Bulliform cells
    B. Palisade parenchyma
    C. Parallel venation
    D. Isobilateral symmetry

5. The Inspiratory Capacity (IC) of the lungs is represented by:
    A. Tidal Volume (TV) + Expiratory Reserve Volume (ERV)
    B. Inspiratory Reserve Volume (IRV) + Tidal Volume (TV)
    C. Vital Capacity (VC) – Tidal Volume (TV)
    D. Residual Volume (RV) + Expiratory Reserve Volume (ERV)

6. The maternal-fetal combination which is most likely to result in Rh incompatibility is:
    A. Rh^- mother and Rh^- fetus
    B. Rh^+ mother and Rh^- fetus
    C. Rh^- mother and Rh^+ fetus
    D. Rh^+ mother and Rh^+ fetus

7. The type of vascular bundle in dicot stem is
    A. Open, conjoint with endarch protoxylem
    B. Open, conjoint with exarch protoxylem
    C. Close, conjoint with endarch protoxylem
    D. Open, conjoint with endarch metaxylem

8. Choose the **INCORRECT** statement -
    A. Grana lamellae have both PSI and PSII
    B. Cyclic photophosphorylation involves both PSI and PSII
    C. Both ATP and NADPH + H^+ are synthesised during non-cyclic photophosphorylation
    D. stroma lamellae lacks PS II and NADP reductase

9. If a respiratory substrate yields 10 mL CO_2 and consumes 20 mL O_2, the RQ value will be:
    A. 0.5
    B. 1.0
    C. 2.0
    D. 1.5

10. Match the column I and column II

Column I (Joint Type)	**Column II (Location/Description)**
P. Ball and Socket Joint	I) Between vertebrae in the spine
Q. Hinge Joint	II) Shoulder and hip
R. Pivot Joint	III) Elbow and knee
S. Gliding Joint	IV) Between the atlas and axis vertebrae
T. Saddle Joint	V) Wrist and ankle joints
U. Cartilaginous Joint	VI) Between the thumb and the wrist
V. Fibrous Joint	VII) Joints between the bones of the skull

Select the correct option:

A. P – III, Q – I, R – IV, S – V, T – VI, U – VII, V – II
B. P – II, Q – III, R – I, S – V, T – VI, U – VII, V – IV
C. P – II, Q – III, R – IV, S – VI, T – V, U – I, V – VII
D. P – II, Q – III, R – IV, S – V, T – VI, U – I, V – VII

11. The main difference between cytokinesis in plant and animal cells is due to:
    A. Presence of centrosomes in plant cells
    B. Lack of spindle fibers in animal cells
    C. Rigid cell wall in plant cell
    D. Absence of cytoplasm in animal cells

12. The Renin-Angiotensin-Aldosterone System (RAAS) plays a crucial role in regulating blood pressure and fluid balance in the body. It is activated in response to low blood pressure or low sodium levels.
    The statement which correctly describes the sequence of events in the RAAS pathway is:
    A. Decreased blood pressure stimulates the release of renin from the liver, which directly increases sodium excretion in the kidney.
    B. Renin is released by the juxtaglomerular cells of the kidney, which converts angiotensinogen into angiotensin I, which is later converted into angiotensin II
    C. Angiotensin II stimulates the release of aldosterone from the pancreas, leading to decreased water retention in the kidneys.
    D. Aldosterone decreases sodium reabsorption in the kidneys, leading to increased urine production.

Question No. 13 to 16 consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:
A. Both A and R are true and R is the correct explanation of A.
B. Both A and R are true and R is not the correct explanation of A.
C. A is true but R is false.
D. A is false but R is true.

13. **Assertion (A):** The Calvin cycle operates in the stroma of chloroplasts and is independent of light.

    Reason (R): It requires ATP and NADPH produced during the light-dependent reactions.

14. **Assertion (A):** Both cilia and flagella are involved in cell movement and show similar internal structure.

    Reason (R): Cilia and flagella are composed of a 9 + 2 arrangement of microtubules and arise from centrioles.

15. **Assertion (A):** Neurotransmitters play a crucial role in transmitting signals across a chemical synapse.

    Reason (R): In a chemical synapse, neurotransmitters are released from the presynaptic neuron, cross the synaptic cleft, and bind to receptors on the postsynaptic neuron to transmit the signal.

