Chapter 25

Model Question Paper

The chapter deals with the design of Model Question Paper for Biology Class XI. This is based on model question paper for Biology Class XII placed on NCERT web site (www.ncert.nic.in) and also keeping in view the question paper developed by CBSE for their board examination 2007. Very Short Answer (VSA) type questions of two marks are included in the present design and Multiple Choice Question (MCQ) of one mark each is also suggested. This chapter is divided into three headings, such as Design of the Question Paper, Model Questions and Answers with Marking Scheme.

Design of the Question Paper

In order to develop a balanced question paper various parameters are taken into consideration. They are the type of questions, marks allocation, number of questions, time allocation, unit/ chapterwise distribution, difficulty level etc. An attempt has been made to provide proper weightage to these parameters under four separate sub-headings.

Type of Question and Marking

1. Multiple Choice Question **(MCQ)** (1) mark
2. Very Short Answer Type Question **(VSA)** (2) marks
3. Short Answer Type Question **(SA)** (3) marks
4. Long Answer Type Question **(LA)** (5) marks

Number, Marks and Time Allocation to Each Type of Questions

Type & Marks	Time in Minutes	Number of questions	Marks distribution	Time distribution
MCQ - 1 mark	2	14	14 × 1 = 14	14 × 2 = 28
VSA - 2 marks	5	10	10 × 2 = 20	10 × 5 = 50
SA - 3 marks	8	7	7 × 3 = 21	7 × 8 = 56
LA - 5 marks	12	3	3 × 5 = 15	3 × 12 = 36
	Total	34 Questions	70 Marks	170 minutes

Unit-wise Distribution of the Questions and Marks

Unit	Unit wise Questions of each type and marks in( )				Unit wise Distribution of total question and marks	
	MCQ	VSA	SA	LA	Total Question	Total Marks
Diversity in the Living World	1 (1)	2 (4)	1 (3)	-	4	8
Structural Organisation in Plants and Animals	3 (3)	1 (2)	-	1 (5)	5	10
Cell: Structure and Functions	3 (3)	2 (4)	1 (3)	-	6	10
Plant Physiology	3 (3)	3 (6)	2 (6)	1 (5)	9	20
Human Physiology	4 (4)	2 (4)	3 (9)	1 (5)	10	22
Total	14	10	7	3	34	70

Difficulty Level of the Question

Easy (E) - 20% = 14 marks
Average (A) - 60% = 42 marks
Difficult (D) - 20% = 14 marks

MODEL QUESTIONS

MCQ'S **Mark 01**

Tick the correct statement

1. The term 'systematics' refers to:
   a. Identification and classification of plants and animals
   b. Nomenclature and identification of plants and animals
   c. Diversity of kinds of organisms and their relationship
   d. Different kinds of organisms and their classification

2. Venation is a term used to describe the pattern of arrangment of
   a. Floral organs
   b. Flower in infloresence
   c. Veins and veinlets in a lamina
   d. All of them

3. Interfascicular cambium and cork cambium are formed due to
   a. Cell division
   b. Cell differentiation
   c. Cell dedifferentiation
   d. Redifferentiation

4. Which one of the following is not a connective tissue
   a. Bone
   b. Cartilage
   c. Blood
   d. Muscles

5. Which of the following statements is true for a secretory cell?
   a. Golgi apparatus is absent
   b. Rough Endoplasmic Reticulum (RER) is easily observed in the cell
   c. Only Smooth Endoplasmic Reticulum (SER) is present
   d. Secretory granules are formed in nucleus.

6. Many organic substances are negatively charged e.g., acetic acid, while others are positively charged e.g., ammonium ion. An aminoacid under certain conditions would have both positive and negative charges simultaneously in the same molecule. Such a form of aminoacid is called
   a. Positively charged form
   b. Negatively charged form
   c. Neutral form
   d. Zwitterionic form

7. Mark the correct event during anaphase-I of meiosis
   a. Homologous chromosomes separate
   b. Non-homologous chromosomes separate
   c. Sister chromatids separate
   d. Non-sister chromatids separate

8. The form of sugar transported through phloem is
   a. Glucose
   b. Fructose
   c. Sucrose
   d. Ribose

9. Reactions carried out by N_2 fixing microbes include
   a. $2NH_3 + 3O_2 \longrightarrow 2NO_2^- + 2H^+ + 2H_2O$ (i)
   b. $2NO_2^- + O_2 \longrightarrow 2NO_3^-$ (ii)

   Which of the following statements about these equations is not true
   a. Step (i) is carried out by *Nitrosomonas* or *Nitrococcus*
   b. Step (ii) is carried out by *Nitrobacter*
   c. Both steps (i) and (ii) can be called nitrification
   d. Bacteria carrying out these steps are usually photoautotrophs

