

Index Number :

Sri Lankan Biology Olympiad 2013



Answer Sheet

Please handover this part to the Invigilator.

Only Part A is allowed to move out of the examination hall.

Part A - Multiple Choice Questions

Mark the correct response with a cross (x)

- | | | | | | | | | | | | |
|-----|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-----|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| 1. | (1) | (2) | (3) | (4) | <input checked="" type="checkbox"/> | 21. | (1) | <input checked="" type="checkbox"/> | (3) | (4) | (5) |
| 2. | (1) | (2) | (3) | (4) | <input checked="" type="checkbox"/> | 22. | (1) | (2) | <input checked="" type="checkbox"/> | (4) | (5) |
| 3. | (1) | (2) | (3) | (4) | <input checked="" type="checkbox"/> | 23. | (1) | (2) | (3) | <input checked="" type="checkbox"/> | (5) |
| 4. | (1) | (2) | (3) | (4) | <input checked="" type="checkbox"/> | 24. | <input checked="" type="checkbox"/> | (2) | (3) | (4) | (5) |
| 5. | <input checked="" type="checkbox"/> | (2) | (3) | (4) | (5) | 25. | (1) | (2) | <input checked="" type="checkbox"/> | (4) | (5) |
| 6. | (1) | (2) | (3) | <input checked="" type="checkbox"/> | (5) | 26. | (1) | (2) | (3) | <input checked="" type="checkbox"/> | (5) |
| 7. | (1) | (2) | (3) | <input checked="" type="checkbox"/> | (5) | 27. | (1) | (2) | (3) | <input checked="" type="checkbox"/> | (5) |
| 8. | (1) | <input checked="" type="checkbox"/> | (3) | (4) | (5) | 28. | (1) | <input checked="" type="checkbox"/> | (3) | (4) | (5) |
| 9. | (1) | <input checked="" type="checkbox"/> | (3) | (4) | (5) | 29. | (1) | (2) | (3) | (4) | <input checked="" type="checkbox"/> |
| 10. | (1) | (2) | (3) | (4) | <input checked="" type="checkbox"/> | 30. | <input checked="" type="checkbox"/> | (2) | (3) | (4) | (5) |
| 11. | (1) | <input checked="" type="checkbox"/> | (3) | (4) | (5) | 31. | (1) | (2) | <input checked="" type="checkbox"/> | (4) | (5) |
| 12. | (1) | (2) | (3) | (4) | <input checked="" type="checkbox"/> | 32. | (1) | (2) | <input checked="" type="checkbox"/> | (4) | (5) |
| 13. | <input checked="" type="checkbox"/> | (2) | (3) | (4) | (5) | 33. | (1) | <input checked="" type="checkbox"/> | (3) | (4) | (5) |
| 14. | (1) | (2) | <input checked="" type="checkbox"/> | (4) | (5) | 34. | <input checked="" type="checkbox"/> | (2) | (3) | (4) | (5) |
| 15. | <input checked="" type="checkbox"/> | (2) | (3) | (4) | (5) | 35. | (1) | (2) | (3) | <input checked="" type="checkbox"/> | (5) |
| 16. | (1) | (2) | (3) | <input checked="" type="checkbox"/> | (5) | 36. | (1) | (2) | (3) | <input checked="" type="checkbox"/> | (5) |
| 17. | (1) | (2) | <input checked="" type="checkbox"/> | (4) | (5) | 37. | <input checked="" type="checkbox"/> | (2) | (3) | (4) | (5) |
| 18. | <input checked="" type="checkbox"/> | (2) | (3) | (4) | (5) | 38. | (1) | (2) | (3) | <input checked="" type="checkbox"/> | (5) |
| 19. | (1) | (2) | (3) | (4) | <input checked="" type="checkbox"/> | 39. | (1) | (2) | (3) | <input checked="" type="checkbox"/> | (5) |
| 20. | <input checked="" type="checkbox"/> | (2) | (3) | (4) | (5) | 40. | (1) | (2) | (3) | <input checked="" type="checkbox"/> | (5) |

(1 x 40 = 40 marks)

Part B – Short Answer Questions

Please answer in the spaces provided. Please use given letters, numbers or symbols only.