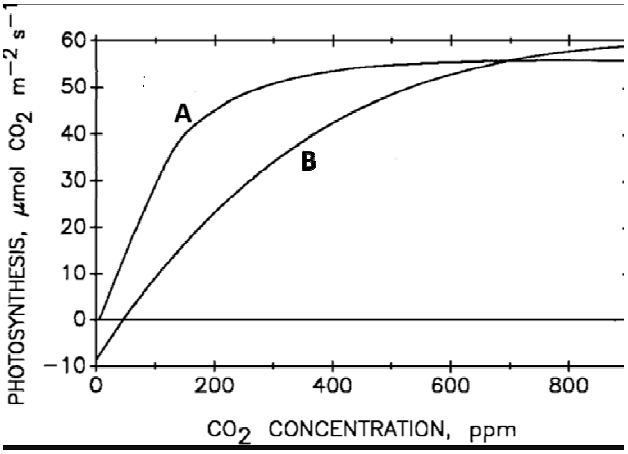
16. **Assertion (A):** Frogs can respire through their skin, lungs, and the lining of the buccal cavity.

    Reason (R): Cutaneous respiration in frogs occurs only when they are in water.

SECTION B

17. Give reason
    A. When vinegar is added to milk, it forms cottage cheese.
    B. An egg solidifies upon boiling.

18. In a graph shown below which curve - A or B represents C4 plants? Justify.



19. Name the type of sense organ in a frog for:
    A. Touch
    B. Balancing
    C. Smell
    D. Taste

20. During an acting audition, two actors performed a scene involving heavy breathing after running.

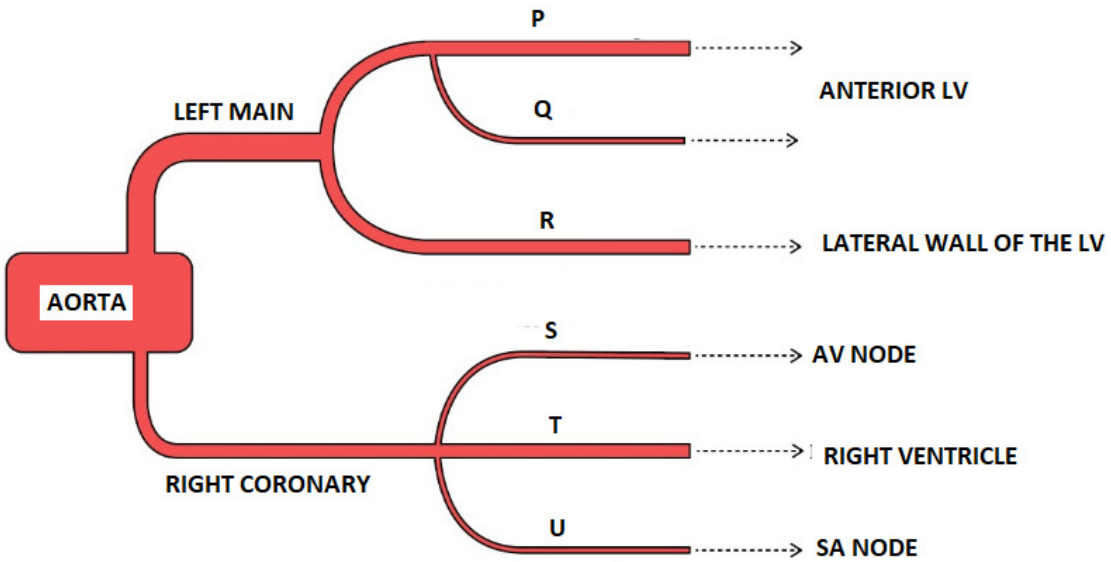
Actor A showed short, quick inhalation followed by long, deep exhalation.

Actor B showed long inhalation followed by short, shallow exhalation.

As a biology student, analyze which actor portrayed post-exercise breathing more accurately and explain why based on respiratory physiology.

OR

Given below is the diagram of coronary circulation. Observe the flow of blood represented and answer the question that follow:



A. What will be the impact on the functioning of the heart if artery 'U' is blocked?
B. Which wave of ECG would be affected if artery 'T' is blocked?

21. What is heterospory in pteridophytes? How does it act as a precursor to the seed habit?

SECTION C

22. Differentiate between *Spirogyra* and *Porphyra* on the basis of
    A. Stored food
    B. Pigments
    C. Cell wall

23. A cell is actively forming new membranes and requires specific biomolecules for this process. List the organelles involved and explain how they coordinate to supply the necessary biomolecules for membrane formation.

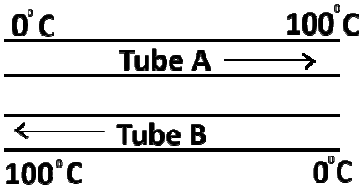
24. Given below are intermediate steps of the TCA cycle. What are the energy equivalents produced during each step?. How many ATP molecules are generated by oxidation of these energy equivalents?
    A. Citric acid → α ketoglutarate
    B. α ketoglutarate → Succinate
    C. Succinate → malate

25. Draw the diagrammatic representation of a sarcomere in
    A. Relaxed state
    B. Contracted state

    Label the regions undergoing change in length.

26. Differentiate between primary and secondary metabolites in terms of their functions and examples. List two secondary metabolites useful in human welfare.

