

## BIOLOGY PAPER 2 (PRACTICAL)

### Question 1

[5]

- (a) Examine carefully the flower specimens **D41** and **D42** provided. Describe the floral characteristics of each in semi-technical terms. (Details of individual whorls are not required.)
- (b) Cut a longitudinal section of the specimen **D41** with a sharp razor blade. Arrange one of the cut surfaces on a moist filter paper. Draw a neat and labelled diagram of this cut surface.
- (c) Similarly, with the help of a sharp razor blade, cut a longitudinal section of the specimen **D42**. Arrange one of the cut surfaces on a moist filter paper. Draw a neat and labelled diagram of this cut surface, highlighting the essential whorls.
- (d) Observe the cut surfaces of **D41** and **D42** and record the following features in a tabular form as given below:

<b>Androecium</b>		<b>D41</b>	<b>D42</b>
(i)	Relation of stamens to each other	--	--
(ii)	Attachment of anther to filament	--	--
<b>Gynoecium</b>			
(i)	Nature of stigma	--	--
(ii)	Structure of placenta	--	--

- (e) Take a fresh specimen of **D41**. With the help of a forceps, remove the whorls one by one, till you reach the gynoecium. With the help of a sharp razor blade, cut a transverse section of the ovary. Draw a neat and labelled diagram of the transverse section.
- (f) Name the families to which **D41** and **D42** respectively belong.
- (g) Write *one* characteristic of each family named by you in (f).
- (h) Draw the floral diagram of specimen **D42**.
- (i) Write the floral formulae of **D41** and **D42**.
- (j) Mention *one* economically important plant belonging to each family mentioned in (f) above. (Write the botanical name only.)

### Comments of Examiners

- (a) Several candidates did not mention all the technical terms. Spelling errors were made by many candidates in writing semi-technical terms. A few candidates, who could not comprehend the meaning of semi-technical terms, described all the four individual whorls. Some candidates used two terms like, regular/ actinomorphic for one expression.
- (b) In some cases, the epicalyx and sepals were not drawn in the correct position (for D41).
- (c) For D42, the gamopetalous and epipetalous conditions were not clear in some diagrams. The bifid stigma was not shown and at many times, the ovules were not attached with the placenta. Mistakes were also made by candidates in labelling – ‘calyx’ was written in place of ‘sepals’, ‘corolla’ in place of ‘petal’.
- (d) (i) Many candidates did not follow the instruction of recording the features in a tabular form. Some did not use the term ‘monadelphous’ for D-41. For D-42 many candidates were confused between ‘polyadelphous’ and ‘polyandrous’.
- (ii) Many candidates were not clear about the terms ‘basifixed’ and ‘dorsifixed’. Spelling errors were also observed. The term ‘axile’ placentation was misspelt by many candidates as ‘axial’ or ‘exile’.
- (e) Some of the mistakes made by candidates in the diagram were: the five locules were not drawn; two ovules in each locule were not drawn; the ovules were not attached to the placenta; some candidates drew the L.S instead of the T.S.
- (f) The names of the families were misspelt by some candidates.
- (g) Many candidates wrote general characteristics of the family. They ignored the most significant features of the family.
- (h) In many cases, the position of the mother axis was incorrect, as a result, the orientation of the whorls was wrong; epipetalous condition, obliquely placed ovary and swollen placenta was not shown by many candidates.
- (i) In some cases, the number of episeals was given in a range (5-7); punctuation was used in the floral diagram. Signs of epipetalous condition and superior ovary were ignored by many candidates.
- (j) The rules of binomial nomenclature were not followed by many candidates. Spelling errors were common.