1. A cell produces and secretes a certain protein. Select from the list only those structures which are involved in these processes, to our present knowledge. (List the numbers in the correct order of the processes).

- | | | |
|--------------------------------|--------------------|----------------------|
| 1. peroxisome | 2. ribosome | 3. golgi apparatus |
| 4. secretory vesicle | 5. plasma membrane | 6. vacuole |
| 7. rough endoplasmic reticulum | 8. lysosome | 9. transport vesicle |

Correct order of Structures: 2 3 4 5 7 9 (4 marks)

2. Which of the following statements are correct regarding anaphase I of meiosis and anaphase of mitosis? Write the correct numbers from the list below, in the spaces given against the phase. Pay attention to the fact that chromatids are subunits of chromosomes

- Chromosomes move to the poles.
- Single chromatids move to the poles.
- The moving chromosomes consist of two chromatids.
- The chromosomes can carry two alleles of a gene.
- One haploid set of chromosomes can move to each pole.
- There are four spindle poles per cell.

1. anaphase I of meiosis: 1 3 4 5 (4 marks)

2. anaphase of mitosis: 2 5 (4 marks)

3. An animal was found to have a protrusible pharynx and two eye spots. Of the following characters indicate which are possessed by this animal by a “✓” sign and indicate those which are not possessed by this animal by a “X” sign.

Segmentation	X
Fragmentation	✓
Cephalization	✓
Hermoproditism	✓
External fertilization	X
Larval stages	X

($\frac{1}{2} \times 6 = 3$ marks)

4. Indicate the type of cell division involved in the organ/cell formation and the ploidy of the cells. Use I for mitosis and II for meiosis

Organ / Cell	Type of cell division	Ploidy of cells
Endosperm of angiosperm	I	3n
Pollen grain	II	n
Egg of angiosperm	I	n
Spore of moss	II	n
Protonema	I	n
Sperm of moss	I	n
Fern gametophyte	I	n
Spore of fern	II	n
Egg of fern	I	n

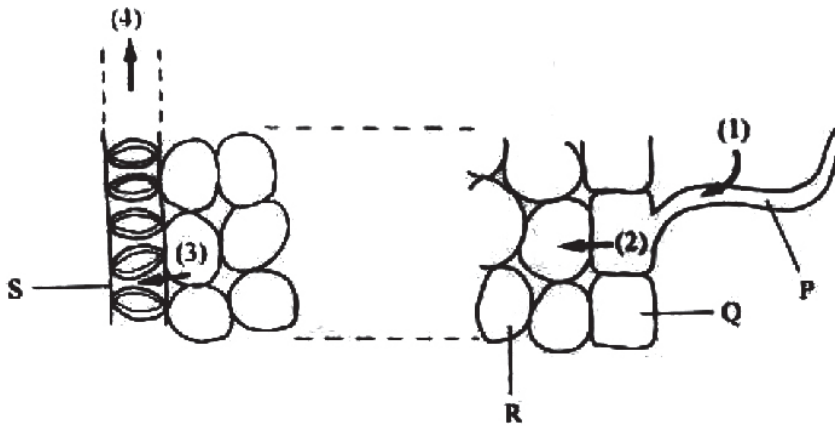
($\frac{1}{2} \times 18 = 9$ marks)

5. Match Plant Growth substances with their functions. Indicate the correct answer(s) with a tick (✓) and incorrect answer(s) with a cross (✗).

Function	Ethylene	ABA	Auxin
1. promote lateral bud growth	X	X	X
2. promoting stomatal closure	X	✓	X
3. promote fruit ripening	✓	X	X
4. apical dominance	X	X	✓
5. delay Aging	X	X	X
6. initiate seed dormancy	X	✓	X
7. promote cell extension	X	X	✓

(1 marks for each row = 7 marks)

Question Nos 6 and 7 are based on the following diagram which illustrates the transport of substances from root to leaves.



