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ISC 2014
BIOLOGY
PAPER-2 (PRACTICAL)

- **SOLUTION OF 2014**
- **COMMENTS OF COUNCIL EXAMINERS**
- **SUGGESTIONS FOR TEACHERS**

Dedicated to all my lovely students. May God help you always.

This small booklet contains solution of ISC 2014 Biology Paper - 2 (Practical).

The comments from the council examiners under solution of every question makes this a very handy guide for students to understand what the council expects as answer from the students.

I hope that the students will find this to be useful.

- *Md. Zeeshan Akhtar*

30th December, 2015.

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BIOLOGY PAPER 2 (PRACTICAL)

Question 1 **[5]**

(a) You are provided with two flower specimens **D-41** and **D-42**. Describe the floral characteristics of each in semi-technical terms. (The details of individual whorls are not required.)

(b) With a sharp razor blade, cut a longitudinal section of flower specimen **D-41**. Place one of the cut surfaces on a moist filter paper. **Show it to the Visiting Examiner**.

Draw a neat and labelled diagram of the cut surface.

(c) Cut a longitudinal section of flower specimen **D-42** with a sharp razor blade. Arrange one cut surface on a moist filter paper and draw a neat and labelled diagram of this cut surface.

(d) Observe the cut surfaces of the flower specimens **D-41** and **D-42** with the hand-lens provided and record your observations of the following features in a tabular form as follows:

			D-41	**D-42**
(i)	**Corolla** Shape			
(ii)	**Androecium:**			
	(1)	Relation of stamens to each other		
	(2)	Relation of stamens to petals		
	Gynoecium			
	(1)	Number of locule(s)		
	(2)	Type of placentation		

(e) Take a fresh specimen **D-42**. Isolate its pistil. Cut a transverse section of its ovary. Draw a neat labelled diagram of the transverse section.

(f) Name the families to which each specimen **D-41** and **D-42** respectively belong.

(g) Write *two* characteristic features of each family you have mentioned in (f) above.

(h) Draw a floral diagram of specimen **D-42**.

(i) Write the floral formulae of **D-41** and **D-42**.

(j) Mention the botanical name of *one* economically important plant belonging to each family that you have named in (f) above.

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Comments of Examiners

(a) Several candidates wrote in details on all the floral whorls instead of describing the floral characteristics in semi-technical terms. Spelling errors were common.

(b) & (c) D-41 and D-42

Some common mistakes made by candidates are as follows:

(i) Gamopetalous/gamosepalous conditions were not shown correctly;
(ii) Epipetalous condition was not represented;
(iii) Shape of the flower was incorrect;
(iv) Fixation not clear;
(v) Bifid stigma was not clear;
(vi) Ovules were not attached to the placenta;
(vii) Labelling was incorrect.

(d) (i) Specific terms for the shape was not mentioned by some candidates. Most of the candidates explained in detail.

(ii) Candidates were not sure about the term 'polyandrous'. Several candidates made spelling mistakes while writing the type of placentation.

(e) A few candidates drew the L.S. of the ovary instead of the T.S. In some cases, the placenta and marginal placentation were wrongly drawn. Guidelines were not connected properly in several cases. The elongated and narrow locule was not shown in some diagrams.

(f) A number of candidates spelt the family names incorrectly. In place of family name, many mentioned the sub-family name.

(g) The characteristic features of each family were given correctly by most candidates.

(h) The Mother axis was not shown by many candidates. Orientation of the whorls was incorrect in several cases.

(i) Incomplete floral formulae were written by many candidates. A few candidates used commas.

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

Suggestions for teachers

- Advise students to read the questions repeatedly.
- Stress upon the correct spelling.
- Explain the meaning of semi-technical term. Emphasize on the use of correct semi-technical terms with correct spelling.
- Emphasize on the importance of neat labelled diagram.
- Students should be taught to draw by observing the specimen during practical period and not from the book later.
- Laboratory manuals should be regularly corrected and mistakes should be pointed out before the next practical class.
- Difference between L.S. and T.S. must be clearly explained.
- Candidates should be encouraged to prepare both the types of slides and observe them under the microscope.
- The concept of the mother axis must be clearly explained. Orientation of the various whorls in relation to the mother axis must be understood.
- Teacher should write the floral formula on the board and should explain the use of the various signs and symbols.
- Teach students the rules for Binomial nomenclature.