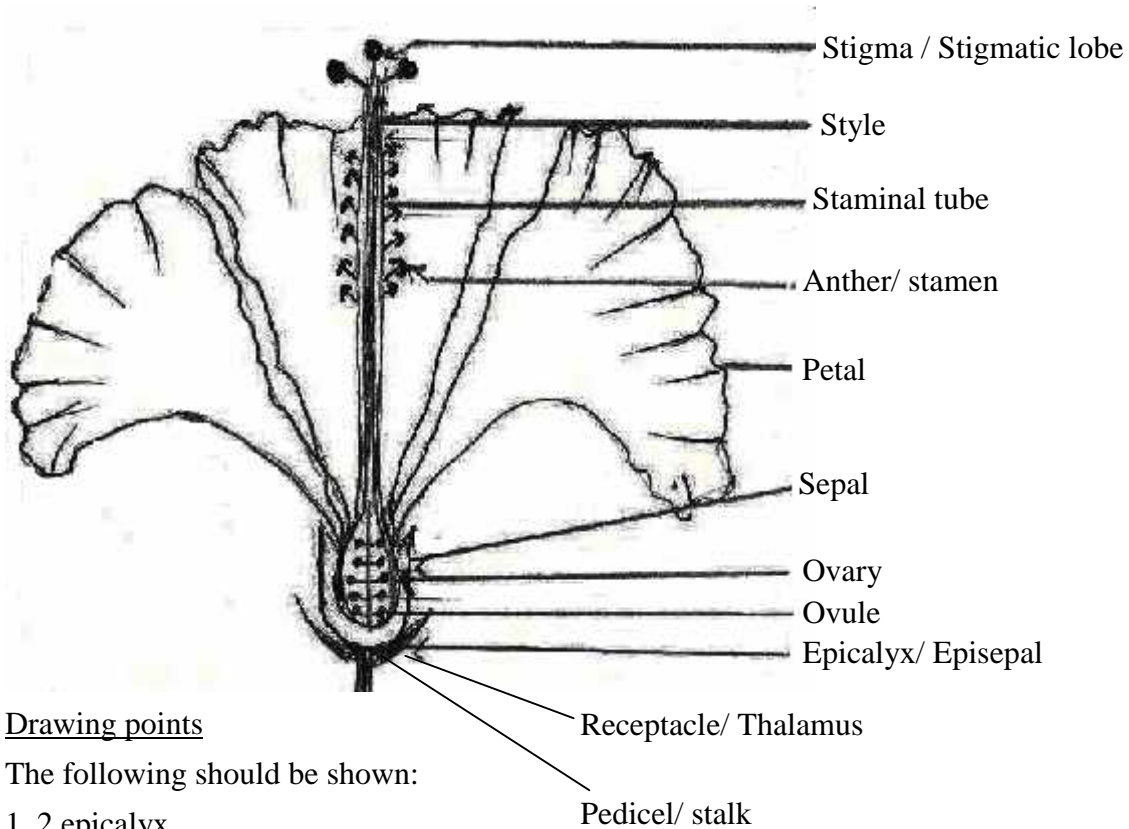
### Suggestions for teachers

- A list of common semi-technical terms must be given to the students. They should then be trained to write the terms with correct spellings.
- Students should be encouraged to draw from the cut surface of a fresh specimen and not to copy from a book. Diagrams must be proportionate and correctly labelled. Fixation must be clear.
- Students must be encouraged to read the question paper and follow the instruction given.
- Types of fixation must be taught using fresh specimen.
- Students should be encouraged to prepare their own temporary slides of the T.S of ovary, view under microscope and then draw. Insist on labelling all the parts.
- Emphasise and point out the most significant feature of the family while teaching.
- Explain the significance and relevance of the mother axis and positioning of the whorls according to it.
- Draw the floral diagram and write the flora formula on the board and explain clearly. Lab manuals must be checked regularly.
- Ensure that scientific names are always written according to the rules of Binomial nomenclature.

## MARKING SCHEME

### Question 1.

- (a) D-41: Hibiscus: Pedicillate, ebracteate, bracteolate/ with epicalyx, complete, actinomorphic/ regular, cyclic bisexual / hermaphrodite, pentamerous, hypogynous  
D-42: Dhatura: Ebracteate, pedicillate, cyclic, pentamerous, actinomorphic/ regular, bisexual / hermaphrodite, hypogynous, infundibuliform/ bell/ funnel/ campanulate, complete.  
Petunia: Ebracteate, pedicillate, cyclic, hypogynous, actinomorphic/ regular, bisexual / hermaphrodite, complete, pentamerous, infundibuliform/ bell/ funnel
- (b) Drawing: L.S. of flower (D-41)