6. Select appropriate transport pathway/ process using a tick (✓) for correct answer and cross (X) for incorrect answer in the following table.

Feature	1	2	3	4
Active transport	✓	✓	✓	X
Osmosis	✓	✓	✓	X
Symplast pathway	✓	✓	X	X

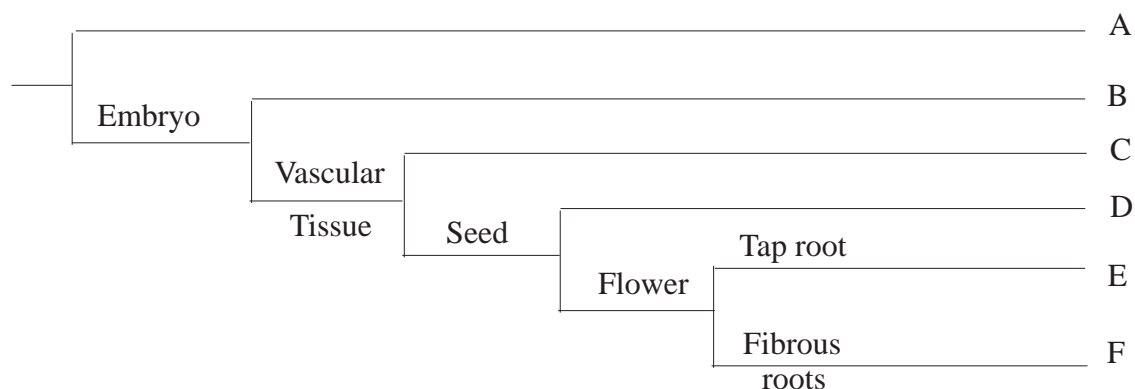
(1 marks for each column = 4 marks)

7. Select cells with following features from among P, Q, R and S. Indicate the correct answer(s) with a tick (✓).

	P	Q	R	S
Highest water potential	✓			
Lowest pressure potential				✓
Thickest cell wall				✓
Storage of food	✓	✓	✓	

(1 marks for each row = 4 marks)

8. Key events in the evolution of plant life cycles are illustrated in this diagram.

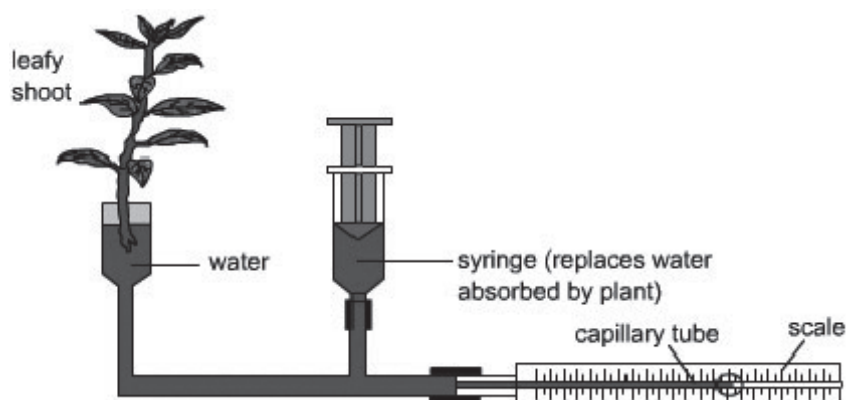


In which of the taxons B-F, the following features are present. Indicate the correct answer(s) with a tick (✓) and incorrect answer(s) with a cross (X).

Feature	B	C	D	E	F
Dioecious sporophyte	X	✓/X	✓	✓/X	✓/X
Reduced independent gametophyte	X	✓/X	✓	✓	✓
Reduced dependent sporophyte	✓	✓/X	X	X	X
Water is required for fertilization	✓	✓	X	X	X
Species can be dispersed to long distances	X	X	✓	✓	✓
Non motile sperms	X	X	X	✓	✓
Present in carboniferous forest	✓	✓	X	X	X

(1 marks for each row = 7 marks)

9. The potometer can be used to measure transpiration in a cut shoot such by measuring water uptake.



Indicate which of the following statements are true (✓) and which are incorrect (X).