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MARKING SCHEME

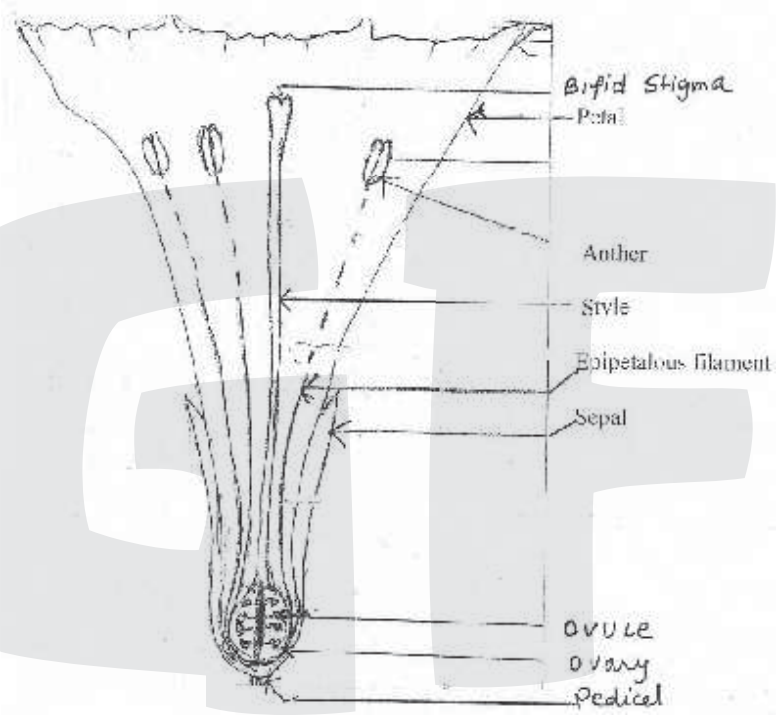
Question 1.

(a) D-41 (Petunia): Ebracteate, pedicellate, actinomorphic/regular, complete, bisexual / hermaphrodite, pentamerous, hypogynous, cyclic.

D-41 (Dhatura): Ebracteate, pedicellate, cyclic, hypogynous, actinomorphic/regular, bisexual/hermaphrodite, infundibuliform/campanulate, complete.

D-42 Complete, Ebracteate/bracteate, pedicellate, hermaphrodite, zygomorphic, hypogynous, papillionaceous, pentamerous.

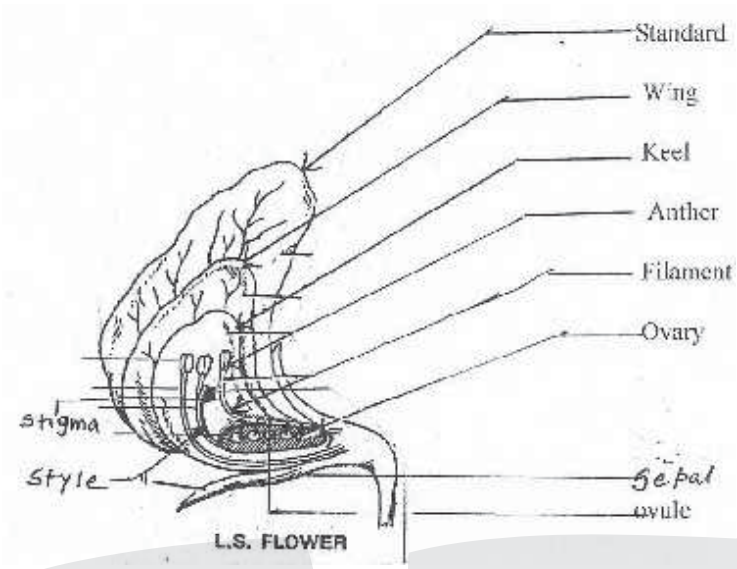
(b) Drawing:



Drawing points:

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

(c) Drawing: D – 42



D-42 – V S

Drawing points:

2 sepals shown

Standard, wing and keel shown

At least three stamens shown

Bent style shown

One chambered ovary shown

4-5 ovules shown attached to the upper margin

Pedicel shown

(d)

