

Sri Lankan Biology Olympiad 2011



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

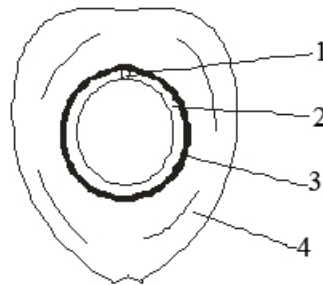
Mark the correct response with a cross (x)

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

Part B – Short Answer Question

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

1. The diagram given below shows the internal structure of a Coconut fruit. $2n$ chromosome number of Coconut plant is 32. A list of some parts of the ovary is also given. Fill the table given below, to indicate the parts of the ovary from which the structures labeled 1, 2, 3 and 4 develop using letters A-I, and the number of chromosomes in their cells.

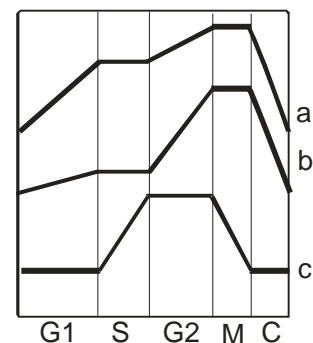


- | | | |
|---------------------|--------------|--------------------------------|
| A. Ovary wall | B. Locule | C. Outer integument |
| D. Inner integument | E. Micropyle | F. Nucellus |
| G. Embryosac | H. Egg cell | I. Secondary endosperm nucleus |

Structure	Part of the ovary	Chromosome number
1	H	32
2	I	48
3	A	32
4	A	32

0.5 x 8 = 4

2. The diagram given below shows some events taking place in different stages of the cell cycle. The three curves show how the amount of DNA per nucleus, number of ribosomes per cell and the number of mitochondria per cell changes in the cell cycle.



- A. Indicate which curve represents each of the following.

Amount of DNA per nucleus c

Number of ribosomes per cell a

Number of mitochondria per cell b

0.5 x 3 = 1.5

- B. Indicate the stage of cell cycle (G1, S, G2, M, C) in which each of the following takes place.

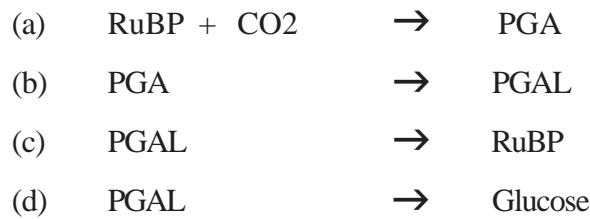
Division of centrioles G2

Formation of cell plate C

Formation of nuclear membrane M

0.5 x 3 = 1.5

3. Four reactions associated with photosynthesis are given below.



If features in the following table are relevant to above reactions, then put (✓) mark and if they are not relevant then put (×) in the following table.

	a	b	c	d
I Reactions which need ATP	×	✓	✓	×
II Reactions which need NADPH	×	✓	×	×
III Reactions that synthesise carbohydrates	×	✓	✓	✓

0.25 x 12 = 3

4. A list of structures found in cells are given below.

- (a) Cell membrane (b) Rough endoplasmic reticulum (c) Smooth endoplasmic reticulum
 (d) Actin filaments (e) Ribosomes (f) Peroxisomes (g) Lysosomes

Indicate below the structures (a - f) which fit the characteristics given in the following descriptions.

- I. Made of proteins only, provides structural support to cell^d.....
 II. Made of proteins and lipids, contain receptor proteins^a.....
 III. Hydrolyses proteins and lipids^g.....
 IV. Proteins are modified, lipids are synthesised.....^c.....

0.5 x 4 = 2

5. This question is based on the Phyla given below.

- A) Annelida B) Arthropoda C) Echinodermata D) Chordata E. Mollusca

In each box place (✓) mark if the character given in the first column is present in the animals of that phylum and place (×) mark if that character is not present in the animals of that phylum..