A. The potometer is usually assembled under water	✓
B. The water-filled syringe is used to suck water out of the apparatus when air bubbles appear.	X
C. The shoot must be sealed over the cut point with vaseline immediately after it is cut from the plant.	X
D. Enclosing the shoot in a black plastic bag will reduce the transpiration	✓
E. The rate of transpiration will be high in still, humid air.	X
F. The rate of transpiration will be highest in warm, dry moving air.	✓
G. The rate of water uptake and the rate of transpiration are not always equal.	✓
H. Low cohesive properties between the water molecules create problems for potometer experiments.	X
I. Results from potometer experiments can never be quantitative.	X

($\frac{1}{2} \times 9 = 4.5$ marks)

10. Some excretory structures found among animals are given below. Indicate which of those are present in animals that excrete uric acid by a “✓” sign and indicate those which are **not** present in the animals that excrete uric acid by “X” sign.

Malpighian tubules	✓
Nephridia	X
Green glands	X
Kidneys	✓
Gills	X

(1 x 5 = 5 marks)

11. Some organs with endocrine function, the hormones secreted by them and the target structures of these hormones are given in the following table.

Organ with endocrine function	Hormone	Target structure
A: Parathyroid	P: Progesterone	i: Intestine
B: Placenta	Q: Parathormone	ii: Mammary glands
C: Ovary	R: TRH	iii: Kidney
D: Hypothalamus	S: Oestrogen	Iv: Anterior Pituitary

Based on the above table, indicate 10 correct combinations of “Secretory organ – Hormone – Target organ” using the respective letters and the numbers.

1..... B S ii 2..... B S iv 3..... B P ii 4..... B P iv 5..... C S iv

6..... C S ii 7..... C P ii 8..... C P iv 9..... A Q i 10..... A Q iii

11 A Q iii

(1 x any 10 = 10 marks)

12. Some events that take place during thermoregulation of man are given below. Indicate by a “✓” sign the events that take place when the heat gain center is stimulated and by a “X” sign the events that **do not** take place when this center is stimulated.

Increase in the activity of sweat glands	X
Inhibition of adrenal activity	X
Contraction of smooth muscle fibers	✓
Contraction of skeletal muscle fibers	✓
Stimulation of Krause's end bulbs	X

(1 x 5 = 5 marks)

13. Some of the following have a pH value less than 7. Indicate those with a “✓” sign. Indicate those with a pH value above 7 with a “X” sign.

Saliva	✓
Gastric juice	✓
Vagina	✓
Seminal vesicle fluid	X
Intestinal juice	X

(1 x 5 = 5 marks)

14. Microbial industries are based on four principal techniques.

- I. Micro-organisms as end product
- II. Microbial products as end product
- III. Microbial processes as end product
- IV. Genetically modified organisms to obtain end product.

Select appropriate principal technique involved in the production of following microbial products by putting a (✓) tick mark in the appropriate cage.

Microbial product	I	II	III	IV
Vinegar		✓		
Penicillin		✓		
Immunization agent against Hepatitis	✓			✓
Extraction of copper			✓	
Bio-insecticides		✓		
Insulin			✓/-	✓/-
Bio remediation			✓	