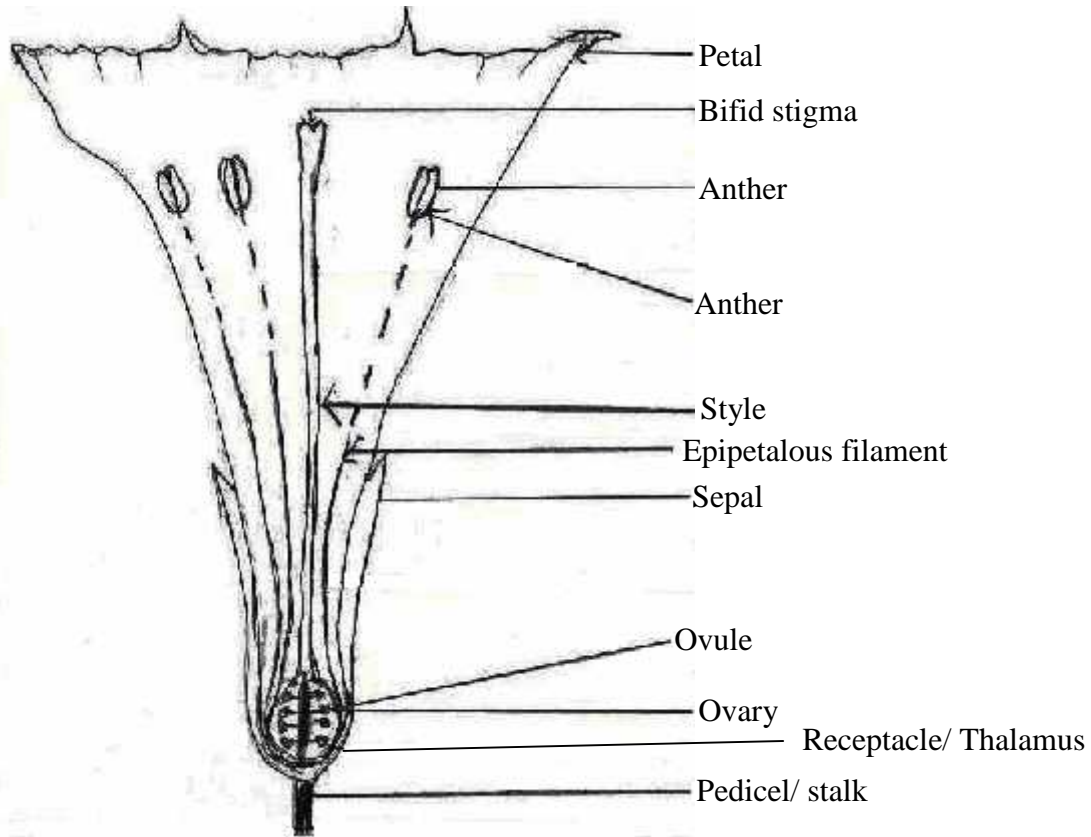


#### Drawing points

The following should be shown:

1. 2 epicalyx
2. 2 sepals
3. 2-3 free petals
4. Staminal tube
5. Thin long style (passing through the staminal tube)
6. Many (4-6) reniform anthers attached to the staminal tube
7. 2-3 capitate stigma
8. 2 locules visible in the ovary
9. 2 rows of ovules attached to the placenta

(c) Drawing: L.S. of flower (D-42)



Drawing points

The following should be shown:

1. 2 sepals (long)
2. 2-3 gamopetalous (bell shaped) petals
3. 2-3 epipetalous stamens
4. Long and basifixed anther
5. Prominent style with bifid stigma
6. Style shorter than the petals
7. 2 locules visible in the ovary
8. 2 rows of ovules attached to the placenta

(d)

**D-41**

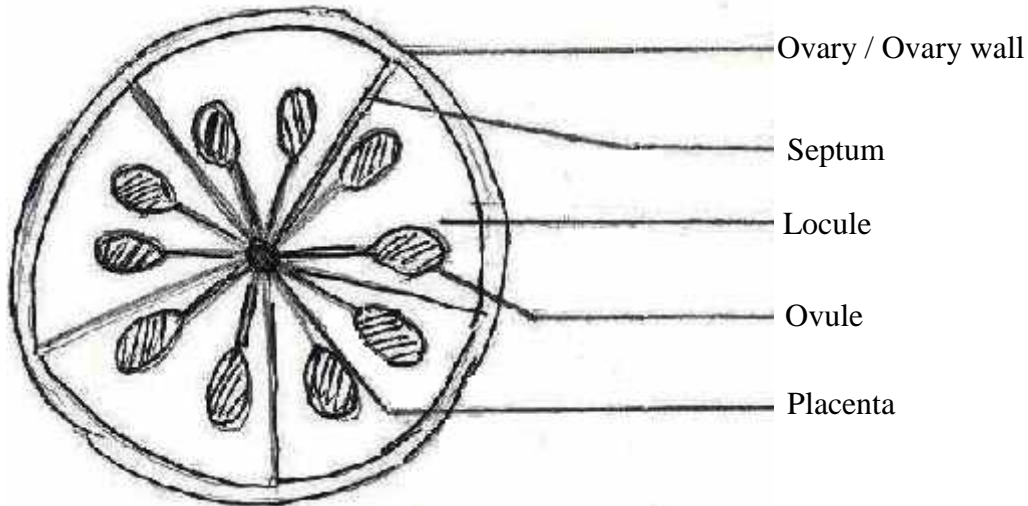
**D-42**

**ANDROECIUM**

i) Relation of stamens to each other	Monadelphous	Polyandrous
ii) Attachment of anther to filament	Dorsifixed/Basifixed	Basifixed

## GYNOECIUM

- |                           |                                       |                             |
|---------------------------|---------------------------------------|-----------------------------|
| i) Nature of stigma       | Capitate/pentafid/five stigmatic lobe | Bifid                       |
| ii) Structure of placenta | Thin/regular/axile                    | Swollen/oblique/thick/axile |
- (e) Diagram: T.S. of ovary of D-41



### Drawing points

The following should be shown:

1. 5 locules
2. 2 ovules in each locule
3. ovules attached to the placenta
4. ovary wall
5. axile placentation

(f) D-41 Malvaceae

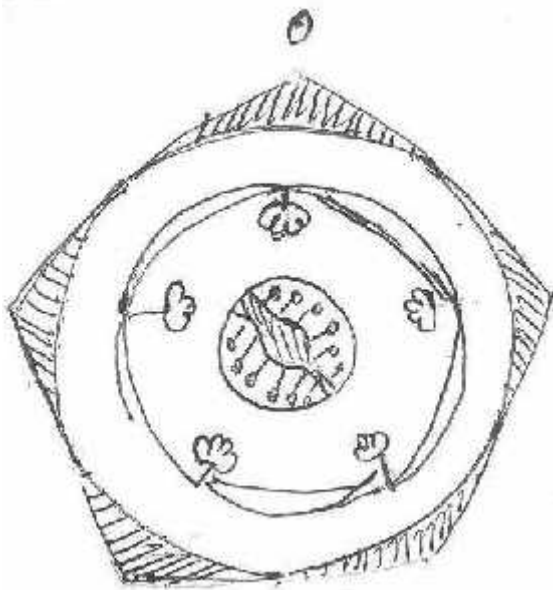
D-42 Solanaceae

(g) Family characteristics

D-41 - Monadelphous stamen / reniform anther / mucilaginous flower / style passes through staminal tube / epicalyx present.

