BIOLOGY PAPER 2 (PRACTICAL)

Question 1 **[5]**

(a) (i) Observe the given specimen **D-41** carefully. With a sharp razor blade, cut the longitudinal section of the specimen. Make a neat and labelled drawing of one of the cut surfaces of **D-41**.

(ii) Name the type of inflorescence observed in specimen **D-41**.

(iii) Name the two types of florets along with their location in the specimen **D-41**.

(b) (i) With the help of forceps provided, remove a floret from the periphery of the specimen **D-41**. Observe the floret carefully with a hand lens. Describe its floral characters in semi-technical terms. (Details of individual whorls are not required.)

(ii) Draw a neat and labelled diagram of the selected floret in (b)(i) above.

(c) (i) Now, carefully remove a floret from the central part of the specimen **D-41** with the help of forceps. Observe it carefully with a hand lens. Describe its floral characteristics in semi-technical terms. (Details of individual whorls are not required.)

(ii) Draw a labelled diagram of the floret selected in (c)(i) above.

(iii) Record your observations about the floret from the centre in (c)(i) above, in the table below:

Androecium:	Floret from the centre
(1) Relation of stamens to petals	
(2) Relation of stamen to each other	
Gynoecium	Floret from the centre
(1) Shape of stigma	
(2) Number of carpels	

(d) Give *one* difference each between the floret from the periphery (b)(i) and the floret from the centre (c)(i), based on the following:

	Floret from the periphery	Floret from the centre
(i) Shape of the corolla	--	--
(ii) Flower symmetry	--	--

(e) Write the floral formula of the floret from periphery.

(f) Draw the floral diagram of the floret from the centre.

(g) To which family does specimen **D-41** belong?

(h) Name *two* floral characteristics of the specimen which places it in the family mentioned in (g).

(i) Write the botanical name of an economically important plant belonging to this family.

Comments of Examiners

(a) Some of the candidates drew the entire flower instead of the L.S.. Convex thalamus was not shown in some cases. The difference in size of the disc florets in the centre and periphery not clearly depicted by some candidates.

(b) Semi-technical terms were not described and spelling errors were made by some candidates. A few candidates gave incorrect position of bracts and pappus in the diagram. Several candidates drew L.S. of ray floret instead of the entire floret.

Suggestions for teachers

- Ask students to learn the spellings of semi-technical terms.
- Students should be taught to draw by observing the specimen and not the diagram learnt from the book.
- Relevance of the mother axis in a floral diagram must be highlighted.
- Teach students the rules for binomial nomenclature

(c) A few candidates drew L.S. of the disc. Some candidates misinterpreted 'relation of stamens to petals' and 'relation of stamen to each other'.

(d) In some of the cases, difference based on the concept of 'symmetry' was not given by candidates.

(e) Incorrect floral formulae were written by many candidates. The sign for the inferior ovary was not placed correctly in several cases.

(f) The Mother axis was either not drawn or drawn in wrong position by many candidates.

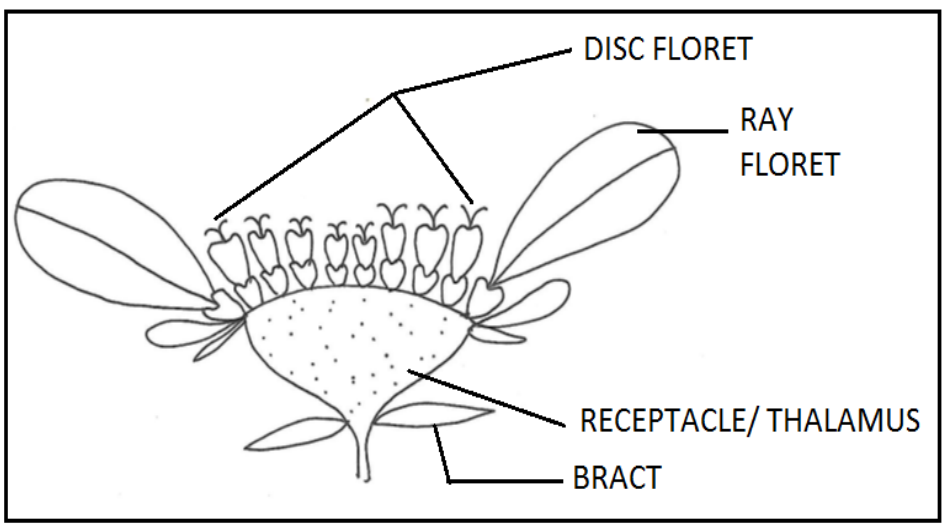
(g) Spelling errors were made by many candidates while naming the family.

(h) The rules for binomial nomenclature were not followed while writing the scientific names. In several cases, spelling mistakes were also made by candidates.

MARKING SCHEME

Question 1.