10. PEP is primary CO_2 acceptor in
    a. C_4 plants
    b. C_3 plants
    c. C_2 plants
    d. Both $C_3 + C_4$ plants

11. Glycogen is a homopolymer made of
    a. Glucose units
    b. Galactose units
    c. Ribose units
    d. Aminoacids

12. One of the common symptoms observed in people infected with Dengue fever is
    a. significant decrease in RBC count
    b. significant decrease in WBC count
    c. significant decrease in platelets count
    d. significant increase in platelets count

13. Which one of the following statements is incorrect?

a. The medullary zone of kidney is divided into a few cortical masses called medullary pyramids projecting into the calyces.

b. Inside the kidney the cortical region extends in between the medullary pyramids as renal pelvis.

c. Glomerulus alongwith Bowman's capsule is called the renal corpuscle.

d. Renal corpuscle, proximal convoluted tabule (PCT) and distal convoluted tubule (DCT) of the nephron are situated in the cortical region of kidney.

14. Mary is about to face an interview. But during the first five minutes before the interview she experiences sweating, increased rate of heart beat, respiration etc. Which hormone is responsible for her restlessness?

a. Estrogen and progesterone

b. Oxytocin and vasopressin

c. Adrenaline and noradrenaline

d. Insulin and glucagon

VSA **Marks 02**

15. Suppose you accidentally find an old preserved permanent slide without a label. In your effort to identify it, you place the slide under microscope and observe the following features :-

a. Unicellular

b. Well defined nucleus

c. Biflagellate–one flagellum lying longitudinally and the other transversely.

What would you identify it as? Can you name the kingdom it belongs to?

16. Identify the phylum in which adults exhibit radial symmetry and larva exhibit bilateral symmetry.

17. Identify the sex of a frog in which sound producing vocal sacs are present.

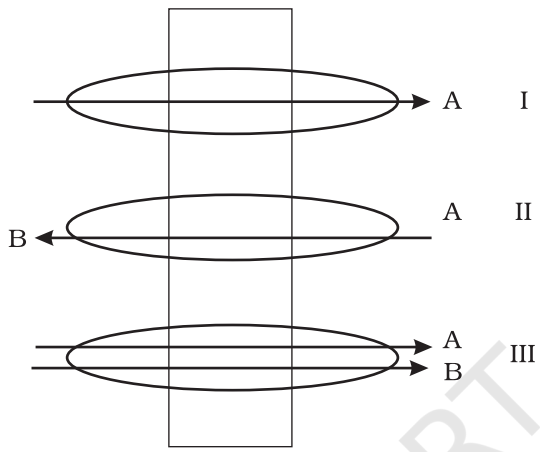
18. What is the feature of a metacentric chromosome?

19. Reaction given below is catalysed by oxidoreductase between two substrates A and A', complete the reaction.

A reduced + A' oxidised ⟶

20. A flowering plant is planted in an earthen pot and irrigated. Urea is added to make the plant grow faster, but after some time the plant dies. Give reason.

21. Identify the process occurring in II and III.



22. Where is NADP reductase enzyme located in the chloroplast? What is the role of this enzyme in proton gradient development?

23. Cigarette smoking causes emphysema. Suggest reasons.

24. Arrange the following in the order of reception and transmission of sound wave from the external auditory canal:

Cochlear nerve, ear drum, stapes, incus, malleus, cochlea.

SA **Marks 03**

25. The heterosporous pteridophytes show certain characteristics, which are precursor to the seed habit in gymnosperms. Explain.

26. The following events occur during the various phases of the cell cycle, Write the phase against each of the events.

a. Appearance of nucleolus _____

b. Division of centromere _____

c. Replication of DNA _____

27. How is sulphur important for plants? Name on amino acids in which it is present.

28. What is the mechanism underlying the phenomenon by which the terminal/apical bud suppresses the growth of lateral buds? Suggest measures to overcome this phenomenon.

29. While eating peach or pear it is usually seen that some stone like structures get entangled in the teeth, what are these stone like structures called?

30. Succulents are known to keep their stomata closed during the day to check transpiration. How do they meet their photosynthetic CO_2 requirements?

31. How are the activities of gastro-intestinal tract regulated?

LA **Marks 05**

32. The arrangement of ovules within the ovary is known as placentation. What does the term placenta refer to? Name the different types of placentation seen in plants. Draw any three types of placentation in flowers as seen in T.S.

33. Give the biochemical events occurring in the root nodule of a pulse plant. What is the end product? What is its fate?

or

It is observed that deficiency of a particular element showed its symptoms initially in older leaves and then in younger leaves.

a. Does it indicate that the element is actively mobilized or relatively immobile?

b. Name two elements which are highly mobile and two which are relatively immobile.

c. How is the aspect of mobility of elements important to horticulture and agriculture?