D-42 - Obliquely placed ovary / swollen placenta / bifid stigma / epipetalous stamen

(h) Floral diagram of D-42



Drawing points

The following should be shown:

1. Mother axis
2. 5 joined sepals with correct orientation
3. 5 joined petals with correct orientation
4. epipetalous stamen alternating to petals
5. bilocular ovary obliquely placed/ tetralocular
6. swollen placenta
7. axile placentation

(i) D 41--- Ebr ⊕ ♂ E.P.K.7 K(5) C5 A(K) G(5)  
 D 42--- Ebr ⊕ ♀ K(5) C(5) A 5 G(2)

(j) D-41:

1. Gossypium arboreum
2. Hibiscus rosa sinensis
3. Althea rosea
4. Hibiscus cannabinus

**D-42:**

1. Solanum tuberosum
2. Solanum melanogena
3. Nicotina tabacum
4. Alotropa belladonna

**Question 2****[5]**

- (a) Measure and pour 20 ml of solutions S<sub>1</sub>, S<sub>2</sub> and S<sub>3</sub> into three separate petri dishes. Label the petri dish with solution S<sub>1</sub> as A, with solution S<sub>2</sub> as B and with solution S<sub>3</sub> as C. Cover the three petri dishes.
- (b) You are provided with a potato, specimen **D43**. Peel the potato. With the help of a knife, cut three rectangular pieces, each measuring approximately 4cms × 0.5cm × 0.5cm in length, width and thickness respectively.
- (c) Place the potato pieces on a moist filter paper to prevent drying. Measure and record the exact length of each piece.

Fully immerse one piece in solution S<sub>1</sub>, in petri dish A. Similarly, immerse the second piece in solution S<sub>2</sub>, in petri dish B and the third piece in solution S<sub>3</sub>, in petri dish C.

- (d) Cover the petri dishes and leave them as such for 30 minutes.

**Show the set up to the Visiting Examiner.**

- (e) After 30 minutes, remove the potato piece from dish A. Dry it on a filter paper and measure it. Record the length. Repeat the procedure with the pieces from petri dishes B and C.
- (f) Record the length of each piece in a tabulated form as shown below:

Length of rectangular potato piece		At the beginning	After 30 minutes
(i)	In S <sub>1</sub> solution - petri dish A		
(ii)	In S <sub>2</sub> solution - petri dish B		
(iii)	In S <sub>3</sub> solution - petri dish C		

- (g) Explain the observation of each potato piece in petri dishes A, B and C as recorded by you in (f) above.
- (h) With the help of forceps pick up the potato piece from petri dish A. Place it on a dry filter paper. Touch it and feel it. Write your observation regarding any change you have noticed.  
Repeat the process with potato pieces from petri dishes B and C.
- (i) Explain the changes (if any) observed by you in (h) above.
- (j) Name and define the process that led to the changes (if any) observed in (h) above.
- (k) Comment on the tonicity of the solutions S<sub>1</sub>, S<sub>2</sub>, and S<sub>3</sub>.

- (l) What do you think would happen if a red blood corpuscle is placed in solution S<sub>1</sub>?
- (m) Give an example of a similar observation seen in a plant body as that observed in petri dish C due to occurrence of the same phenomenon.

Comments of Examiners

- (a) Some of the candidates did not use the solutions in perfect amount. Observations made by candidates revealed that either solutions S<sub>1</sub>, S<sub>2</sub> and S<sub>3</sub> were not taken in proper petri dishes A, B, C, respectively, or they were confused while marking.
- (b) From the answer scripts it appeared that many candidates did not cut the photo according to the dimensions mentioned in the question paper.
- (f) The unit of measurement was not mentioned by many candidates; some did not write the observation in the tabular form. Many candidates did not mention the initial measurement in the Column after 30 minutes.
- (g) The observation of each potato piece in petri dishes A, B, and C was not written separately in some cases; in other cases, the explanation lacked keywords and the process involved.
- (h) Many candidates ignored ‘touch it and feel it’ part of the question. Most observations were recorded on the basis of the alteration of the length of the pieces and not on the basis of how it felt when touched.
- (i) In several cases, the explanation given by candidates lacked the key words. Many failed to explain the changes correctly.
- (j) Many candidates were unable to name and define the process involved. Candidates did not have a clear concept of terms like Plasmolysis and Osmosis. They defined Plasmolysis and deplasmolysis instead of Exosmosis and Endosmosis.
- (k) The concept of tonicity was not clear to many candidates.
- (l) The term ‘crenation’ was not used by a number of candidates. Many used wrong terms like - plasmolysed, turgid, etc.
- (m) Many candidates gave wrong examples in this part.