(a) (i) Drawing:



Drawing points:		**Labelling points:**	
1	At least 2 ray florets shown	1	Ray floret
2	Many disc florets shown in the centre	2	Disc floret
3	Bigger disc florets at the periphery smaller disc florets at the centre	3	Receptacle
4	Broad & convex thalamus / receptacle shown	4	Bract
5	At least 2 bracts shown		

(ii) Capitulum/ Head

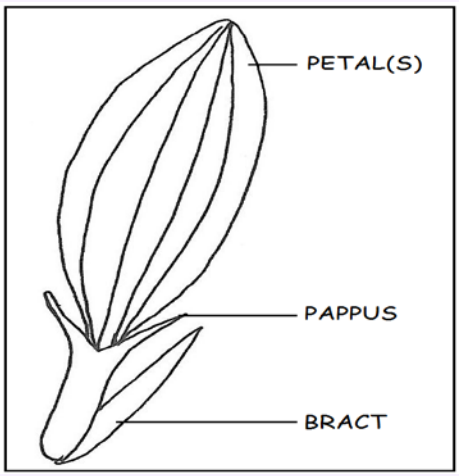
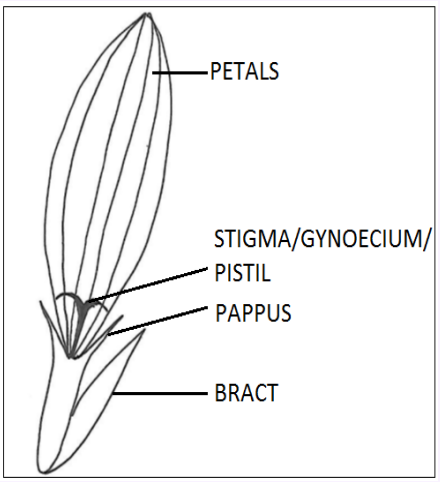
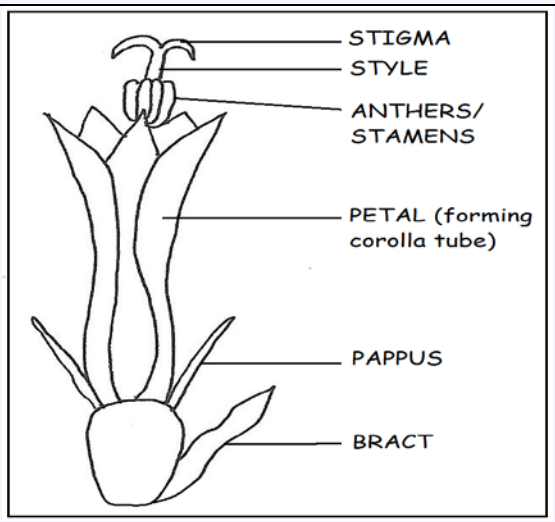
(iii) Ray floret - Periphery

Disc floret - Centre

(b) (i) Bracteate, sessile, ligulate, incomplete, zygomorphic/irregular, neuter.

or

Bracteate, sessile, ligulate, incomplete, unisexual, zygomorphic/irregular, pistillate, epigynous. ***(any five)***

	(ii)	Diagram   **Drawing:** 1. Bract shown 2. Pappus shown 3. (5 fused) petals 4. Ligulate/corolla shown 5. Bifid stigma (in case of pistillate flower) **Labelling:** 1. Bract 2. Pappus 3. Petals 4. Stigma/ pistil/ gynoecium
(c)	(i)	Bracteate, sessile, tubular, complete, actinomorphic (regular), bisexual (hermaphrodite), pentamerous, epigynous.
	(ii)	 **Drawing:** 1. Bract shown 2. Pappus shown 3. 5 fused tubular petals shown 4. Anthers shown **Labelling:** 1. Bract 2. Pappus 3. Petals 4. Anthers

		5. Bifid stigma (in case of pistillate flower)	5. Stigma/ pistil/ gynoecium 6. Style
	(iii)	Androecium	
		1. Relation of stamen to petals	Epipetalous
		2. Relation of stamens to each other	Syngenesious
		Gynoecium	
		1. Shape of stigma 2. Number of carpel	Bifid Bicarpellary /Two

(d)

		Florets from the periphery	Florets from the centre
(i)	Shape of corolla	Ligulate/strap	Tubular
(ii)	Flower Symmetry	Zygomorphic/ irregular	Actinimorphic/ regular

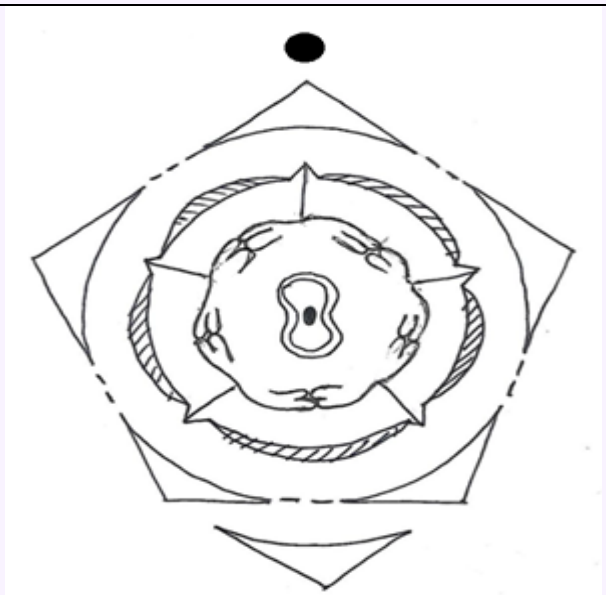
(e) Floral formula of the peripherally located floret (Ray floret).