Character	Annelida	Arthropoda	Echinodermata	Chordata	Mollusca
Gills	✓	✓	✓	✓	✓
Exoskeleton	×	✓	×	✓	✓
Endoskeleton	×	×	✓	✓	✓
Larval stages	✓	✓	✓	✓	✓

0.25 x 20 = 5

6. Fill the cages of the table below with (✓) yes or (×) no signs to indicate the activities of xylem and phloem.

Activity	Xylem	Phloem
Conducts water	✓	✓
Conducts organic substances	×	✓
Transports inorganic ions	✓	✓
Transport ethelene	×	✓
Transports cytokinin	✓	×

0.25 x 10 = 2.5

7. Place a (✓) mark in the relevant cage if the endocrine glands given below secrete hormones which regulate the activities stated in 1st Column and place a (×) mark if that endocrine gland does not secrete a hormone that regulate those activities.

Activity	Parathyroid	Anterior Pituitary	Thyroid	Adrenal cortex
Calcium metabolism	✓	×	✓	×
Somatic growth	×	✓	✓	×
Breakdown of proteins	×	×	✓	✓
Phosphate metabolism	✓	×	✓	×

1st and 4th columns are deleted

Each row 0.5 x 4 = 2

8. Names of five scientists have been combined with five terms used in classification of organisms. Indicate against each of them whether the combination is logical (✓) or not (×)

I.	Domain	-	Woese✓.....
II	Phyllum	-	Linnaeus×.....
III	Monera	-	Haeckel✓.....
IV	Protista	-	Whitaker✓.....
V	Taxon	-	Aristotle×.....

0.5 x 5 = 2.5

9. Dwarf variety of Garden Pea plants used by Mendel in his experiments are now known to have a mutation in a gene needed for synthesis of Gibberelin. F1 plants obtained by Mendel from the Tall (TT) x dwarf (tt) cross were tall.

Which of the following conclusions regarding this would be correct? Use (✓) mark to indicate correct statements and (×) mark to indicate incorrect statements.

I.	Gibberelin causes elongation of stems	✓
II.	Heterozygous(Tt) plants produce the same amount of gibberelin as double dominant (TT) plants	✓
III.	Gibberelin induces production of auxin	×
IV.	Mutation may have occurred in a gene producing an enzyme	✓

0.5 x 4 = 2

10. Some pathogenic bacteria produce exotoxins or endotoxins. Against each type of toxins, if a feature is present put (✓) mark or if a feature is absent put (×) mark in the following table.

	Exotoxins	Endotoxins
1. Made of proteins	✓	×
2. Made of lipopolysaccharides	×	✓
3. Some are neurotoxins	✓	×
4. Destroyed by boiling water	✓	×
5. Structural component of the cell	×	✓
6. Cholera toxin is one of them	✓	×
7. Disrupt metabolic activities of host cells	✓	✓

Question is deleted

11. Concentration of CO₂ in atmosphere is known to be increasing gradually. Which of the following is/are likely consequences in the future if the increase continues. Use (✓) mark to indicate correct statements and (×) mark to indicate incorrect statements.

I.	C4 photosynthetic plants will grow better than C3 photosynthetic plants	×
II.	Many species will show increased mutation rates in order to adapt to higher temperatures	×
III.	Plant biomass will increase adding more organic matter to the soil	✓
IV.	Increased temperature of the environment will cause higher metabolic rates of some organisms	✓
V.	Mineral cycling in the soil will take place slower than at present	×
VI.	Global rainfall pattern will change	✓