Suggestions for teachers

- Ask students to follow the instructions accurately.
- Emphasise the use of “Keywords”.
- Help students understand the concepts of osmosis, plasmolysis and deplasmolysis. Emphasise that osmosis is the movement of solvent only.
- Provide a clear understanding of words like hypertonic, hypotonic and isotonic.
- Train students to answer logically to a specific question.

**MARKING SCHEME**

**Question 2.**

(f)	Length of the piece of D-43	At the beginning	After 30 minutes
1.	In S <sub>1</sub> – Petridish A	4 cms	Decreased / 3.7
2.	In S <sub>2</sub> – Petridish B	4 cms	No change / 4
3.	In S <sub>3</sub> – Petridish C	4 cms	Increased / 4.3



- (g) S<sub>1</sub> – solution is hypertonic, exosmosis occurs, potato piece becomes smaller.  
 S<sub>2</sub> – solution is isotonic, exosmosis/endosmosis does not occur, potato piece size remains the same.  
 S<sub>3</sub> – solution is hypotonic, endosmosis occurs, potato size increases.
- (h) S<sub>1</sub> – Potato piece is soft and limp.  
 S<sub>2</sub> – Potato piece appears same as before/ no change.  
 S<sub>3</sub> – Potato piece is stiff and hard.
- (i) S<sub>1</sub> – As the potato piece was kept in hypertonic solution it lost water through exosmosis due to which it became soft and decreased in size.  
 S<sub>2</sub> – Solution is isotonic as a result the potato piece showed no change.  
 S<sub>3</sub> – Solution is hypotonic as a result the potato piece increased in size due to endosmosis and became stiff.
- (j) Endosmosis - movement of solvent molecules from the surrounding into the cell sap due to difference in tonicity, i.e. from hypo to hyper.  
 Exosmosis – movement of solvent molecules from the cell sap to the surrounding.
- (k) Tonicity of solutions:  
 S<sub>1</sub> – Hypertonic  
 S<sub>2</sub> – Isotonic  
 S<sub>3</sub> – Hypotonic
- (l) RBC would shrink due to exosmosis and may get crenated.
- (m) Absorption of water by root from the soil.  
 Opening of stomata.  
 Turgidity of leaf.

### Question 3

[5]

- (a) With a sharp razor blade, cut several transverse sections of the specimen **D44** provided. Select a good section and stain with safranin. Mount it in glycerine.  
**Show your slide to the Visiting Examiner under low power of Microscope.**
- (b) Draw a neat labelled diagram of the mount as seen under the microscope. (Microscopic details are not required.)
- (c) Identify the given specimen.
- (d) Write *three* characteristic features of this specimen.

### Comments of Examiners

- (a) Candidates of certain centres were unable to prepare the slide properly- sections were oblique, overstained or understained.
- (b) Microscopic details were drawn by some candidates, which were not required. A few candidates drew only one or two bundles, as a result, the 'scattered' condition was not clear. The conjoint, collateral and closed nature of the vascular bundles was not clear. In a number of cases, the labelling was incomplete.
- (c) By and large this part was answered correctly. A few candidates identified the specimen as 'dicot stem' or 'dicot root'.
- (d) Instead of writing the key identifying features, some candidates wrote general characteristics. Some candidates were confused between the terms 'endarch' and 'exarch'.

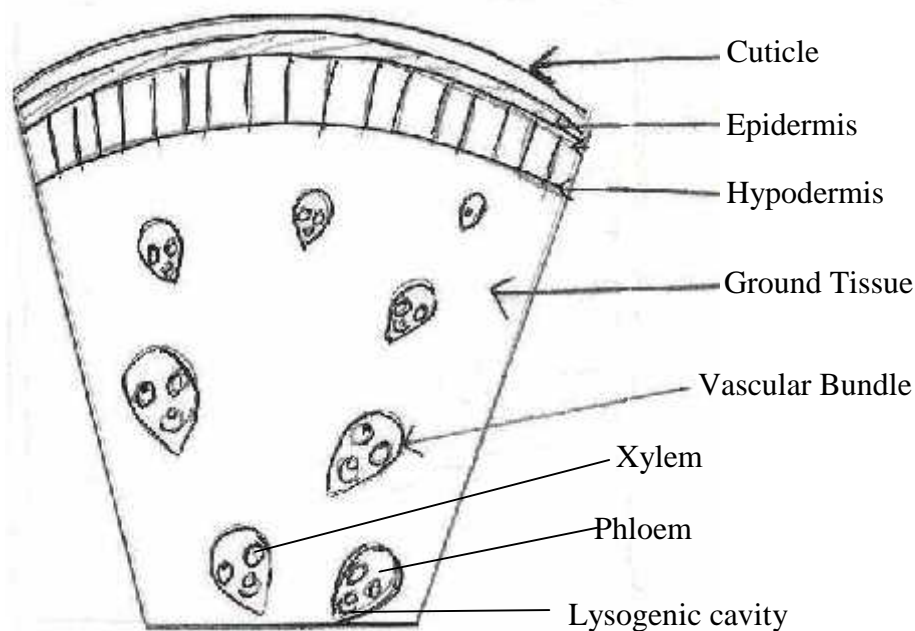
### Suggestions for teachers

- Sufficient practice needs to be given in slide preparation. Oblique sections must be rejected.
- Students must be trained to draw outline diagrams and to show the structure of vascular bundles clearly. All parts must be labelled. The difference in the size of vascular bundles must be emphasised.
- Train students to observe the most distinctive features under the microscope.