	D-41	**D-42**
<u>Corolla</u>		
(i) Shape	Bell shaped/ Infundibuliform/ campanulate	papillionaceous
<u>Androecium</u>		
i) Relation of stamens to each other	Polyandrous/ free	Diadelphous/ 2 bundles
ii) Relation of stamens to petals	Epipetalous	Free
<u>Gynoecium</u>		
i) Number of locules in the ovary	Two	One
ii) Type of placentation	Axile	Marginal

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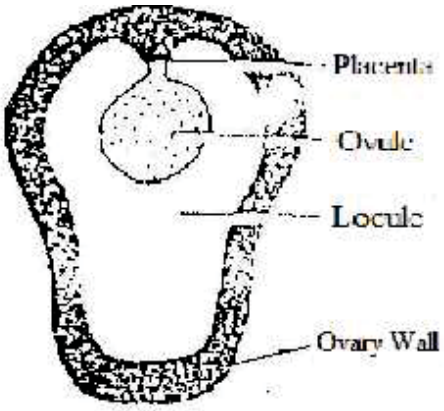
(e) Diagram:

T.S. of ovary of D-42



Drawing Points	Labelling Points
Narrow, elongated locule shown	Locule
One locule drawn	Ovary wall
Marginal placentation shown	Placenta
One ovule connected with the placenta	Ovule

(f) D-41 Solanaceae

D-42 Leguminosae / Fabaceae

(g) D-41 obliquely placed ovary, swollen placenta, bifid stigma, epipetalous stamen with long prominent anther.

D-42

Papilionaceous corolla

Diadelphous stamens

Marginal placentation

Vexillary aestivation (*any two*)

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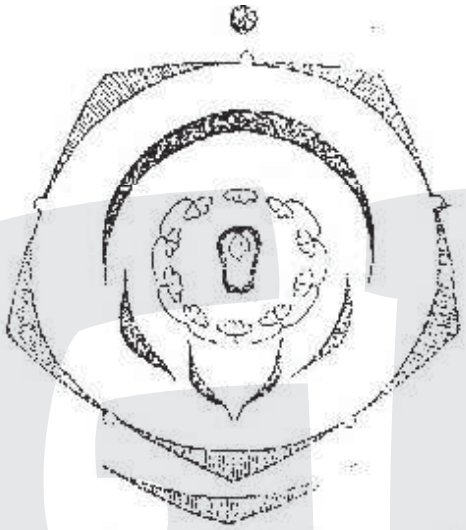
(h) F.D. D-42

- Mother axis
- One bract shown (according to flower)
- 5 joined sepals with correct orientation
- 5 petals in vexillary aestivation
- 10, diadelphous stamens, (9) + 1
- unilocular ovary with one ovule attached
- showing marginal placentation



(i) Br $\oplus$ $\underset{+}{\sigma}$ $K_{(5)}$ $\overset{\frown}{C_{(5)}A_5}$ $G_{(2)}$ --- Floral formula of D-41

Br % $\oplus$ $\underset{+}{\sigma}$ $K_{(5)}$, C_1 + 2 +(2) $A_{1+(9)}$ G_1 --- Floral formula of D-42

(j) D-41: *Solanum tuberosum, Capsicum annuum, Lycopersicum esculentum, Datura stramonium, Bombax malabaricum*

D-42: *Arachis hypogaea*, *Pisum sativum, Glycine max, Phaseolus vulgaris*

Question 2 **[5]**

(a) You are provided with glassware and twigs of plant **D-43** to set up an experiment to demonstrate photosynthesis. Set up the experiment using tap water and one or two twigs of plant **D-43**.

(b) Keep the set-up at a distance of 5 cm, from the source of light. When gas bubbles start emerging from the cut end of the twig(s), **show the experimental set-up to the Visiting Examiner**.

Draw a neat and fully labelled diagram of the experimental set-up.

(c) Count the number of bubbles evolved in one minute and record it. Repeat your observations for two more readings in this set-up.

Tabulate the readings as shown in the table in (f). Calculate the average number of bubbles (x) evolved in one minute.

(d) Now, place the experimental set-up at a distance of 15 cm. from the source of light. Wait for two minutes. Count the number of gas bubbles evolved in one minute. Take three readings. Calculate and record the average number of bubbles (y) evolved in one minute.

(e) Shift the set-up at a distance of 25 cm. from the source of light. Wait for two minutes. Count the number of gas bubbles evolved in one minute. Again take three readings. Calculate and record the average value (z).