34. Discuss the role of Ca^{2+} ions in muscle contraction. Draw neat sketches to illustrate your answer.

or

A milkman is very upset one morning as his cow refuses to give any milk. The milkman's wife gets the calf from the shed. On fondling by the calf, the milkman got sufficient milk. Describe the role of endocrine gland and hormone associated with this response with suitable diagram.

Answers with Marking Scheme

Answers

Marks

MCQ

1. c—Diversity of kinds of organisms and their relationship 1
2. c— Veins and veinlets in a lamina 1
3. a—Cell division 1
4. d—Muscles 1
5. b—Rough Endoplasmic Reticulum (RER) is easily observed in the cell 1
6. d—Zwitterionic form 1
7. a—Homologus chromosomes separate 1
8. a—Sucrose 1
9. d—Bacteria carrying out these steps are usually photoautotrophs 1
10. a—C_4 plants 1
11. a—Glucose units 1
12. d—Significant increase in platelets count 1
13. b—Inside the kidney the cortical region extends inbetween the medullary pyramids as renal pelvis. 1
14. c—Adrenaline and noradrenaline 1

VSA

15. Dinoflagellates 1+1

    Kingdom: Protista

16. In Phylum Echinodermeta, adults show radial symmetry whereas larvae show bilateral symmetry. 1+1
17. Male Frog. 2
18. The metacentric chromosome has a centromere in the middle region with two equal arms of the chromosome 1+1
19. A reduced + A′ oxidised → A oxidised + A′ reduced 2
20. Exosmosis 2
21. II—Antiport 1+1

    III—Symport

22. NADP reductase enzyme is located on the stroma side of thylakoid membrane. 1+1

This helps in reduction of $NADP^+$ is NADPH + H^+ to create a proton gradient across thylakoid membrane leading to release of energy.

23. Cigarette smoking causes damage of the alveolar walls leading to decreased respiratory surfaces for exchange of gases. 2

24. Ear drum, malleus, incus, stapes, cochlea, chochlear nerve. 2

SA

25. All seed plants including gymnosperms are heterosporous producing megaspores and microspores that give rise respectively to megagametophytes and microgametophytes, a condition required for seed production. Production of seed is an extreme form of heterospory, in which ovule is formed, the structure which develops into seed. The seed has replaced the spore of lower plants as the unit of dispersal. The presence of heterospory in pteridophytes indicates the evolution of gymnosperms from pteridophytes. 3

26. a—Telophase b—Anaphase c—Interphase 1+1+1

27. Sulphur, besides being present in some amino acids essential for protein synthesis, is also a constituent of several coenzymes, vitamins and ferrodoxin which are involved in some biochemical pathway. It is present in amino acid cystein. 3

28. The phenomenon by which the terminal apical bud suppresses the growth of lateral buds is referred to as apical dominance. This is because of the hormone auxin synthesised in the apical bud that inhibits lateral bud development. 3

This can be overcome by removing the apical bud (decapitating) and young leaves which will increase branching. It may also be possible to overcome this phenomena by application of cytokinin and antiauxins like ethylene chlorohydrin, DCA (dichloroanisole) etc.

29. The structures that get entangled in the teeth while eating fruits like peach and pear are actually the stone cells or brachysclereids which are unbranched, short and isodiametric type of sclereids. These stone cells usually occur in groups and provide grit or stone like hardness that get entangled in the spaces between teeth. 3

30. Succulents (water storing) plants fix CO_2 into organic compound using PEP carboxylase at night, when the stomata are open. 1+1+1

$PEP + CO_2 \longrightarrow OAA$

$OAA \longrightarrow \longrightarrow \longrightarrow$ Malic acid

The organic compound (malic acid) accumulates throughout the night and is decarboxylated during the day to produce CO_2.

31. The activities of gastro-intestinal tract are regulated by the hormones and neural signals. 1+1+1

The sight and smell of food stimulates secretion of saliva

or

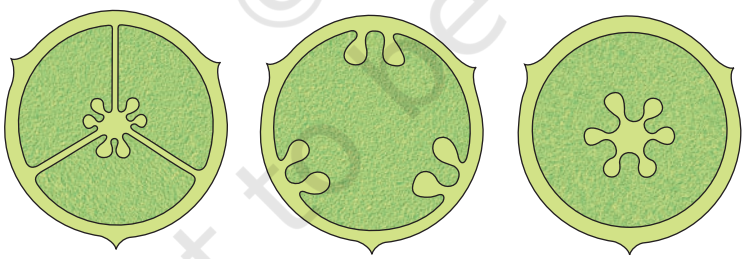
The muscular acitivities of the alimentry canal are moderated by neural signals.

