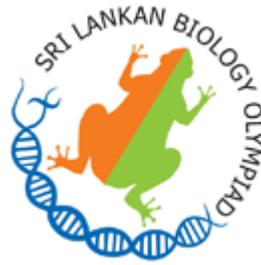


Index Number:

## Sri Lankan Biology Olympiad 2016



### Marking Scheme for Part A and Part B

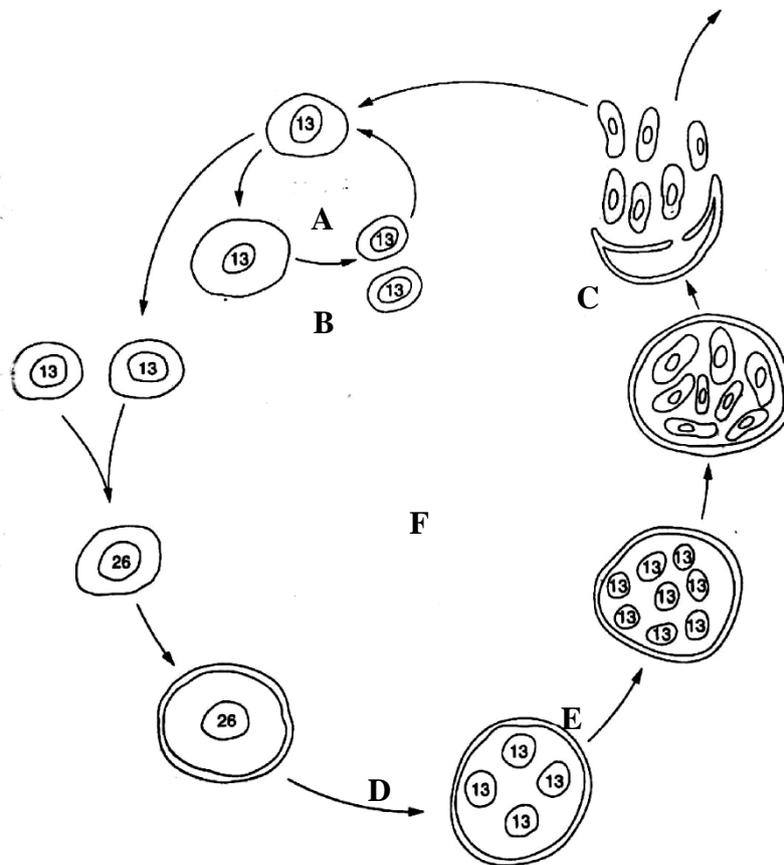
#### Answers for Part A

01.	<input checked="" type="checkbox"/>	(2)	(3)	(4)	(5)	21.	(1)	<input checked="" type="checkbox"/>	(3)	(4)	(5)
02.	(1)	(2)	<input checked="" type="checkbox"/>	(4)	(5)	22.	(1)	(2)	(3)	<input checked="" type="checkbox"/>	(5)
03.	(1)	(2)	(3)	<input checked="" type="checkbox"/>	(5)	23.	<input checked="" type="checkbox"/>				
04.	(1)	<input checked="" type="checkbox"/>	(3)	(4)	(5)	24.	<input checked="" type="checkbox"/>	(2)	(3)	(4)	(5)
05.	(1)	<input checked="" type="checkbox"/>	(3)	(4)	(5)	25.	<input checked="" type="checkbox"/>	(2)	(3)	(4)	(5)
06.	(1)	(2)	<input checked="" type="checkbox"/>	(4)	(5)	26.	(1)	(2)	<input checked="" type="checkbox"/>	(4)	(5)
07.	(1)	<input checked="" type="checkbox"/>	(3)	(4)	(5)	27.	<input checked="" type="checkbox"/>	(2)	(3)	(4)	(5)
08.	(1)	<input checked="" type="checkbox"/>	(3)	(4)	(5)	28.	(1)	(2)	(3)	<input checked="" type="checkbox"/>	(5)
09.	(1)	(2)	(3)	<input checked="" type="checkbox"/>	(5)	29.	(1)	<input checked="" type="checkbox"/>	(3)	(4)	(5)
10.	<input checked="" type="checkbox"/>	(2)	(3)	(4)	(5)	30.	(1)	(2)	<input checked="" type="checkbox"/>	(4)	(5)
11.	(1)	(2)	<input checked="" type="checkbox"/>	(4)	(5)	31.	(1)	(2)	<input checked="" type="checkbox"/>	(4)	(5)
12.	(1)	(2)	<input checked="" type="checkbox"/>	(4)	(5)	32.	<input checked="" type="checkbox"/>	(2)	(3)	(4)	(5)
13.	<input checked="" type="checkbox"/>	(2)	(3)	(4)	(5)	33.	(1)	(2)	(3)	(4)	<input checked="" type="checkbox"/>
14.	(1)	(2)	<input checked="" type="checkbox"/>	(4)	(5)	34.	<input checked="" type="checkbox"/>	(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)	(5)	36.	(1)	(2)	<input checked="" type="checkbox"/>	(4)	(5)
17.	<input checked="" type="checkbox"/>	(2)	(3)	(4)	(5)	37.	(1)	(2)	(3)	(4)	<input checked="" type="checkbox"/>
18.	(1)	(2)	<input checked="" type="checkbox"/>	(4)	(5)	38.	(1)	(2)	<input checked="" type="checkbox"/>	(4)	(5)
19.	<input checked="" type="checkbox"/>	(2)	(3)	(4)	(5)	39.	(1)	(2)	(3)	<input checked="" type="checkbox"/>	(5)
20.	<input checked="" type="checkbox"/>	(2)	(3)	(4)	(5)	40.	(1)	(2)	<input checked="" type="checkbox"/>	(4)	(5)