(f) Tabulate your observations as follows:

Distance of set-up from light source		Number of gas bubbles evolved per minute			
		I	II	III	Average value
(c)	5 cm				(x)
(d)	15 cm				(y)
(e)	25 cm				(z)

(g) Explain your observations with reference to each average value, (x), (y) and (z), recorded by you in the table above.

(h) Name the plant specimen **D-43**.

(i) Mention *two* precautions taken by you while setting up this experiment.

(j) What is concluded from this experiment?

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Comments of Examiners

(a) A number of candidates did not follow the instructions given. Some common errors made by candidates were as follows:
- The stem of Hydrilla was not placed pointing towards the neck of the funnel;
- Too many twigs were used in the funnel.

(b) Candidates made the following errors while drawing the experimental setup:
- Light source was not shown;
- The test tube did not touch the funnel;
- The stem of the funnel was drawn above the level of water in the beaker;
- Bubbles were drawn in blank spaces.

(d) In a number of cases, the number of bubbles evolved in one minute was either too less or too many.

(f) A few candidates calculated the average value of number of bubbles and wrote the answer in fraction.

(g) Some candidates did not explain each observation separately. Most candidates gave a general report. Some candidates simply copied the chart.

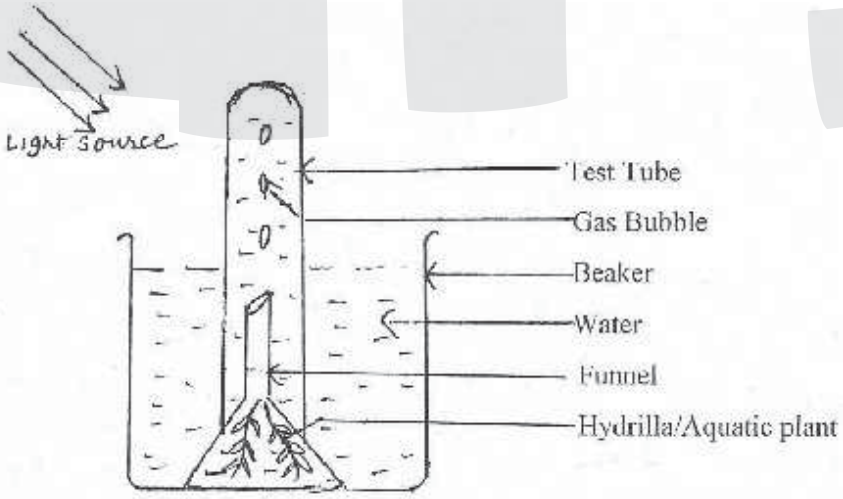
(j) A number of candidates did not write 'Rate of photosynthesis' and failed to explain its relationship with the intensity of light.

Suggestions for teachers
- Each student must set up all physiological set ups individually and not in groups.
- Teachers must monitor each student individually.
- Students must be encouraged to draw diagrams by observing the physiological set up and not from any book.
- Students must be trained to take the readings carefully. They must also be told to write observation and explanation separately.
- The relationships between the rate of photosynthesis and the nature of light intensity must be explained.

MARKING SCHEME

Question 2.

(b)



Drawing points:	**Labelling points:**
Stem of the twigs pointed towards the neck of the funnel	Light Water
Test tube rests on the funnel	Test tube
Stem of the funnel under water	Gas bubbles / air bubbles
Light source shown	Beaker
Bubbles shown in the test tube in water	Funnel
	Hydrilla/aquatic plant

(f)

Distance of set-up from light source		Number of gas bubbles evolved per minute			
		I	II	III	Average value
(c)	5 cm	Observation	Observation	Observation	(X) Maximum
(d)	15 cm	Observation	Observation	Observation	(Y) Medium
(e)	25 cm	Observation	Observation	Observation	(Z) Minimum

(g) (X) Shows maximum value as set-up was close to light source; more photosynthesis; more gas bubbles evolved.

(Y) Average value decreased, as light intensity has decreased due to increase in the distance; photosynthesis decreased; less gas bubbles evolved.

(Z) Minimum average value as light intensity decreased further; rate of photosynthesis less; few gas bubbles evolved.

(two each)

(h) Hydrilla / Elodea

(i) (i) Stem of funnel should be completely under water

(ii) Cut end of the twig(s) should be in the mouth of the stem of the funnel.