Br % $K_{2\ (Pappus)}\ C_{(5)}\ A_0\ G_0$

Or

Br % ♀ $K_{2/3\ (pappus)} C_{(5)}\ A_{(0)}\ \overline{G}_{(2)}$

(f)



Drawing:

1. Mother axis
2. Bract at the opposite pole of mother axis
3. Reduced sepals/Pappus in correct orientation (2 – 5)
4. 5 fused petals

	5. 5 dithecous stamen 6. Syngenesious stamen 7. Epipetalous stamen 8. Unilocular ovary 9. Basal placentation showing single ovule
(g)	Family to which the specimen D-41 belongs. Compositae / Asteraceae
(h)	Family characteristics**:** ● Inflorescence Capitulum/ Head ● Calyx as pappus ● 5 Syngenesious stamen ● Basal Placentation ● Inferior ovary/ Epigynous flower ● Has two types of florets-Ray and Disc *(any two)*
(i)	Scientific name of economically important plant belonging to the same family as Specimen D - 41 ● Dahlia pinnata ● Calendula officinalis ● Cosmos bipinnatus ● Chrysanthemum carinatum ● Eclipta alba ● Dahlia excelsa ● Helianthus annuus

Question 2 **[5]**

(a)		You are provided with distilled water, 10% NaCl, 0·1% NaCl solution and a Rhoeo discolour leaf **D-42**.	
(b)	(i)	Take three glass slides and label them as A, B and C.	
	(ii)	Using different droppers, put a little distilled water on slide A, 10% NaCl solution on slide B and 0·1% NaCl solution on slide C.	
(c)	(i)	With the help of forceps, remove a few small pieces of epidermis from the leaf provided.	
	(ii)	Transfer a piece of epidermis to each of the slides A, B and C. Wait for five minutes.	
(d)	(i)	Cover the epidermal peel on slide A with a cover slip and examine it under low power of microscope. Draw a labelled diagram to show the position of the cell wall and cell membrane clearly.	

	(ii)	Now, cover the peel on slide B with a coverslip. Examine it under the low power microscope and **show it to the Visiting Examiner**. Draw a neat diagram labelling the position of the cell wall and cell membrane.	
	(iii)	Similarly, repeat the procedure with slide C and draw a labelled diagram of what you observed about the position of the cell wall and cell membrane. (Note: *Only one cell from each peel should be drawn.*)	
(e)	Name the process you have observed in:		
	(i)	Slide A	
	(ii)	Slide B	
(f)	Define the process you have mentioned in:		
	(i)	Slide A	
	(ii)	Slide B	
(g)	What would happen if the peel from slide B is kept in tap water? Why?		
(h)	Why is it not advisable for human beings to drink distilled water?		
(i)	Why are pickles and jams made with excess salt and sugar respectively?		

Comments of Examiners

(d) The correct position of cell wall and cell membrane was not given by a number of candidates. In some cases, the labelling arrow did not touch the concerned structure. A number of candidates seemed to be unclear about the concept of turgidity. The cell wall of the adjoining cell was considered as reference by some of the candidates. In the diagram, the shrunken protoplasm was not represented by some candidates.

(e) Some of the candidates were confused between the terms 'endosmosis' and 'exosmosis'.

Suggestions for teachers

- Explain the concept of tonicity with the help of simple physiological experiments.
- Ask students to learn definitions correctly along with the relevant key words.
- Explain the difference between hypo/ hyper and iso.

(f) Incorrect definitions with basic conceptual errors were given by a number of candidates.

(g) Many candidates explained completely opposite processes for slides A & B. Some of the key words were also missing in the answers.

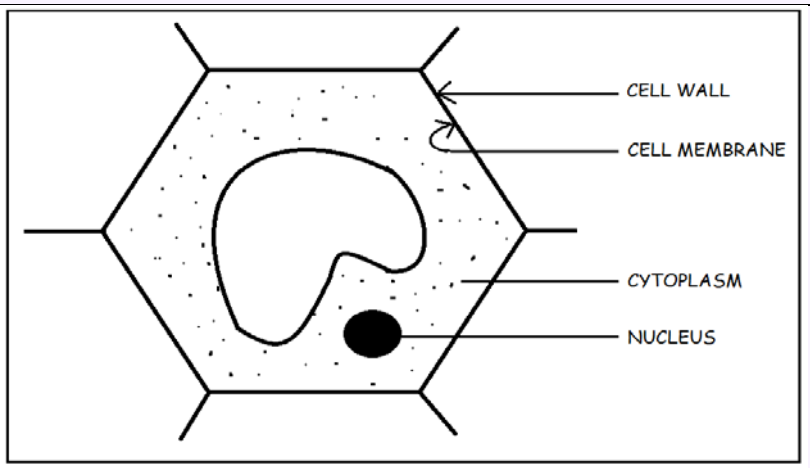
(h) Most of the students failed to mention the absence of minerals in distilled water.

