Sri Lankan Biology Olympiad 2015

Marking Scheme for Part A and Part B

Please handover this part to the Invigilator.
Only Part A is allowed to be moved out of the examination hall.

1.	(1)	(2)	(3)	(4)	(5)	21.	(1)	(2)	(3)	(4)	(5)
2.	(1)	(2)	(3)	(4)	(5)	22.	(1)	(2)	(3)	(4)	(5)
3.	(1)	(2)	(3)	(4)	(5)	23.	(1)	(2)	(3)	(4)	(5)
4.	(1)	(2)	(3)	(4)	(5)	24.	(1)	(2)	(3)	(4)	(5)
5.	(1)	(2)	(3)	(4)	(5)	25.	(1)	(2)	(3)	(4)	(5)
6.	(1)	(2)	(3)	(4)	(5)	26.	(1)	(2)	(3)	(4)	(5)
7.	(1)	(2)	(3)	(4)	(5)	27.	(1)	(2)	(3)	(4)	(5)
8.	(1)	(2)	(3)	(4)	(5)	28.	(1)	(2)	(3)	(4)	(5)
9.	(1)	(2)	(3)	(4)	(5)	29.	(1)	(2)	(3)	(4)	(5)
10.	(1)	(2)	(3)	(4)	(5)	30.	(1)	(2)	(3)	(4)	(5)
11.	(1)	(2)	(3)	(4)	(5)	31.	(1)	(2)	(3)	(4)	(5)
12.	(1)	(2)	(3)	(4)	(5)	32.	(1)	(2)	(3)	(4)	(5)
13.	(1)	(2)	(3)	(4)	(5)	33.	(1)	(2)	(3)	(4)	(5)
14.	(1)	(2)	(3)	(4)	(5)	34.	(1)	(2)	(3)	(4)	(5)
15.	(1)	(2)	(3)	(4)	(5)	35.	(1)	(2)	(3)	(4)	(5)
16.	(1)	(2)	(3)	(4)	(5)	36.	(1)	(2)	(3)	(4)	(5)
17.	(1)	(2)	(3)	(4)	(5)	37.	(1)	(2)	(3)	(4)	(5)
18.	(1)	(2)	(3)	(4)	(5)	38.	(1)	(2)	(3)	(4)	(5)
19.	(1)	(2)	(3)	(4)	(5)	39.	(1)	(2)	(3)	(4)	(5)
20.	(1)	(2)	(3)	(4)	(5)	40.	(1)	(2)	(3)	(4)	(5)

Part B – Short Answer Questions

Please answer in the spaces provided. Please use given letters, numbers or symbols (√ or X) only.

1. Indicate whether each of the following statements is correct (√) or incorrect (X).

1.	The fastest reacting enzyme known to date is catalase	√
2.	All macromolecules are biopolymers	X
3.	The predominant intracellular ion in the human body is Na+	X
4.	The abundant protein in the biosphere is Ribulose Bis Phosphate	√
5.	DNA molecule always present as double stranded molecule	X

1x5 = 5 marks

2. This question is based on following molecules

(a) Fibrinogen (b) Tubulin (c) Chitin (d) Prostagladin

State the correct letter (s) a – d in respect of following questions.

1. N containing macromolecule……a,…b,…c……..
2. Need for coagulation of blood……a……
3. Made up of spindle fibres……b……..
4. Involve in inflammation…… d……..
5. Component of cell wall……c…….

1x5 = 5 marks

3. Indicate whether each of the following statement is correct (√) or incorrect (X).

1.	Mitochondria has 70s ribosomes	√
2.	ER can extend from one cell to a another through plasmodesmata	√
3.	Microtubules are involved in the formation of pseudopodia	X
4.	Some membrane proteins act as enzymes.	√
5.	Ribosomal subunits are always produced by Nucleolus	X

1x5 = 5 marks

4. Indicate whether each of the characters given in the 1st column of the following Table is present (√) or absent (X) in the organisms belonging to the phyla listed in the 1st row.