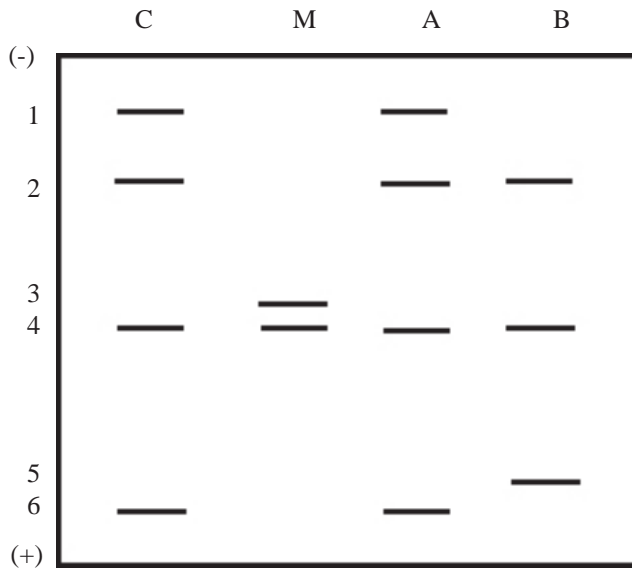
(1 marks for each row = 7 marks)

15. A paternal chromosome has alleles L, M, and n and the maternal chromosome has alleles l, m, and N. Which of the following chromosomes could possibly be produced as a result of a single crossing over
Indicate the correct answer(s) with a tick (✓) and incorrect answer(s) with a cross (x). (1 point)

I. LMN	✓
II. LMn	x
III. LmN	✓
IV. Lmn	x
V. lmn	✓

(1 x 5 = 5 marks)

16. This question is regarding a paternal dispute of a child (C), where Mother (M) is known but father can be either A or B male. DNA finger printing is carried out on blood from child (C), the mother (M) and two males A and B using multi-loci DNA probe. The result is shown in the following diagram.

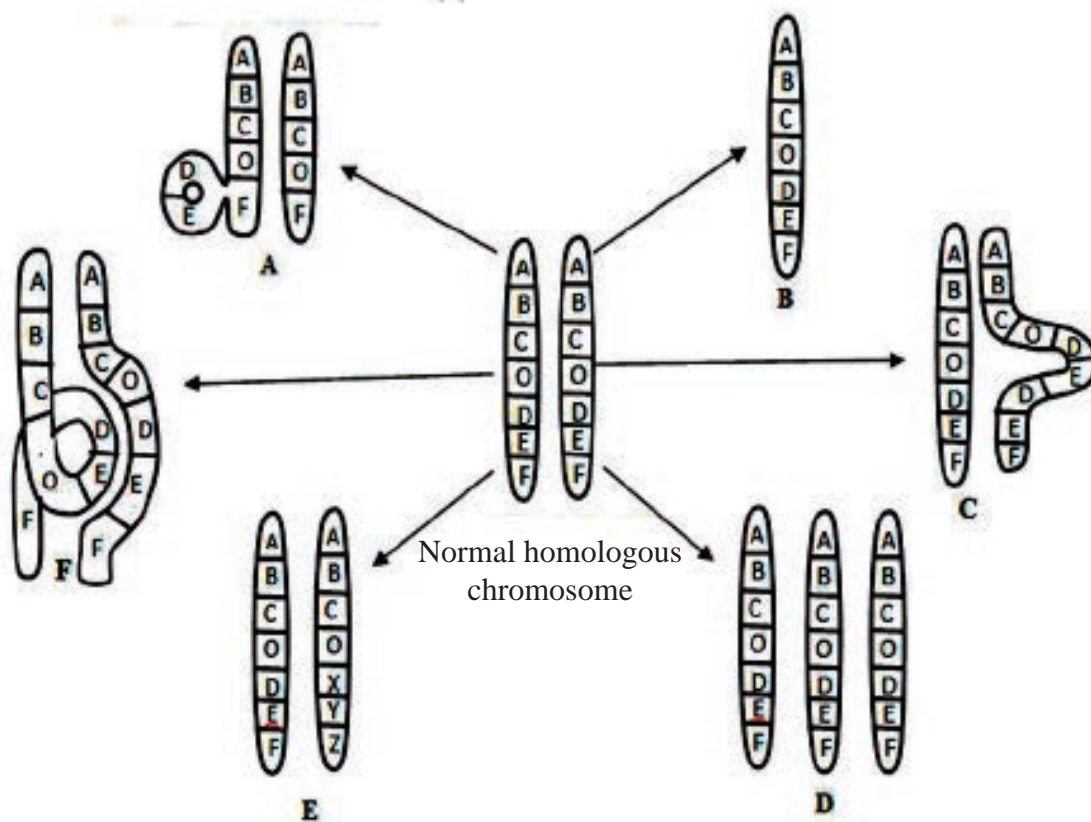


Select the number of the DNA band corresponding to following situations by putting a (✓) tick mark in the appropriate cage.