(i) Many candidates did not understand the concept of hypo/hypertonicity.

MARKING SCHEME

Question 2.

(d) (i)



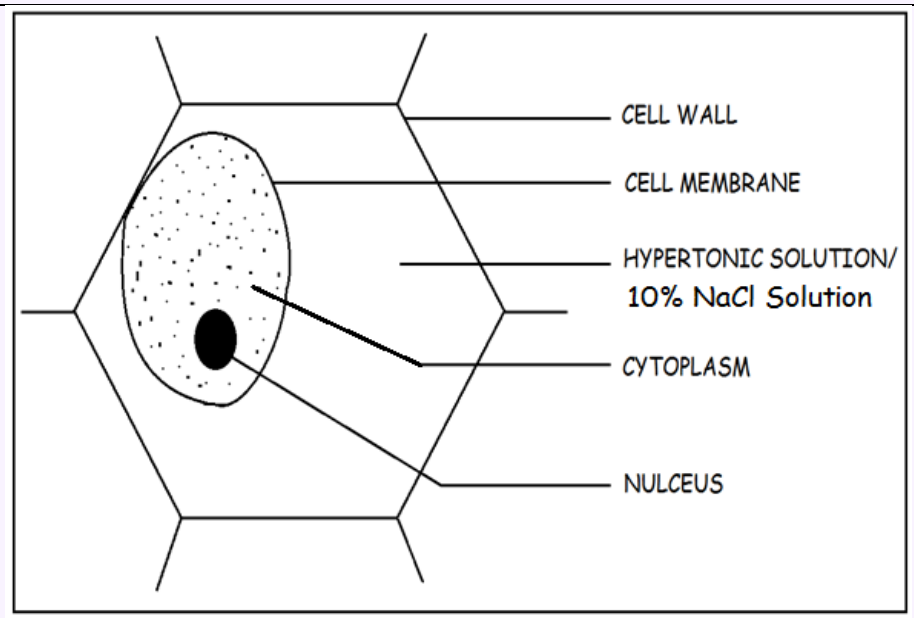
Drawing points:

1. Cell wall distinct
2. Cell membrane indistinct
3. Cytoplasm well spread out

Labelling points:

1. Cell wall
2. Cell membrane
3. Cytoplasm
4. Nucleus

(ii)

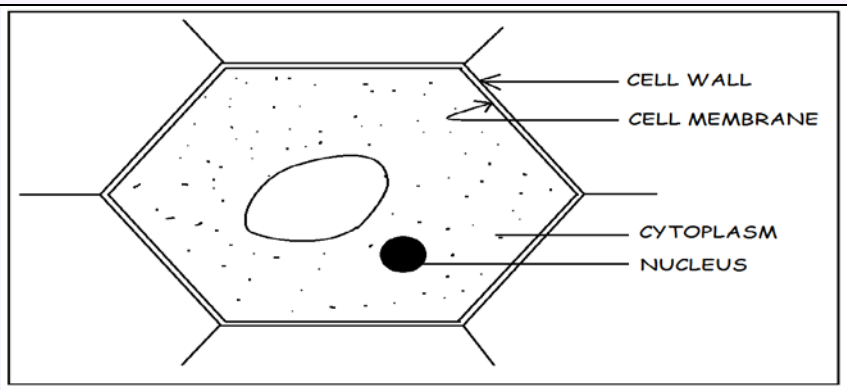


Drawing points:

1. Cell wall distinct
2. Shrunken cytoplasm
3. Gap between cell wall and Cell membrane

Labelling points:

1. Cell wall
2. Cell membrane
3. Cytoplasm
4. Nucleus
5. NaCl solution/ hypertonic sol.

<table>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>(iii)</td><td> 

<table>
<tr><th colspan="2">Drawing points:</th><th colspan="2">Labelling points:</th></tr>
<tr><td>1.</td><td>Cell wall distinct</td><td>1.</td><td>Cell wall</td></tr>
<tr><td>2.</td><td>Cell membrane appears to be fused with the cell wall</td><td>2.</td><td>Cell membrane</td></tr>
<tr><td></td><td></td><td>3.</td><td>Cytoplasm</td></tr>
<tr><td></td><td></td><td>4.</td><td>Nucleus</td></tr>
</table></td></tr>
<tr><td>(e)</td><td>(i)</td><td>Endosmosis</td></tr>
<tr><td></td><td>(ii)</td><td>Exosmosis/ Plasmolysis</td></tr>
<tr><td>(f)</td><td>(i)</td><td>Endosmosis
Inward movement of water from hypotonic environment into the cell.</td></tr>
<tr><td></td><td>(ii)</td><td>Exosmosis/ Plasmolysis
Outward movement of water/ hypotonic solution from the cell to its periphery due to its hypertonic surrounding.
The shrinkage of protoplasm away from the cell wall when placed in a hypertonic solution is known as plasmolysis.</td></tr>
<tr><td>(g)</td><td colspan="2">Deplasmolysis
Due to endosmosis</td></tr>
<tr><td>(h)</td><td colspan="2">Distilled water lacks minerals essential for our body such as iodine, fluorides etc.</td></tr>
<tr><td>(i)</td><td colspan="2">Excess salt and sugar in jams and pickles create a hypertonic condition for the invading microorganisms which spoil food. Causes their death due to plasmolysis which increases the shelf life.</td></tr>
</table>