(iii) Test tube should be completely filled with water for inverting over the funnel.

(iv) Light source should be present.

(v) Fresh twigs should be used. *(any two)*

(j) The rate of photosynthesis depends on the intensity of light.

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Question 3 **[5]**

(a) With the sharp razor/blade provided, cut thin transverse sections of specimen **D-44**. 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

(a) Candidates of a few centres were unable to prepare slides properly. Common mistakes made by candidates were:
- Overstaining or understaining;
- Oblique/thick section;
- Improper mounting.

(b) Some errors made by candidates in the drawing were as follows:
- Indistinct pith not clear;
- Many candidates were not sure of the endodermis and pericycle. In some cases, epiblema was labelled as epidermis.
- Thick cortex was not shown.

(c) Many candidates were unaware of the difference between 'general features' and 'identifying features'. Some failed to mention the nature of vascular bundles and the exact number.

Suggestions for teachers
- Students must be trained to draw an outline diagram and to show the structure of vascular bundles clearly.
- Students must be trained to observe the most distinctive features under the microscope.

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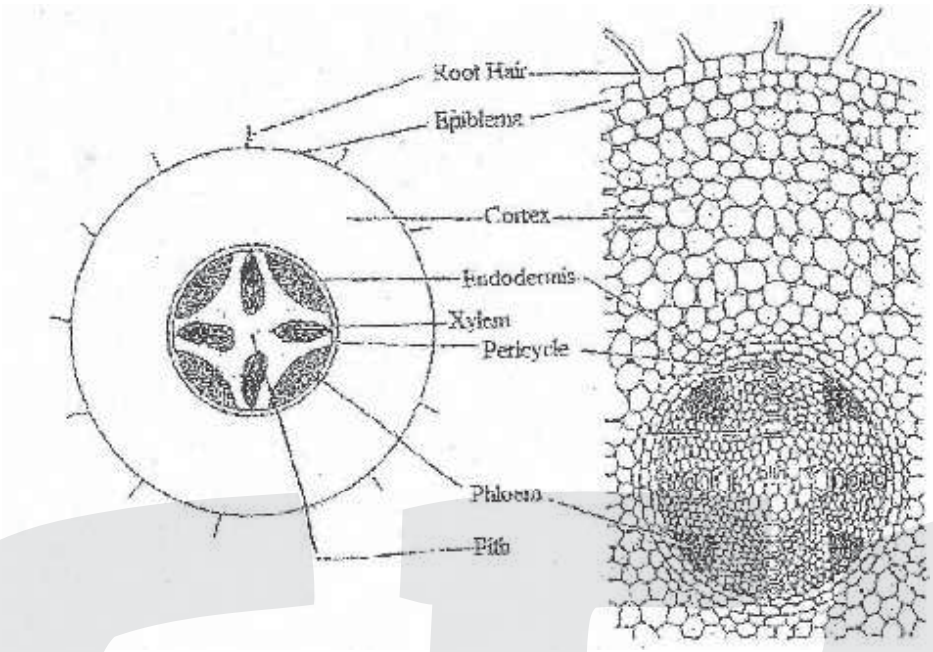
MARKING SCHEME

Question 3.

(b)



Drawing points:	**Labelling points:**
Root hair shown	Root hair
Epiblema shown	Epiblema
Thick cortex shown	Cortex
Endodermis shown	Endodermis
Pericycle shown	Pericycle
4-5 radial vascular bundle shown	4-5 radial vascular bundle
Pith poorly developed/absent	Pith
	Xylem, Phloem

(c) (i) Identification of T.S. of dicotyledonous root :

(ii) Reasons:

- Vascular bundles are radial
- Number of vascular bundles between 2 – 6
- Xylem is exarch
- Pith is poorly developed.
- Epidermal hair are unicellular *(any two)*

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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 booklet to the Supervising Examiner after you finish answering this question.*

Comments of Examiners

Specimen A

Common errors made by candidates were as follows:

- Incomplete identification was done by a number of candidates. Many did not mention 'T.S. or 'Mammalian'.
- In several cases, candidates did not label the diagram completely.
- A few candidates did not mention 'seminiferous tubules'.
- In some cases, the labelling and the reason for identification did not match.