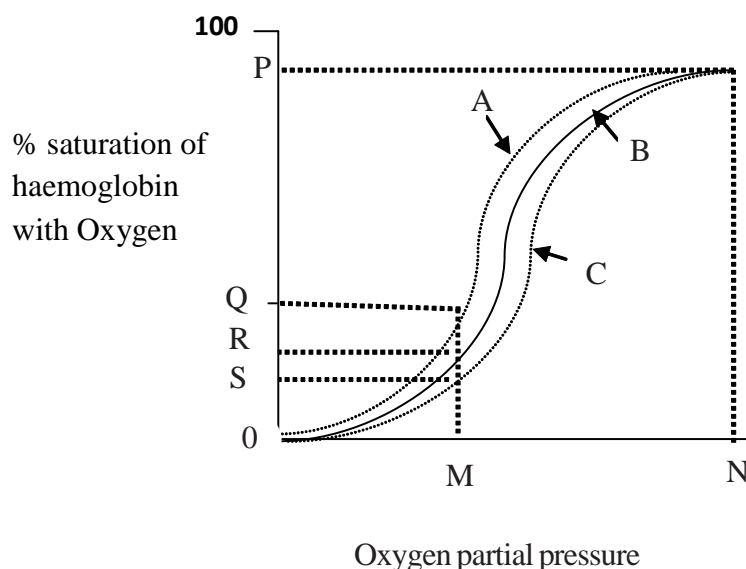
0.5 x 6 = 3

12. Indicate with a (✓) sign drawn in the correct cage the organs where the epithelial tissues given in the 1st column could be observed in a cross section. Put a (×) mark in the relevant cage if these tissues cannot be observed in a particular organ.

Epithelial tissues	Organs			
	Skin	Thyroid	Kidney	Stomach
Simple cuboidal epithelium	✓	✓	✓	×
Simple columnar epithelium	✓/×	×	×	✓
Stratified squamous epithelium	✓	×	×	×

0.25 x 12 = 3

13. This question is based on the following figure which indicates the variation of oxygen saturation (%) of haemoglobin with oxygen partial pressure.



Indicate whether the following statements are correct or incorrect. Use (✓) mark to indicate correct statements and (×) mark to indicate incorrect statements.

1.	The curve A represents % saturation at a lower concentration of carbon dioxide than at a carbon dioxide concentration represented by curve B	✓
2.	The amount of oxygen released at the most active tissue is P-S	✓
3.	If A, B and C are three different respiratory pigments, the highest affinity to oxygen is shown by C	×

1 x 3 = 3

14. Using (✓) mark in the appropriate cage indicate the animal groups which possess the reproductive patterns given below. Place (×) mark in the relevant cage if that reproductive pattern is not seen in that animal group.

Animal group	Reproductive Pattern		
	Asexual reproduction	Internal fertilization	External fertilization
Hydrozoa	✓	×	✓
Mollusca	×	✓	✓
Annelida	✓	×	✓
Platyhelminthes	✓	✓	×

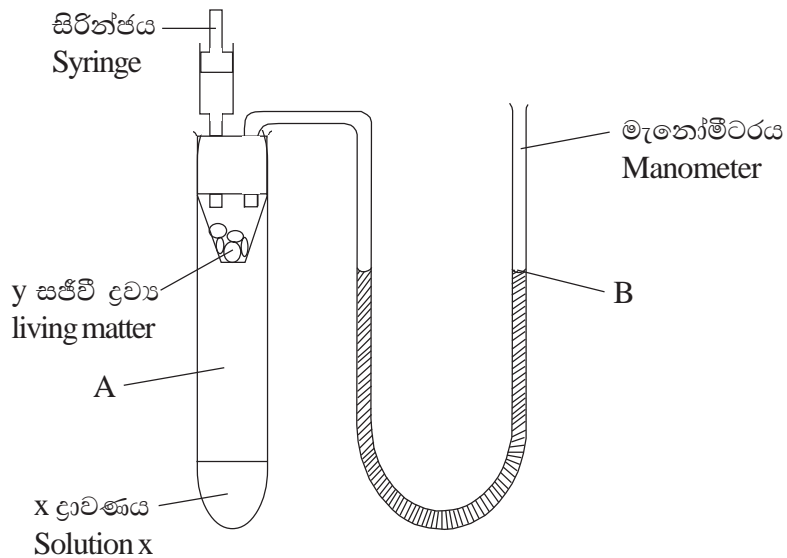
0.25 x 12 = 3

15. Given below are four statements regarding the cerebrospinal fluid of man. Place (✓) mark against the correct statements and (×) mark against the incorrect statements.

1.	It is present between arachnoid and dura mater, within the ventricles of the brain and within the central canal of the spinal cord.	×
2.	It provides oxygen and nutrients to the nervous tissue.	✓
3.	It contains monocytes which destroy decaying cells.	×
4.	It helps to remove waste material from the nervous tissue.	✓

0.5 x 4 = 2

16. The diagram shows a respirometer that is used to measure gaseous exchange in biological material. Materials labeled as x and y are given in the table. The apparatus is maintained at a constant temperature.