Question 3 **[5]**

(a)	With the sharp razor blade provided, cut thin transverse sections of specimen **D-43**. Select a good transverse section and stain with safranin. Mount the section in glycerine. Observe it under low power of the microscope and **show it to the Visiting Examiner.**	
(b)	Draw a neat labelled outline of the mount as observed under the microscope. (Cellular details are not required.)	
(c)	Answer the following questions:	

	(i)	Identify the given specimen.	
	(ii)	Give *two* reasons to support your answer in (c)(i) above.	

Comments of Examiners

(b) Most candidates drew diagrams with cellular details instead of outline diagram as required. In many cases, pointing labels were not correct. The concept of radially arranged vascular bundle was not clear to several candidates. A few candidates wrote 'epidermis' instead of 'epiblema'.

(c) Some candidates wrote 'Dicot stem' or 'Monocot stem' instead of 'Monocot Root'. Specific and distinguishing reasons were not given for identification. Most of the students mentioned number of vascular bundle as a range (6-12).

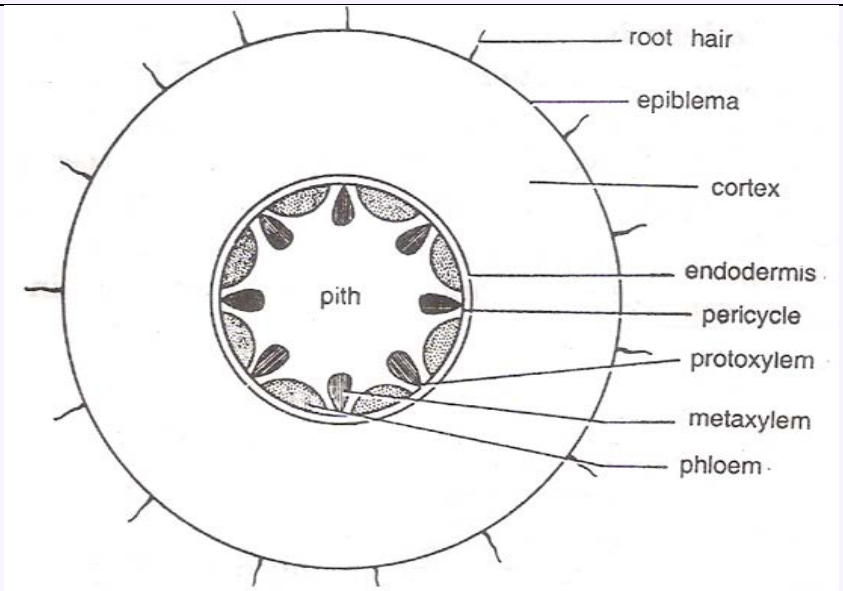
Suggestions for teachers

- Students must be encouraged to read the question paper thoroughly.
- Students should be made aware of the fact that pointer of the labelling must touch the specific structure.
- Distinguishing features for identification should be specified while teaching theoretical concepts in class.

MARKING SCHEME

Question 3.

(b)



Drawing points:

1. Unicellular root hair
2. Single layered epiblema
3. General cortex (thick)
4. Endodermis
5. Pericycle
6. Xylem and phloem alternate
7. Exarch xylem
8. Distinct pith

Labelling points:

1. Root hair
2. Epiblema
3. Cortex
4. Endodermis
5. Pericycle
6. Xylem
7. Phloem
8. Pith

	9. Vascular bundle more than 6	
(c)	(i)	The given specimen is (T.S.) Monocot Root
	(ii)	**Reasons of identification:** ● Vascular bundles are radial. (Xylem and phloem present on separate radii) and more than 6 **(operative)** ● Xylem exarch (Protoxylem towards the periphery and metaxylem towards the centre). ● Pith is well developed. *(any two)*

Question 4 **[5]**

Identify the given specimens A to E. For specimen C, identify the **type of pollination**. Give *two* reasons to support your answer in each case. Draw a neat and labelled diagram of each specimen. You are not allowed to spend more than three minutes for each spot.

Note: *Hand over your continuation booklet to the Supervising Examiner, **immediately** after you finish answering this question.*

Comments of Examiners

(a) Some of the candidates drew all the stages of spermatogenesis with incorrect labelling. Connective tissue was generally not marked by most of the candidates. Location of 'Leydig cells' and 'Sertoli cells' was not mentioned in characteristics by several candidates.

(b) The shape of the organism was not drawn correctly by many candidates. A number of candidates did not place nucleus centrally. In some of the cases, 'sporozoite' were misspelt.