Suggestions for teachers

- Students must be trained to make correct observation to identify the given specimen. They should be able to match the drawing, labelling and identifying remarks.
- Explain the importance of making a simple and completely labelled diagram.
- Tell students that the distinct identifying features should be mentioned and not general features.
- Tell students that the drawing should match the identifying features and that the guide lines must not cross over; all apparatus must be labelled.

Specimen B

- A number of candidates did not mention 'T.S.' in the identification.
- In some cases, the gap between the inner mass of cells and zona pellucida was not drawn distinctly.
- Many did not label 'zona pellucida' and also did not mention it in the reason.

Specimen C

- 'T.S.' was not mentioned by many candidates in the identification.
- In several cases, spongy and palisade parenchyma could not be distinguished in the diagram.
- In many cases, the labelling was incomplete.

Specimen D

- A few candidates identified the spot as 'Hibiscus' / 'self-pollinated' flower / 'L.S. of flower' instead of entomophilous flower.
- In many cases the labelling was incomplete.

Specimen E

- Wrong or incomplete identification was done by candidates.
- In some cases, the shape of the thistle funnel was not drawn correctly.
- In a few cases, the thistle funnel was not labelled.
- The initial and final level was not clearly mentioned by some candidates.

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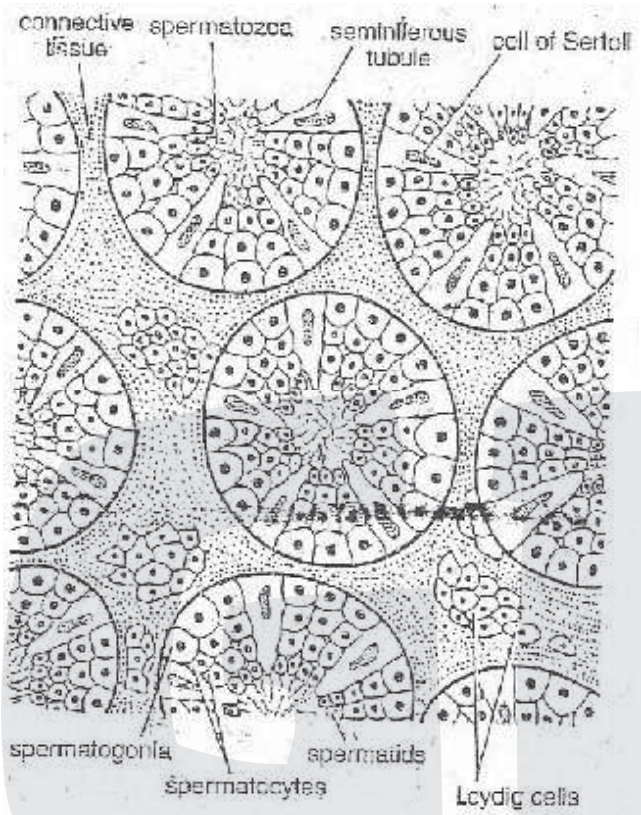
MARKING SCHEME

Question 4.

Spot A:

Identification of T.S. Testis of mammal:



Drawing points:	**Labelling points:**
Seminiferous tubules shown	Seminiferous tubules
Leydig cells in between seminiferous tubules shown	Leydig cells
Elongated Sertoli cells shown	Sertoli cells
Spermatogania/ spermatocyte/ spermatids/ spermatozoa	Spermatogania/ spermatocyte/ spermatids/ spermatozoa
Connective tissue shown in between tubules	Connective tissue

Reasons:

(i) Seminiferous tubules showing spermatogenesis

(ii) Sperms in the centre of the tubules

(iii) Leydig cells in the matrix *(any two)*

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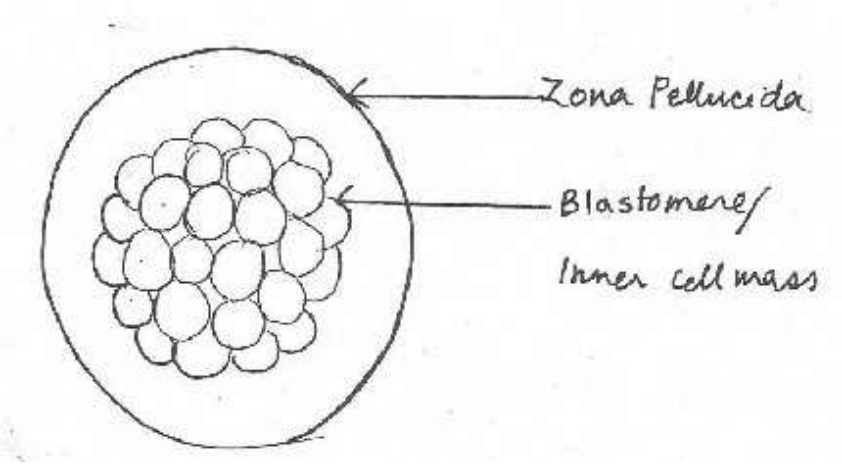
Spot B: Identification.