## Part B – Short Answer Questions

**Answer in the spaces provided. Use only the given letters, numbers or symbols (✓ or X).**

1. Figure below shows the possible life cycle of *Pneumocystis jirovecii*, a yeast-like fungus that lives in human lungs. The numbers on the diagram represent the number of chromosomes in each stage.



State the relevant letter in respect of the process in the life cycle.

- (1) Meiosis I .....D.....
- (2) Asexual phase .....A.....
- (3) Infective stage .....C.....
- (4) Meiosis II .....E.....
- (5) Sexual phase .....F.....
- (6) Mitosis .....B.....

2. Complete the following table by indicating the presence ( ✓ ) or absence ( ✗ ) of features indicated in column 1.

Feature	Myoglobin	DNA	Glycolipids	Maltase
1. Contains iron	✓	✗	✗	✗
2. Contains phosphate	✗	✓	✓	✗
3. Able to replicate	✗	✓	✗	✗
4. Hydrogen bonds are present to stabilise the molecule	✓	✓	✗	✓
5. Contains nitrogen	✓	✓	✗	✓

3. Indicate whether each of the following statements regarding vertebrates is correct (✓) or incorrect (✗).

- |   |     |
|---|-----|
| (1) Reptiles have external ears.                | ✓   |
| (2) Chondrichthyes show internal fertilization. | ✓   |
| (3) Aves have a larval stage.                   | ✗   |
| (4) Mammals do not have a nictitating membrane. | ✗   |
| (5) All amphibians excrete urea                 | Any |

4. Indicate whether each of the following statements is correct (✓) or incorrect (✗).

- |  |   |
|--|---|
| (1) Insects and annelids have nephridia.       | ✗ |
| (2) Crustaceans and Insects have ommatidia.    | ✓ |
| (3) Arthropod coelom is divided into segments. | ✗ |
| (4) All mollusks have radula.                  | ✗ |
| (5) Some cephalopods have exoskeleton.         | ✓ |

5. Indicate whether each of the following statements regarding the large intestine of man is correct (✓) or incorrect (✗).

- |   |   |
|---|---|
| (1) Fat contained in food is finally digested in the large intestine.                           | ✗ |
| (2) Fluids in the food is mostly absorbed in the large intestine.                               | ✗ |
| (3) The number of villi in the large intestine is only about 4% of that in the small intestine. | ✗ |
| (4) Many bacteria reproduce in the large intestine.   | ✓ |
| (5) Large intestine absorbs only the water that is contained in the food.                       | ✗ |

6. Indicate whether each of the following statements regarding resting membrane potential of a human axon is correct (✓) or incorrect (✗).

- |  |   |
|--|---|
| (1) Electric potential outside is -70 mV relative to the inside of the cell membrane.    | ✗ |
| (2) K <sup>+</sup> diffuse out through the axolemma.                                     | ✓ |
| (3) Negatively charged proteins inside the cell attract K <sup>+</sup> from the outside. | ✓ |
| (4) Both the electrical and diffusional forces are needed to maintain resting potential. | ✓ |
| (5) Na <sup>+</sup> are moved into the neuron by sodium-potassium pump.                  | ✗ |

7. Indicate whether each of the following statements regarding the human hormones is correct (✓) or incorrect (X).

- |   |                                     |
|---|-------------------------------------|
| (1) Parathyroid hormone acts on small intestine, kidneys and bones. | <input checked="" type="checkbox"/> |
| (2) Pancreatic hormones regulate carbohydrate metabolism.           | <input checked="" type="checkbox"/> |
| (3) Hormones are secreted by neurons also.                          | <input checked="" type="checkbox"/> |
| (4) Hormones secreted by adrenal medulla act on kidney tubules.     | <input type="checkbox"/>            |
| (5) Oxytocin stimulates the production of milk.                     | <input type="checkbox"/>            |