### **MARKING SCHEME**

#### **Question 3.**

(b)



Drawing points:

1. Vascular bundles are conjoint, collateral and closed
2. Vascular bundles are scattered
3. Y shaped arrangement of xylem vessels
4. Pith is indistinct

5. Vascular bundles are of different sizes, smaller ones are seen towards the periphery and the larger ones towards the centre
  6. Cuticle/ hypodermis present
  7. Lysogenous cavity
- (c) (T.S.) monocotyledonous stem
- (d)
1. Vascular bundles are conjoint, collateral and closed.
  2. Vascular bundles are scattered in the ground tissue.
  3. Hypodermis is sclerenchymatous.
  4. Pith is indistinct.
  5. Vascular bundles are of various sizes.
  6. Y shaped arrangement of xylem.
  7. Lysogenous cavity
  8. Endarch Xylem
- (Points 1 or 2 must be mentioned and any two from the rest)*

#### Question 4

[5]

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

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

#### Comments of Examiners

**Spot A:** Incomplete identification was done by many candidates. Several candidates omitted to write 'T.S' or 'mammalian ovary'; the different follicular stages were not shown in some cases; a few candidates labelled 'primordial follicle' as 'primary follicle'; in some cases, Graffian follicle not drawn correctly. The key identifying features were not written correctly by many candidates.

**Spot B:** This was wrongly identified as 'germinating pollen tube', or 'germinating seed'. In other cases, 'rough exine' was not drawn; the germ pore was not labelled; the two nuclei were not labelled correctly.

**Spot C:** While identifying the spot, several candidates failed to write 'T.S'. In other cases, unicellular root hair not drawn; the radial arrangement was not clear; proto and metaxylem were of same size; pith was made distinct; endodermis and pericycle were wrongly labelled.

#### Suggestions for teachers

- Give regular training to students so that they can make correct observations, within the given time. The drawings should highlight the specific features.
- Insist that the diagram drawn is clear and correctly labelled. Identifying features must be given importance.
- Insist on correct diagram and complete labelling. Cellular details are not required in spotting.
- In the physiological set up a complete statement should be given for identification.

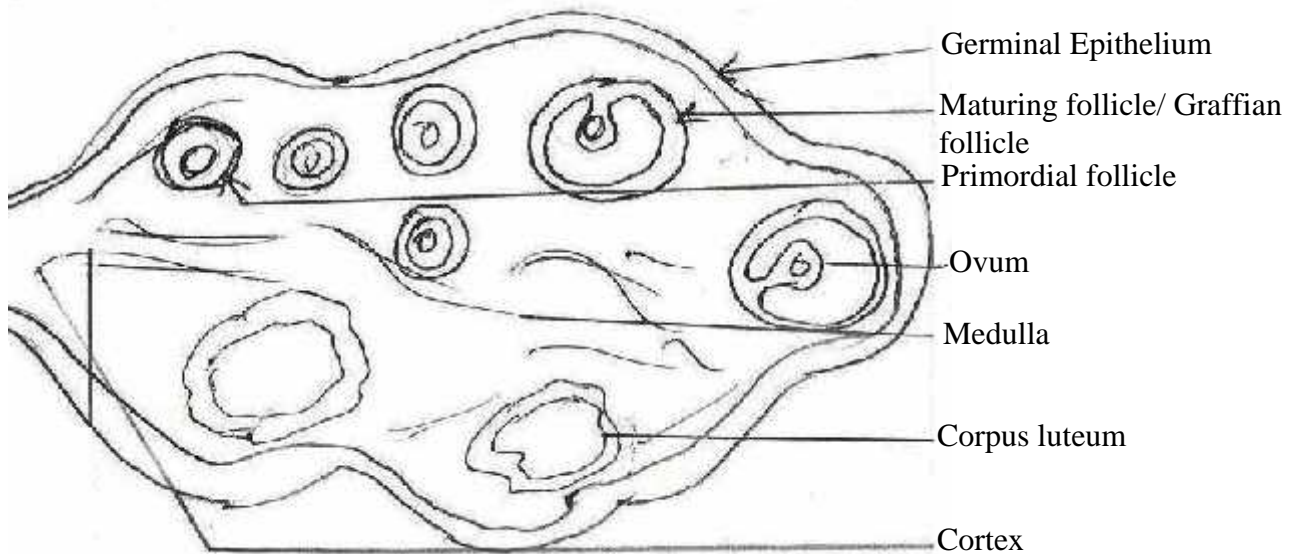
**Spot D:** Incomplete or incorrect identification was made by many candidates, i.e. the word 'Model' was missing. Some candidates identified the spot as, 'synovial joint' or 'hinge joint'.