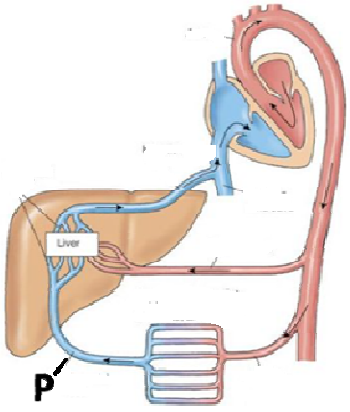
27. The diagram below shows two tubes with fluid flowing in opposite directions, facilitating heat exchange.



    A. Name the mechanism and two parts forming such an arrangement in the kidney for osmoregulation.
    B. How does this mechanism help the body conserve water?

OR

Observe the diagram and answer the questions that follow



    A. Identify the blood vessel P.
    B. What is unique about this vascular connection?
    C. What is the significance of blood vessel P?

28. Unlike animals and plants, fungi exhibit a unique pattern of sexual reproduction that involves three distinct phases. These phases help them transition from haploid cells to the formation of spores in a specialized way. Identify and describe these three phases of fungal sexual reproduction in the correct sequence.

SECTION D

29. A diploid cell in a plant has 2n = 8 chromosomes. During its life cycle, this cell may either divide by mitosis for growth or by meiosis for the formation of gametes. The C value represents the amount of DNA in a nucleus of haploid cell.
    A. During which phase of mitosis does the C value become 4C, and why?
    B. If the diploid cell stated failed to separate homologous chromosomes during Anaphase I, what would be the chromosomal outcome in the gametes?
    C. After Meiosis I, how many chromosomes and chromatids are present in each daughter cell of this organism?

    OR

    D. At Metaphase II, what is the chromosome and chromatid count per cell?

    (1+1+2)

30. A student conducted an experiment to study the growth of two types of plant tissues under controlled conditions:

Parameter	Tissue P	Tissue Q
Initial stage	2 cm	1 unit
Growth rate	0.5 per day	Doubles every day
Experimental duration	6 days	6 days

    A. Calculate the final length of Tissue P after 6 days.
    B. Identify the type of growth curve shown by Tissue Q.
    C. Plot a simple labeled sketch showing the growth curve for Tissue P.

    OR

    D. Plot a simple labeled sketch showing the growth curve for Tissue Q.

    (1+1+2)

SECTION E

31. Explain the mechanism of hormone action with reference to progesterone.
    A. Give the chemical nature of the hormone?
    B. Where are the receptors for progesterone located?
    C. Once progesterone binds to its receptor, how does it initiate a response?
    D. Draw a diagram to show the mechanism of progesterone action.

    OR

Explain the mechanism of nerve impulse transmission in an axon by including the following:

A. Describe the polarized state of the neuron at rest. How is the resting potential maintained across the axonal membrane?
B. Explain the depolarization process during an action potential. How do sodium (Na^+) ions influence this process?
C. Describe the process of repolarization after the action potential. How do potassium (K^+) ions contribute to this process?
D. Draw a diagram of a nerve impulse traveling through the axon.

32. Observe the pictures of animal shown below:

A

B

. Identify the classes to which animal A and B belong. Give four features on the basis of which they are classified into different classes.

OR

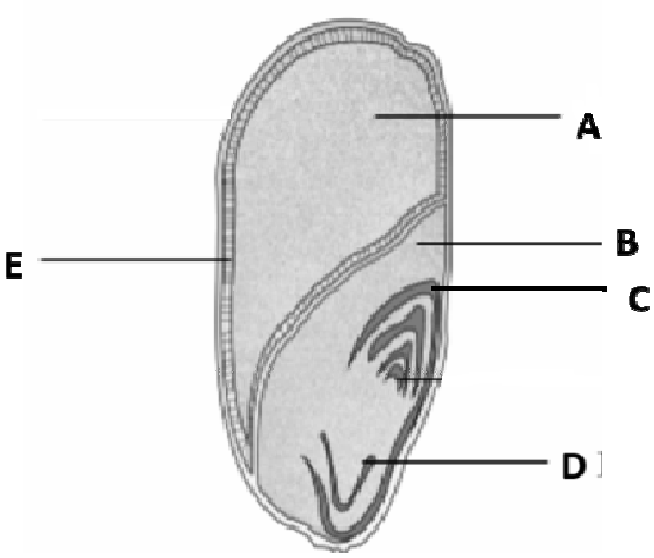
Observe the two body forms of organisms belonging to the same phylum

.

A B

Identify the two different body forms shown in the diagram (A and B), name the phylum they belong to, mention two characteristic features of this phylum, and state two differences between these body forms.

33. In the diagram given below identify the labels A,B,C,D and E. State one function of each.



OR

Identify and describe the given symbols used in the representation of floral formula.

A. ☐

B. ☐

C. G

D. $A_{(4)+(4)}$

E. C A