Suggestions for teachers
- Teach students how to identify the given spot.
- Tell students that the identifying features should be appropriate.
- Students should be encouraged to draw what is displayed and not from rote learning.

(c) Several candidates misspelt 'entomophilous' flower and did incomplete labelling of the flower.

(d) The specimen was wrongly identified as 'Monocot root'. Conjoint, collateral and open vascular bundles were not drawn correctly by many candidates. A number of candidates did not show the arrangement of vascular bundles in a ring.

(e) Many candidates identified the set up as 'Plasmolysis'. In the diagrams drawn by a few candidates, water was not drawn in the beaker/thistle funnel, initial and final levels were not marked. In some cases, semi-permeable membrane was missing in the diagram.

MARKING SCHEME

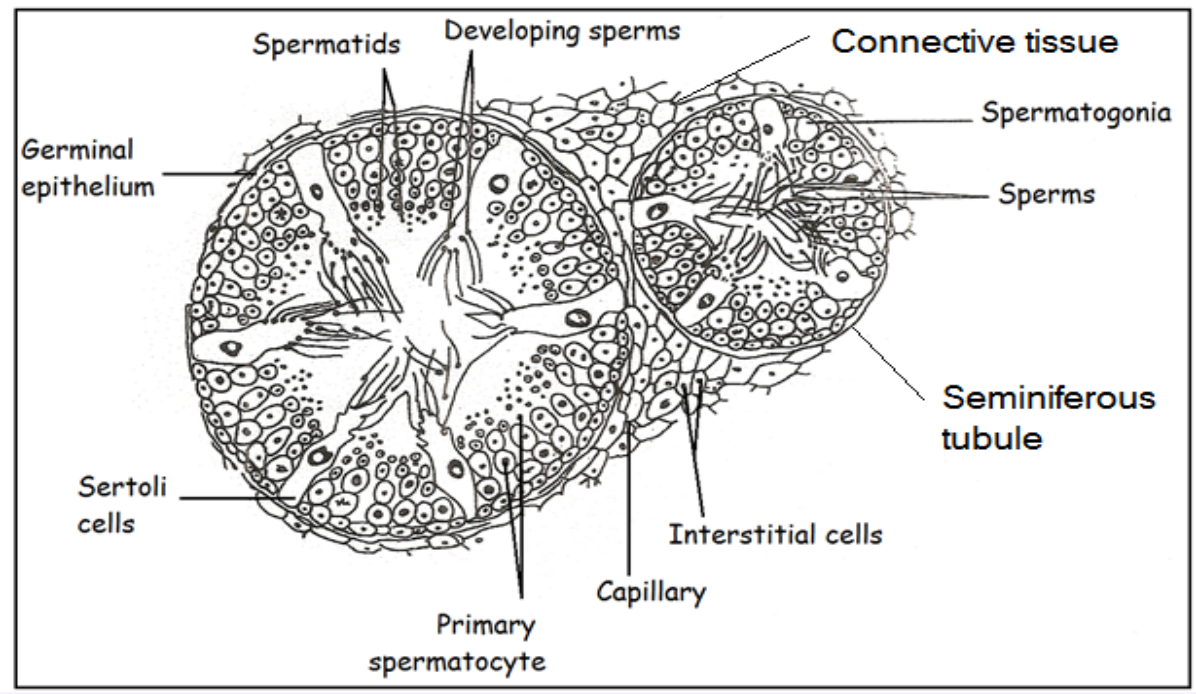
Question 4.

SPOT A

Identification: Slide showing T.S. of Mammalian Testes/Testis

Reasons:

- Seminiferous tubules are seen (operative)
- Spermatogonia, primary spermatocytes and spermatozoa are present in the seminiferous tubules or seen
- Sertoli cells are found in-between the Spermatogonia.
- Leydig's cells /interstitial cells are found in the connective tissue / matrix.
- Sperms seen in the centre of the tubule *(any two)*



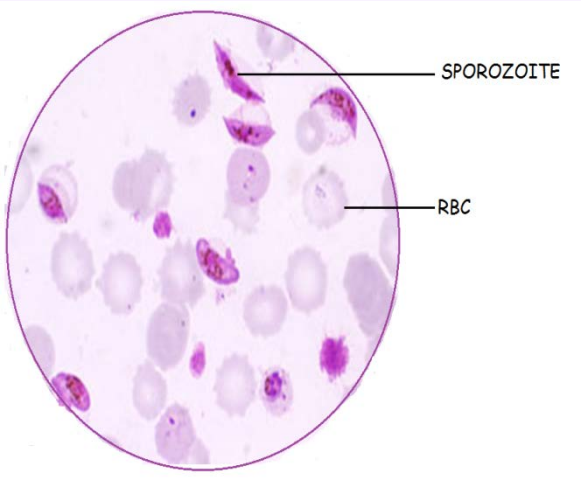
Drawing points:		**Labelling points:**	
1.	Semineferous tubule or tubules	1.	Seminiferous tubule
2.	Leydig/Interstitial cell between seminiferous tubules	2.	Leydig's cells / Interstitial cells
3.	Elongated sertoli cells	3.	Sertoli cells
4.	Spermatozoa towards the centre	4.	Connective tissue
		5.	Spermatogonia/spermatocyte/spermatozo