8. Indicate whether each of the following statements regarding excretion is correct (✓) or incorrect (X).

- |  |                                     |
|--|-------------------------------------|
| (1) Salt glands of crustaceans secrete salts.                        | <input type="checkbox"/>            |
| (2) Contractile vacuoles are the excretory organs of <i>Amoeba</i> . | <input type="checkbox"/>            |
| (3) Sweat glands of man excrete salts.                               | <input checked="" type="checkbox"/> |
| (4) Production of some excretory products does not need energy.      | <input checked="" type="checkbox"/> |
| (5) Marine birds excrete nitrogenous waste through green glands.     | <input type="checkbox"/>            |

9. Indicate whether each of the following statements regarding human skeleton is correct (✓) or incorrect (X).

- |  |                                     |
|--|-------------------------------------|
| (1) Acromion process of the scapula articulates with the humerus.                              | <input type="checkbox"/>            |
| (2) Appendicular and axial skeletons are not connected to each other.                          | <input type="checkbox"/>            |
| (3) Pelvic girdle is composed of odd number of bones.  | <input checked="" type="checkbox"/> |
| (4) Female pelvis is heavier than male pelvis to bear the weight of the fetus during pregnancy | <input type="checkbox"/>            |
| (5) There are five arches in the foot  | <input type="checkbox"/>            |

10. Indicate whether each of the following statements regarding sexually transmitted diseases is correct (✓) or incorrect (X).

- |  |                                     |
|--|-------------------------------------|
| (1) Gonorrhoea can be transmitted from mother to child.                            | <input checked="" type="checkbox"/> |
| (2) AIDS can be transmitted without sexual contact.                                | <input checked="" type="checkbox"/> |
| (3) Sexual contact is essential to get an infection of <i>Treponema pallidum</i> . | <input type="checkbox"/>            |
| (4) Gonorrhoea can cause sterility in females.                                     | <input checked="" type="checkbox"/> |
| (5) Syphilis can be transmitted from mother to child.                              | <input checked="" type="checkbox"/> |

11. Indicate whether each of the following statements regarding birth controlling pills of women is correct (✓) or incorrect (X).

- |   |                                     |
|---|-------------------------------------|
| (1) They contain oestrogen.                           | <input checked="" type="checkbox"/> |
| (2) They prevent the maturation of ovarian follicles. | <input checked="" type="checkbox"/> |
| (3) They prevent implantation.                        | <input checked="" type="checkbox"/> |
| (4) They are poisonous to sperms.                     | <input type="checkbox"/>            |
| (5) They thicken mucosal layers.                      | <input checked="" type="checkbox"/> |

12. Indicate whether each of the following statements is correct (✓) or incorrect (X).

- |   |   |
|---|---|
| (1) Ethylene is produced in immature seeds                | X |
| (2) 2,4-D is used for induction of root cuttings          | X |
| (3) Gibberellins are transported through parenchyma cells | ✓ |
| (4) Abscisic acid is used to induce abscission of fruits  | X |
| (5) Auxins induce cambial activity                        | ✓ |

13. A beaker contains a sucrose solution with a solute potential of -300 kPa. A flaccid cell with a solute potential of -900 kPa is placed in this solution.

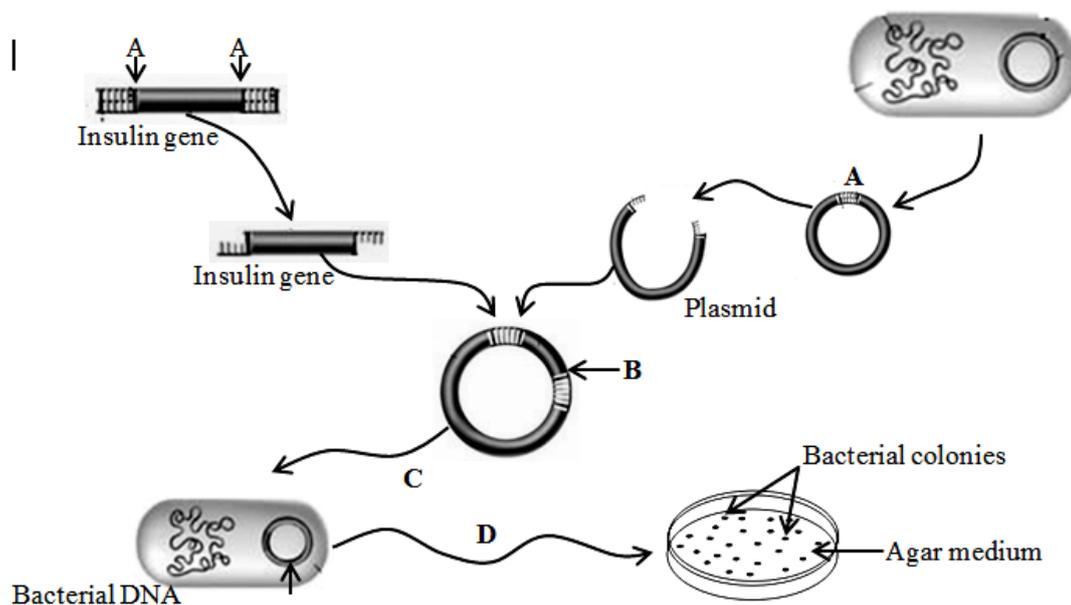
Indicate whether each of the following statements is correct (✓) or incorrect (X).