	Protista	Fungi	Plantae	Animalia
Heterotrophic nutrition	√	√	√	√
Unicellular organisms	√	√	X	X
Presence of cilia	√	X	√	√
Photoautotrophic nutrition	√	X	√	X

2 marks for each correct row = 8 marks

5. Arrange the following organisms in correct order of increasing number of locomotory structures. Use only the letters (a) – (g).

(a) Bug (b) *Paramecium* (c) *Chlamydomonas* (d) Toad

(e) Millipede (f) Tick (g) Centipede

…c……, ……d.., …a……, f….., …g……, …e….., …b……

correct sequence = 6

6. Indicate whether each of the vitamins given in the 1st row of the following Table is present (√) or absent (X) in green vegetables.

Vitamin A	Vitamin E	Vitamin K	Vitamin B_1	Vitamin B_2
√	√	√		√

1x4 = 4 marks

7. In an experiment to determine the water potential of potato tuber cells, the discs of potato tubers were immersed in sucrose solutions of various concentrations and left for 30 minutes. Results are shown in the table.

Concentration of the Solution	Initial mass of discs(g)	Final mass of discs (g)
0.1 M	1.77	1.84
0.2 M	1.76	1.83
0.3 M	1.86	1.71
0.4 M	1.73	1.47
0.5 M	1.88	1.35

Indicate whether following statements regarding the results of this experiment are correct(√) or incorrect (X).

1.	All potato discs were not accurately cut into same dimensions	√
2.	Negative correlation exists between concentration of sucrose solution and change in mass of discs	√
3.	Solution isotonic to potato cells would be between 0.4 M to 0.5 M	X
4.	0.5 M solution is hypotonic to potato cells	X
5.	Water moves into the cells from 0.1 M solution	√

1x5 = 5 marks

8. Indicate whether each of the following statements regarding human heart is correct (√) or incorrect (X).

1.	It lies in the thoracic cavity little more towards the left.	√
2.	It consists of three layers of tissues.	√
3.	Its thickest tissue layer is the myocardium.	√
4.	The outermost tissue layer is made up of two sacs.	√
5.	Its innermost tissue layer is composed of flattened epithelial cells.	√

1x5 = 5 marks

9. Indicate whether each of the following statements regarding the sensory structures found in the human skin is correct (√) or incorrect (X).

1.	Ruffini corpuscles are sensitive to high temperatures.	√
2.	Krause's end bulbs are sensitive to pressure changes.	X
3.	Meissner's corpuscles are sensitive to touch.	√
4.	Pacinian corpuscles are sensitive to low temperatures.	X
5.	Free nerve endings are sensitive to vibrations.	X
6.	Merkel's discs are sensitive to touch.	√

1x6 = 6 marks

10. Indicate whether each of the following statements regarding the human brain is correct (√) or incorrect (X).

1.	Basal nuclei influence the skeletal muscle tone.	√
2.	Motor area lies in the parietal lobe.	X
3.	Temporal lobe is responsible for manual dexterity.	X
4.	Auditory sensory area lies in the temporal lobe.	√
5.	Frontal lobe is responsible for memory.	X
6.	Sensory speech area is located in the parietal lobe.	√

1x6 = 6 marks

11. This question is based on the following excretory products of animals.
(a) Ammonia (b) Urea (c) Uric acid (d) Creatinine
Using the correct letters (a-d) indicate the most probable excretory product/products of the following animals.
Tilapia: …… A… D……
Man: …… B… D……
Sea anemone ……A……..
Grasshopper …… C…… 1x4 = 4 marks

12. Some features of muscle cells are given below.
(a) Uninucleate (b) Cylindrical in shape (c) Unbranched
(d) Neurogenic (e) non-rhythmic contraction
Using the correct letters (a-e), indicate which of the above characters is/are present in the following muscle fibers.
Skeletal muscle fibers: …b……c……d……e……
Smooth muscle fibers: …a……c……d……e……
Cardiac muscle fibers: …a……b…… 2x3 = 6 marks

13. Indicate whether each of the following statements regarding the human sperm is correct (√) or incorrect (X).

1.	Entire sperm is covered by the cell membrane.	X
2.	Microtubules are present in the tail.	√
3.	Head possesses a modified lysosome containing trypsin.	√
4.	Centrioles are present in the anterior region of the mid-piece.	X
5.	Axial filaments start from the centrioles and run through the tail	X

1x5 = 5 marks

14. Indicate with a (√) sign if the feature is present, and (X) sign if the feature is absent in each of the following plant species.