Hormones produced by the gastric and intestinal mucosa regulates the secretion of digestive juices.

LA

32. The ovlues are female reproductive structures and borne in the ovary of the flower. Their number, structure, position in the ovary varies in different plants. They also differ in their mode of attachment with the the ovary wall. At the point of attachement there is a cellular ridge or cushion of cells called placenta. The mode of attachment of ovule to the placenta is known as placentation which is of the following types: 1+1+3

(a) Parietal (b) Marginal (c) Axile (d) Free Central (e) Basal



Axile Placentation | Parietal Placentation | Free central Placentation

33. (i) Root nodules are the site of N_2 fixation. The fixation of nitrogen is done by Nitrogenase enzyme, an Mo-Fe protein present in the nodule. The process requires a source of electrons, protons and ATP molecules.Nitrogen is bound to the enzyme surface and is reduced in stepwise reaction to ammonia. This stepwise reduction of N_2 to NH_3 is catalyzed by nitrogenase with the 3

help of reducing agents and hydrolysis of ATP. When eight electrons (and $8H^+$) are accepted by N_2, 2 NH_3 are released from the enzyme. The biochemical pathway can be summarized by the reaction below:

$$N_2 + 8e^- + 8H^+ + 16\ ATP \rightarrow 2\ NH_3 + 12ADP + 12\ Pi$$

(ii) The end product of this reaction is ammonia. ½

(iii) At physiological pH, the ammonia is protonated to form NH_4+ (ammonium) ion which is used to synthesize amino acids in plants. The synthesis of amino acids take place by two main ways viz. Reductive amination and transamination. 1½

or

a—It is actively mobilized 1

b—Highly mobile- Nitrogen, magnesium 2

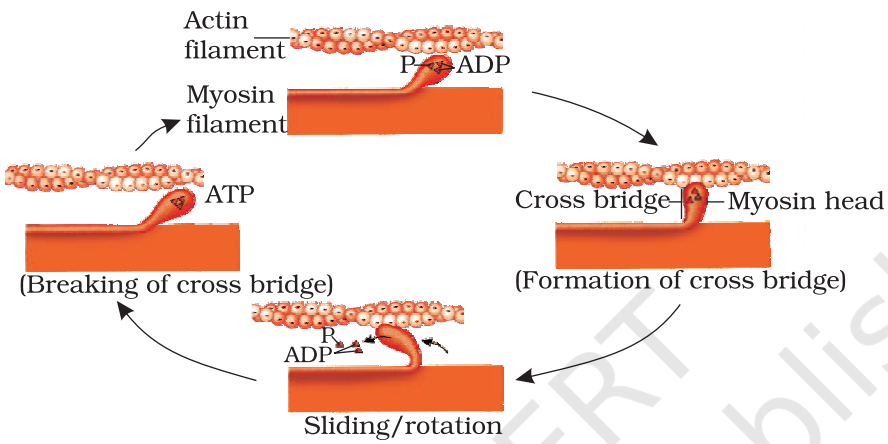
Relatively immobile- Sulphur, Calcium

c—Symptoms of deficiency of mobile elements are more pronounced in older leaves and symptoms of deficiency of relatively immobile element appear first in younger leaves. This information can be utilised by horticulturist and agriculturist to get a broad idea of the deficiency elements in plants. 2

34. Muscle contraction is initiated by a neural signal, which after reaching neuromuscular junction or motor end plate releases a neurotransmitter, which generates an action potential in the sarcolemma. Action potential spreads through muscle fibre and causes the release of calcium ions into the sarcoplasm. Increase in Ca^{2+} level leads to the binding of calcium with a subunit of troponin on actin filaments and thereby removes the masking of active sites for myosin. Utilising the energy from ATP hydrolysis, the myosin head now binds to the exposed active site on actin to form a cross-bridge. This pulls the attached actin filaments towards the centre of 'A' band. The 'Z' line attached to these actins are also pulled inwards thereby causing shortening of the sarcomere, i.e., contraction. 3½+1½

A new ATP binds to myosin head and the cross-bridge is broken. The ATP is again hydrolysed by the myosin head and the cycle of cross-bridge formation and breakage is

repeated causing further sliding. The process continues till the Ca^{++} ions are pumped back to the sarcoplasmic cisternae resulting in masking of actin filaments and breakage of all cross bridges. This cause the return of 'Z' lines along with filaments back to their original position, i.e., relaxation.



or

Sucking by the calf creates a neuroendocrine reflex which results in release of oxytocin from the neurohypophysis. Oxytocin brings about contraction of smooth muscle of the udder resulting in milk flow. A direct intra-udder injection of oxytocin like hormone would do the same function. 2½+2½