T.S. of Morula.

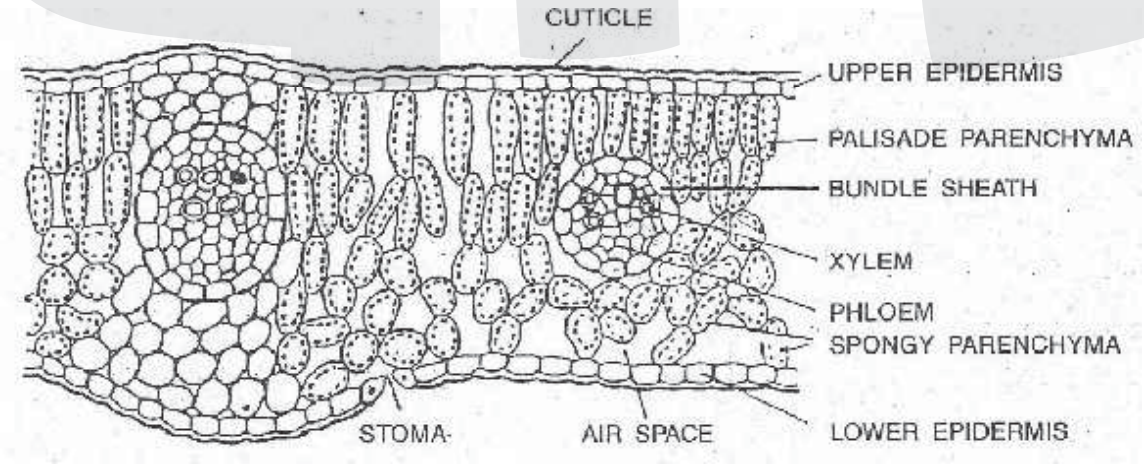


Drawing points:	**Labelling points:**
Spherical mass of cells in the centre shown.	Blastomere/ Inner cell Mass.
Zona pellucida shown	Zona pellucida
Gap shown between mass of cells and zona pellucida	

Reasons:
- Spherical mass of cells visible / many blastomeres.
- Mass of cells surrounded by a thin layer of tissues *(any two)*

Spot C:

Identification of T.S. of dicotyledonous leaf/ Dorsiventral leaf:



Drawing points:	**Labelling points:**
Palisade tissue shown	Palisade parenchyma
Spongy parenchyma shown	Spongy parenchyma

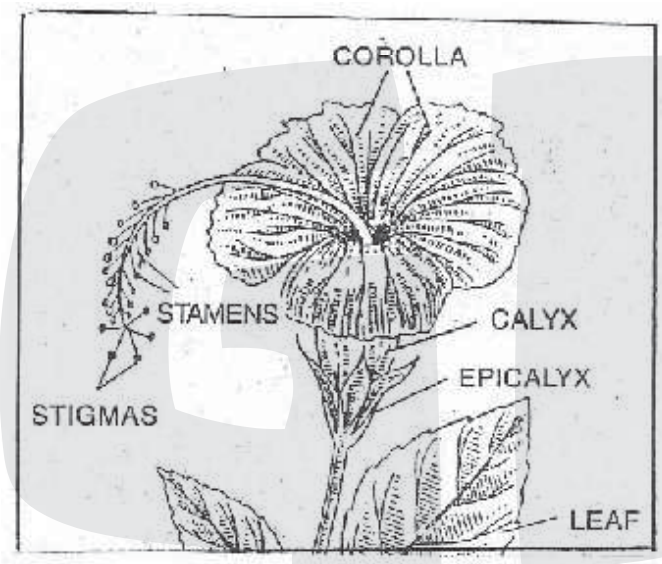
Lower epidermis with stoma shown	Epidermis (lower/upper)
Vascular bundle shown	Stoma/stomata
Thick cuticle in the upper epidermis shown	Cuticle
	Vascular bundle

Reasons:

- Mesophyll is differentiated into Palisade and Spongy parenchyma
- Stomata mainly present on the lower epidermis
- Thick cuticle in the upper epidermis *(any two)*

SPOT D

Identification: Hibiscus rosa sinensis – Entomophilous flower/correct explanation.