	1	2	3	4	5	6
Shortest band in the DNA profile						✓
Band common to all males		✓				
Band common to humans				✓		
Band common to all females			✓			
Band(s) common to Biological father and Child	✓					✓

(1 marks for each row = 5 marks)

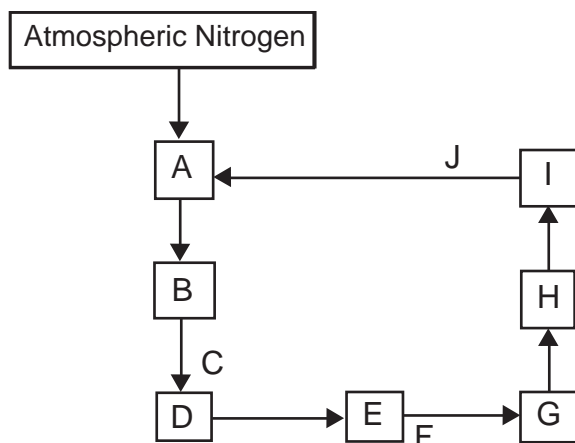
17. The diagram below shows different forms of chromosomal mutations. Indicate the correct letter for the types of chromosomal mutations.



1. Inversion	F
2. Deletion	A
3. Monosomic	B
4. Duplication	C
5. Trisomic	D
6. Translocation	E

(1 x 6 = 6 marks)

18. Gross diagram of the nitrogen cycle is given below



Select the correct letter from the above diagram which indicates the each of the following processes/substances and write it in the appropriate cage.

Ammonification	J
Nitrification	C
Plant proteins	E
Nitrates	D
Organic nitrogen in soil	H
Animal protein	G
Amino acids	I
Ammonium ions	A
Nitrites	B
Ingestion	F

(1 x 10 = 10 marks)

19. Several statements regarding the estuarine ecosystems in Sri Lanka are give below. Indicate the correct statements by a “✓” sign and the **incorrect** statements by a “X” sign.

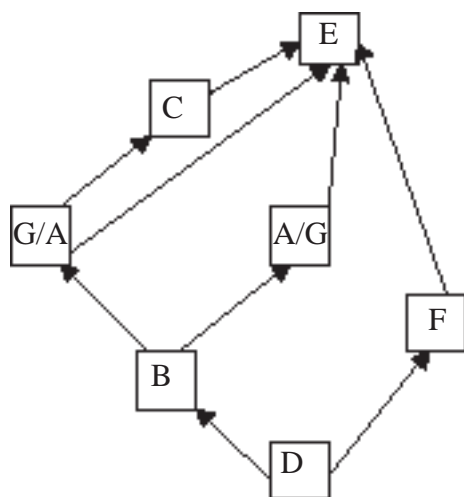
Salinity is below than that of the sea water	✓
Nutrient content is higher than that of the ocean	✓
Biodiversity is in between those of the ocean and freshwater ecosystems	X
Primary productivity is in between those of the ocean and freshwater ecosystems	X
Connection with the sea is sometimes closed by a sand bar	X

(1 x 5 = 5 marks)

20. Some organisms that are found in a home garden ecosystem are as follows.

- | | | | |
|----------|----------------|--------------|----------|
| A: Toad | B: Grasshopper | C: Rat snake | D: Grass |
| E: Eagle | F: Hare | G: Lizard | |

In the food web of this ecosystem given below, indicate the correct position of the above organisms using the appropriate letter.



(1 x 7 = 7 marks)

Total = 120.5 marks

Maximum marks for Part B = $\frac{120}{2} = 60$ marks