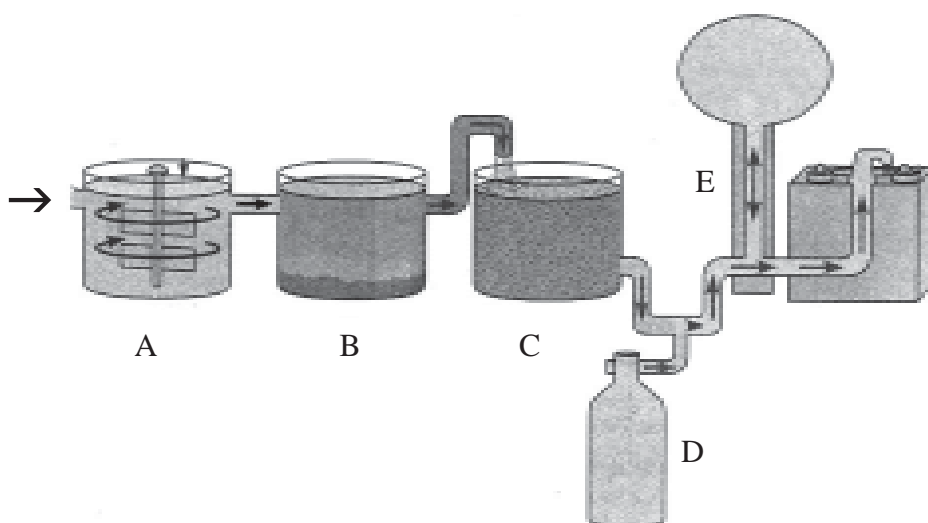


Indicate whether following parameters increase (↑), decrease (↓) or remain constant (=) with time by putting appropriate symbols (↑ or =) in each cage.

X solution and Y tissue	gas pressure at A	fluid level at B	RQ = 1
x = water, y = pea seeds	=	=	=
x = KOH, y = pea seeds	↓	↓	=
x = KOH, y = castor (Endaru) seeds	↓	↓	↓
x = KOH, y = insects ?	=	=	=

Each correct line 0.5 x 4 = 2

17. The steps involve in treatment of water in a typical municipal water purification plant is given below.



Select appropriate steps by putting (✓) marks in the appropriate cage.

	A	B	C	D	E
Addition of Aluminium sulfate	x	✓	x	x	x
Removal of bacteria	x	✓	✓	✓	x
Disinfection of pathogens such as <i>Salmonella</i>	x	x	x	✓	x
Removal of finely suspended matter	✓/x	✓	✓/x	x	x

(Marks are given for x or blank) 0.25 x 20 = 5

18. Materials and organisms that are used in the production of alcoholic beverages using micro-organisms are given below.

A- Water B - malt C - hops D – Molasses E - *Aspergillus oryzae*

F - *Saccharomyces cerevisiae* G - Wort H - Grapes I – starch J – Fruits

Select organism or material involved in the following steps in the production of beer (Please put letters A-J).

1. Liberation of CO₂ BF
2. Conversion of starch to sugar ABI
3. Flavoring C
4. Activation of enzymes ABI

0.5 x 8 = 4

19. The light energy available in a field is $7200 \text{ kJ m}^{-2} \text{ d}^{-1}$. Only 1% of energy is converted into net plant production. At each trophic level 10% of the net production is transferred to the next trophic level. What is the amount of energy entering the secondary consumers.

$$0.72 \text{ kJ m}^{-2} \text{ d}^{-1}$$

.....
(Without units - No marks) correct answer = 3

20. A student dissected a plant leaf and found bundle sheath cells full of starch granules. Which (one or more) of the following characteristics can be observed in this plant? Place (✓) mark against the correct statements and (×) mark against the incorrect statements.

I.	Stomata open at night	×
II	Presence of PEP carboxylase in mesophyll cells	✓
III	Presence of Rubisco in bundle sheath cells	✓
IV	High photorespiration in hot days	✓
V	Light reaction and carbon fixation taking place in different cell types	✓
VI	Carbon fixation rate is saturated in the early morning	×

0.5 x 6 = 3