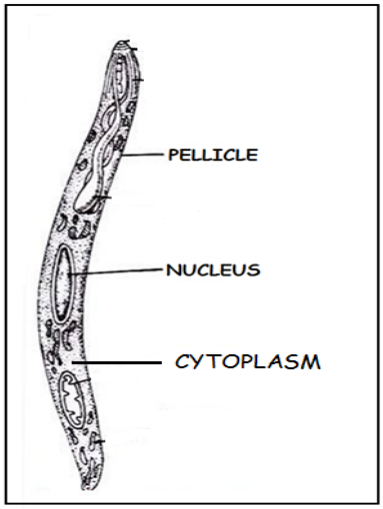
SPOT B

Identification: Slide showing (whole mount) of Plasmodium sporozoite

Reasons:

- Spindle shaped/ elongated body **(operative)**
- Blood smear with many cellular structure within
- Elongated nucleus in the middle
- Pellicle visible *(any two)*





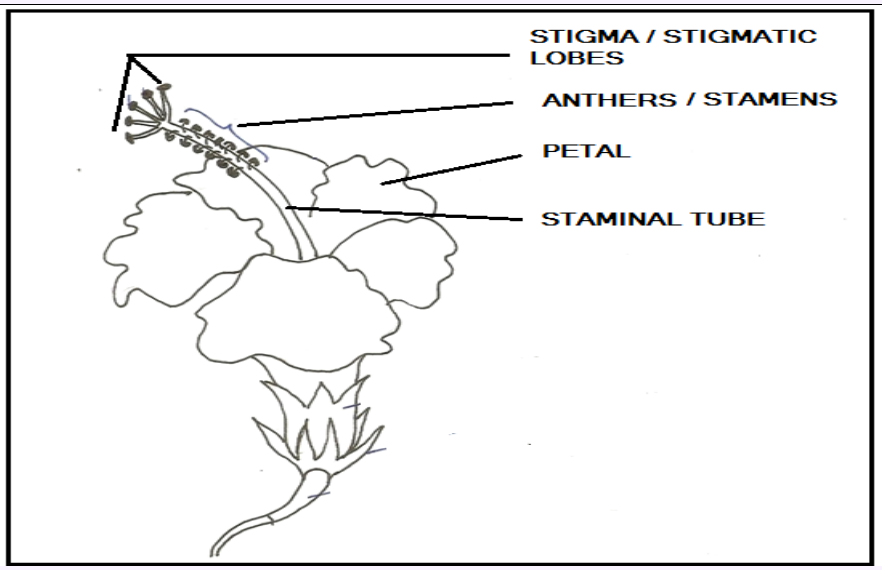
Drawing points:		**Labelling points:**	
1.	Elongated/spindle shaped body	1.	Nucleus
2.	Elongated / long nucleus	2.	Pellicle
3.	Prominent pellicle	3.	Cytoplasm
		4.	RBC *(any three)*

SPOT C

Identification: Insect pollinated flower/ Entomophilous flower/ cross pollination

Reasons:

- Flower is Large, showy or brightly coloured.
- Pollen grain rough, sticky, spiny
- Stigma sticky
- Many anthers/stamens
- Anthers on monadelphous hanging stamen
- Long staminal tube ***(any two)***



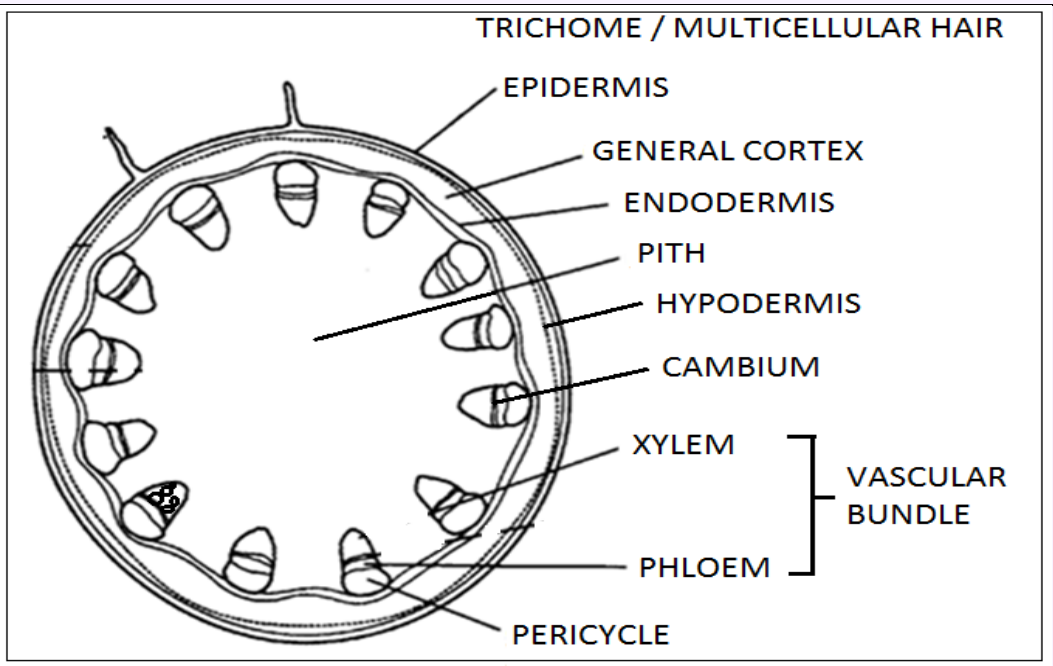
Drawing points:		**Labelling points:**	
1.	Large flower	1.	Petal
2.	Large petal	2.	Stigma/ Stigmatic lobes
3.	Monadelphous stamen	3.	Anther/ Stamen
4.	Pentafid stigma	4.	Staminal tube