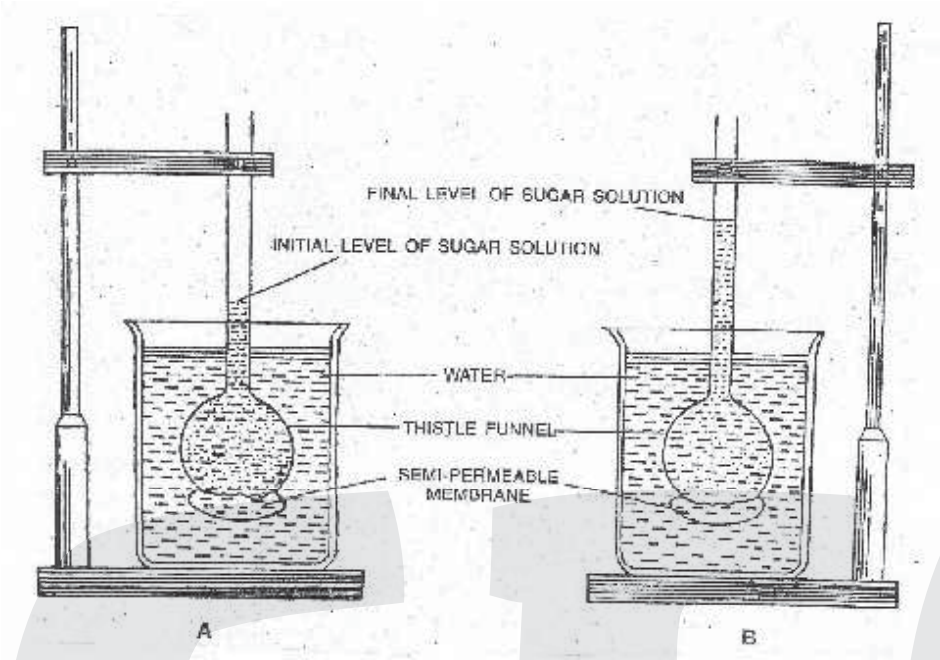
Drawing: - Large flower shown
- Large petals shown
- Monadelphous stamen shown
- Prominent stigma shown

Labelling: Bright petal, pollen grain/anthers, stigma, staminal tube

Reasons: - Large brightly coloured showy flower.
- Many anthers (with pollen grains).
- Stigmatic surface sticky. *(any two)*

SPOT E

Identification : Experiment to demonstrate osmosis



Drawing Points:	**Labelling Points:**
Beaker with water shown	Beaker with water
Mouth of thistle funnel is covered with semi permeable membrane	Thistle funnel
Thistle funnel filled with hypertonic solution	Semi-permeable membrane
Initial level of hypertonic solution is less than the final level in the stem of the funnel	Hypertonic solution
	Initial level, final level

Reasons: - Mouth of thistle funnel tied with semipermeable membrane

- Beaker has water, thistle funnel has hypertonic solution
- Final level of solution in the stem of the funnel higher than initial level

(any two)

Question 5

Show the following to the Visiting Examiner for assessment:

(a) Project **[7]**

(b) Biology Practical File. **[3]**

GENERAL COMMENTS:

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

Question 1 – Floral formula, floral diagram and botanical names.

Question 2 – Interpretation of the Observation.

Question 4 – Identification of Morula.

(b) Concepts in which candidates got confused:

- Gamosepalous and epipetalous condition.
- Exarch and endarch xylem, epidermis and epiblema.
- Leydig cell and Sertoli cell.
- Anemophily and Entomophily.

(c) Suggestions for candidates:

- Think logically and establish a cause and effort relationship while setting up a physiological experiment.
- Conceptual understanding is important.
- Learn the semi-technical terms with correct spellings.
- Practice drawing all the diagrams through observation.
- Read each question carefully and then answer.
- Make a neat presentation.