**Spot E:** Incomplete identification was done by many candidates. In some cases, only 'photosynthesis' was mentioned. Some identified it as, 'Process of Transpiration'. In the diagrams drawn by several candidates, the leaf was not attached to the plant; the flask was not balanced; source of light was not shown; instead of a complete leaf, only a part of the leaf was inserted in the flask.

## MARKING SCHEME

### Question 4.

SPOT A: Identification – T.S. of Ovary of mammal



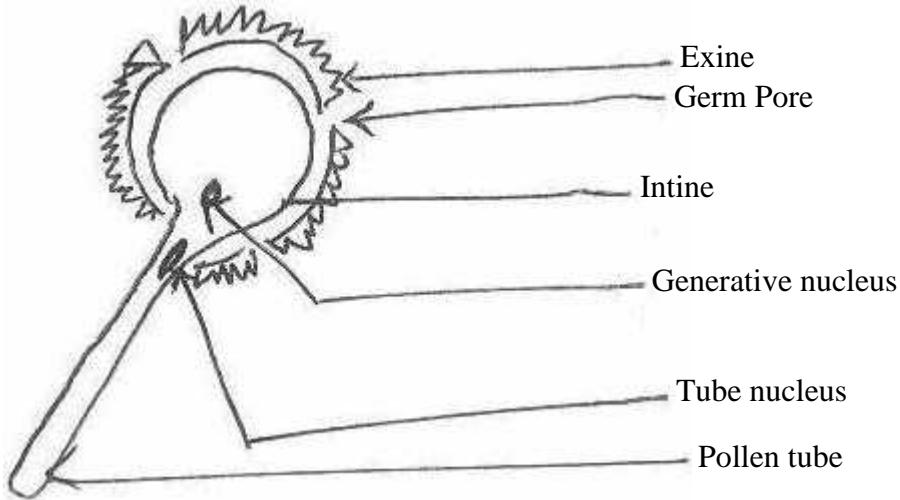
Drawing points:

1. Follicles of different sizes shown.
2. Germinal epithelium present.
3. Ovum seen in mature follicle.
4. Empty follicle visible.
5. More follicles in the cortex.

Reason:

1. Many ovarian follicles of different sizes seen.
2. Germinal epithelium visible.
3. Matured follicle has ovum in it.
4. Corpus Luteum visible.

SPOT B: Identification – Germinating pollen grain



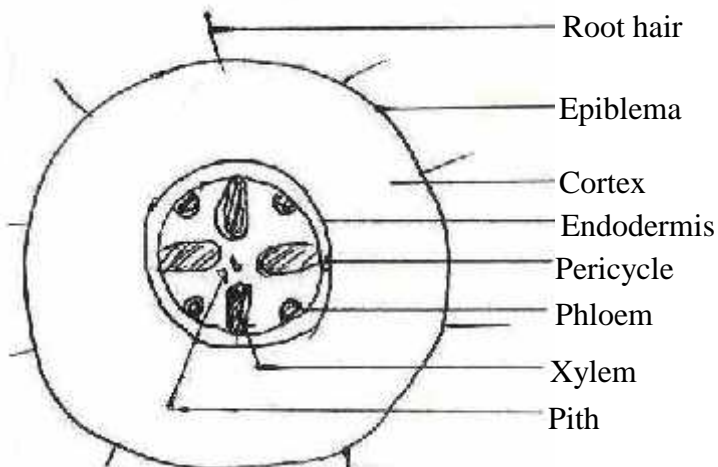
Drawing points:

1. Rough exine visible.
2. Germ pore shown.
3. (Smooth) intine extends as pollen tube.
4. Two nuclei shown.

Reason:

1. (Rough) exine attached with germ pore.
2. Pollen tube projecting out of a germ pore.
3. 2 nuclei visible.
4. Intine present.
5. Germ pore is present

SPOT C: Identification – T.S. of dicotyledonous root



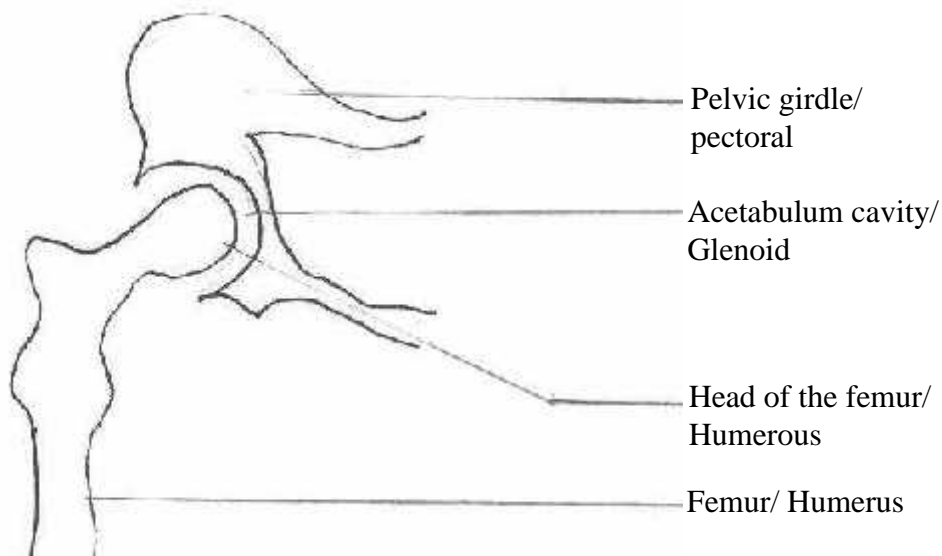
Drawing points:

1. Unicellular root hair shown.
2. Radial vascular bundles (3 – 6).
3. Xylem exarch.
4. Pith indistinct.

Reason:

1. Vascular bundles are radial and exarch.
2. Number of vascular bundles 6 or less.
3. Pith is indistinct.
4. Xylem is exarch.

SPOT D: Identification – Model of Ball and Socket Joint



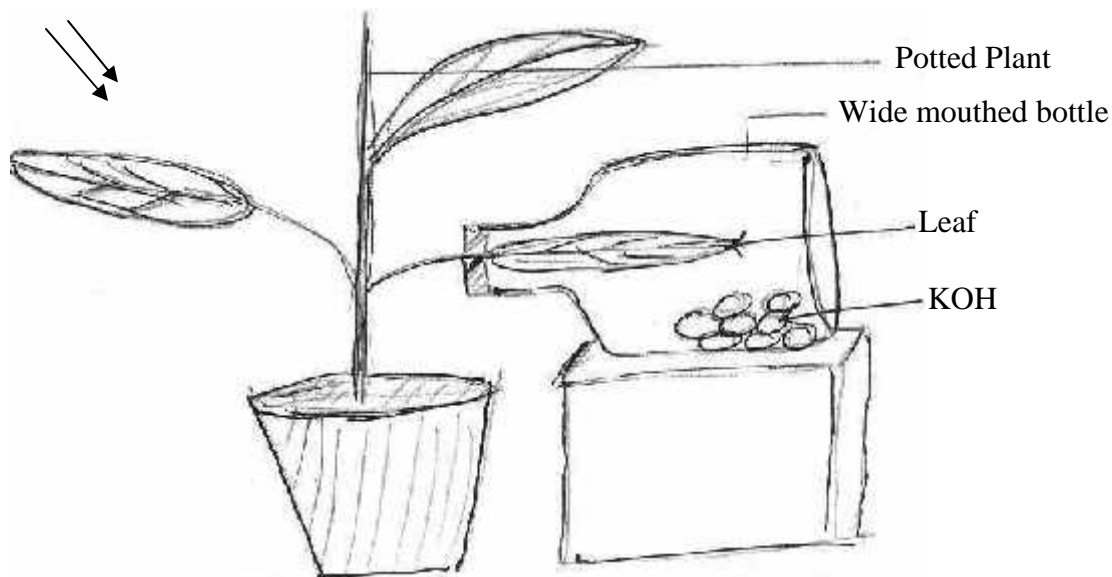
Drawing points:

1. Acetabulum cavity of pelvic girdle / glenoid cavity of pectoral girdle shown.
2. Head of the femur is fitted into the acetabulum cavity / head of the humerus fitted into the glenoid cavity.
3. Femur/Humerus drawn.

Reason:

1. Depressed cavity/socket is clearly visible (any girdle).
2. Head of the long bone (name) is within the socket and allows free movement.

SPOT E: Identification – Experimental setup to show that carbon dioxide is necessary for photosynthesis



Drawing points:

1. Leaf is connected to the potted plant.
2. One leaf is inside the bottle.
3. KOH is present inside the bottle.
4. Bottle is balanced.
5. Light rays are shown.

Reason:

1. Leaf present in the bottle does not receive carbon dioxide as KOH absorbs it.
2. As a result experimental leaf cannot carry out photosynthesis and would give negative result for the starch test.

### **GENERAL COMMENTS:**

#### **(a) Topics found difficult by candidates in the Question Paper:**

- Using of semi technical terms with correct spelling.
- Tabulating the information.
- Floral formula and Floral diagram.
- Correct spelling of scientific names.
- Concept of tonicity.
- Interpretation of observation in the physiology experiment.

**(b) Concepts between which candidates got confused:**

- Staminal tube and style.
- Monadelphous and polyandrous condition.
- Concept of endarch and exarch xylem.
- Concept of conjoint, collateral and closed vascular bundles.
- Tonicity of the solutions.
- Concept of osmosis- (endosmosis and exosmosis) and plasmolysis

**(c) Suggestions for students:**

- Given importance to practical classes.
- Do not compartmentalize theory and practical classes, both complement each other.
- Observe specimens and physiological setup keenly.
- Follow instructions given in the question.
- Reading the question paper carefully to understand the scope of the question.
- Use the keywords in the answer and be precise.
- Focus the slide correctly.
- Practice diagrams and their labelling regularly.
- Be thorough with the semi technical terms.
- Learn the most significant features for identification.