Feature	*Cycas*	*Selaginella*	*Nephrolepis*	*Pogonatum*	*Mangifera*
Both sporophyte and gametophyte are autotrophic	X	X	√	X	X
Developing sporophyte is dependent on gametophyte	√	√	√	√	X
Fertilization takes place inside a structure surrounded by wall of the spore	√	√	√	X	√
Dioecious sporophyte	√	X	X	X	√ /X
Antherozoids are dispersed by water	X	√	√	√	X

2 marks for each correct row x 5= 10

15. This question is based on following enzymes
(a) RNA polymerase (b) DNA polymerase (c) Primase (d) Helicase (e) Reverse transcriptase
Using the correct letters (a-e) indicate correct enzyme which is used for the following processes.
1. Synthesis of primer in DNA replication ……c……
2. Synthesis of DNA strand in HIV virus …e……..
3. Unwinding of the double helix …d……..
4. Synthesis of DNA strand in DNA replication ……b…….
5. Need for transcription…a……

1x5 = 5 marks

16. Few genetic phenomena are given below
a. Epistasis b. Polygeneic inheritance c. Non – disjunction d. Polypoidy e. Dominance
Using the above genetic phenomena select a suitable one for the following descriptions and state the letter from a –e.
1. Increase the number of chromosome complement……d…….
2. Increase or decrease one chromosome in the chromosome complement……c…….
3. A specific genotype at one locus can prevent the phenotypic expression of a genotype at one or more loci……a…….
4. One allele of a gene suppresses the phenotypic expression of another allele at the same locus in homologous chromosomes……e……
5. Many alleles at different loci are involved for the expression of a character……b…….

1x5 = 5 marks

17. Indicate whether each of the air pollutants given in the 1st row of the following Table is responsible (√) or not responsible (X) for the impacts listed in 1st column.

	Hydro-carbons	Carbon Monoxide	Sulphur Dioxide	Nitrogen oxides	Particulate matter
Asthma	√	X	√	√	√
Reduction in the Oxygen carrying capacity of blood	X	√	X	√	X
Cancer	√	X	√	X	√

1x15 = 15 marks

18. Gross primary productivity of a grassland was calculated to be 34,000 KJ m^{-2} $year^{-1}$. If the energy available at the 4th tropic level of this ecosystem is 6 KJ m^{-2} $year^{-1}$, what is the amount of energy used for respiration by the primary producers. Do your calculations in the space provided below.

4th trophic level 6
3rd " " 60
2nd " " 600
1st " " 6000
Respiration = 34,000 - 6,000
Amount of energy used for respiration by the primary producers : 28,000 $kJm^{-2}year^{-1}$

Correct Answer = 7 marks

19. Indicate with a (√) sign if the feature is present, and (X) sign if the feature is absent in each of the following bacteria.

Feature	*Clostridium*	*Azotobacter*	*Acetobacter*	*Lactobacillus*	*Nitrobacter*
CO_2 is used as carbon source in nutrition	X	X	X	X	
Aerobic	X	√	√	√	
Increases soil N	√	√	X	X	
Endospore forming	√	X	X	X	

1 mark for each correct row x 4 = 4 marks

20. Four chemicals secreted by microorganisms are listed below. Indicate whether these chemicals conduct (√) or do not conduct (X) by following activities.

Activity	Clotrimazole	Polymyxin	Phospholipase	Penicillin
Inhibition of cell wall synthesis	X	X	X	√
Affects cell membrane	√	√	√	X
Inhibition of protein synthesis	X	X	X	X
Inhibition of DNA synthesis	X	X	X	X

1 mark for each correct row x 4 = 4 marks

Part B = 120 marks / 2 = 60 marks

Part A = 40 marks
Part B = 60 marks
100 marks