SPOT D

Identification: Slide showing T.S. of Dicot stem

Reasons:

- Vascular bundles arranged in a ring.
- Vascular bundles are conjoint, collateral and open (Cambium present). (operative)
- Xylem endarch (Protoxylem towards the centre and metaxylem towards the periphery).
- Cortex is differentiated (into general cortex, endodermis, and pericyle).
- Endodermis contains starch grains.
- Pericycle consists of semi-lunar patches of sclerenchyma and intervening masses of parenchyma.
- Well-developed pith. ***(any two)***



T.S. OF DICOT STEM

Drawing points:

1. Trichome/ multicellular hair
2. Single layered epidermis
3. Hypodermis
4. General cortex (thick)
5. Endodermis
6. Pericycle (in patches)
7. Vascular bundles arranged in a ring
8. Conjoint, collateral, open vascular bundles
9. Endarch xylem
10. Distinct pith

Labelling points:

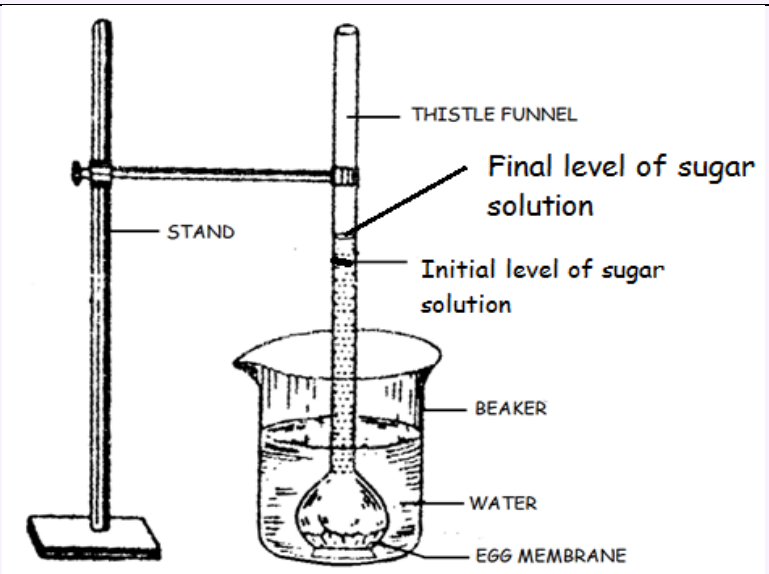
1. Trichome/ multicellular hair
2. Epidermis
3. Hypodermis
4. Cortex
5. Endodermis / starch sheath
6. Pericycle / bundle cap
7. Xylem & Phloem/ Vascular bundle
8. Pith
9. Medullary ray

SPOT E

Identification: Experiment to demonstrate osmosis (using thistle funnel).

Reasons:

- Final level of solution in the thistle funnel is higher than the initial level of the solution. (There is rise in level of solution in the thistle funnel). **(operative)**
- Thistle funnel contains hypertonic/ sugar solution and beaker contains water.
- Mouth of the thistle funnel is tied with semi-permeable membrane.
- Thistle funnel is inverted in a beaker full of water ***(any two)***



Drawing points:

1. 2/3rd Beaker with water
2. Thistle funnel with solution
3. Mouth of thistle funnel with semi-permeable membrane
4. Initial and final level
5. Mouth of thistle funnel immersed in water

Labelling points:

1. Beaker
2. Thistle funnel
3. Semi-permeable membrane
4. Water/hypotonic/dilute solution
5. Sugar solution/hypertonic
6. Initial level
7. Final level

GENERAL COMMENTS:

(a) Topics found difficult/ confusing by candidates:

- The experiment of Question no 3.
- Floral formula and floral diagram
- Tonicity, plasmolysis and deplasmolysis

(b) Suggestions for candidates:

- Observe and draw from the actual specimen and do not copy from the practical book.
- Learn spellings of the semi-technical term.
- Draw neat diagram with correct labelling.
- Specific distinctive features must be learnt.
- Experiments must be carried out carefully and observations recorded correctly.