- |   |   |
|---|---|
| (1) Pressure potential of the flaccid cell before it was placed in the solution is 300 kPa              | X |
| (2) Water potential of the cell before it was placed in the solution is - 300 kPa                       | X |
| (3) Water potential of the sucrose solution is -300 kPa   | ✓ |
| (4) Pressure potential of the plant cell when it is in equilibrium with the sucrose solution is 600 kPa | ✓ |
| (5) When cell is placed in the sucrose solution, water moves out of the cell.                           | X |

14. Indicate whether each of the following statements regarding fungi is correct (✓) or incorrect (X).

- |  |   |
|--|---|
| (1) In <i>Aspergillus</i> , meiosis occurs inside conidia                      | X |
| (2) In <i>Mucor</i> , sexual and asexual spores are produced inside sporangium | ✓ |
| (3) Zygomycetes lack a prominent dikaryotic phase                              | ✓ |
| (4) Basidium can be observed in bread mold                                     | X |
| (5) In <i>Chytridium</i> , spores are dispersed by water                       | ✓ |

11. The below diagram illustrates the fundamental procedure for cloning insulin gene.



1. Inoculation      2. DNA ligase      3. DNA gyrase      4. Restriction endonuclease  
 5. Recombinant DNA      6. Transfection      7. DNA polymerase      8. Transformation

Indicate the relevant number in respect of the enzymes/ processes given in the figure.

Enzymes/ Processes	Relevant number
(1) A	4
(2) B	2
(3) C	8
(4) D	1

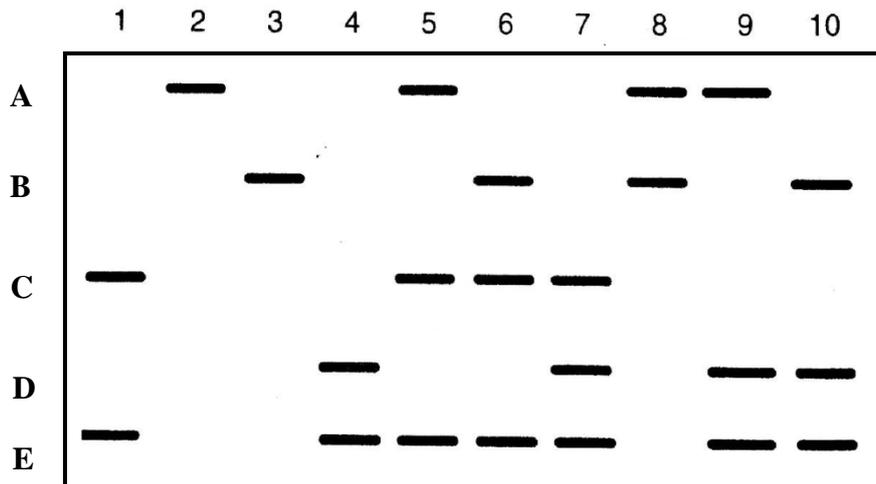
16. Few genetic phenomena are given below

- (a) Co-dominance    (b) Recombination    (c) Aneuploidy    (d) Dominance    (e) Polyploidy  
 (f) Transformation

Indicate the relevant genetic phenomena given as a – f in the following

- (1) Increase or decrease one chromosome in the chromosome complement .....c.....  
 (2) Dominant allele suppress the activity of recessive allele .....d.....  
 (3) Transfer of gene from one bacterium to another .....f.....  
 (4) Process which produces new combination of genetic material .....b.....  
 (5) There is no dominance and recessiveness .....a.....

17. DNA was prepared from small sample of white blood cells from a large number of people. Ten different patterns were seen when their DNAs were digested with *EcoRI* followed by electrophoresis and southern blotting. Finally, the blot was probed with a radioactively labeled cloned human DNA sequence. The following figure shows ten DNA patterns taken from ten people.



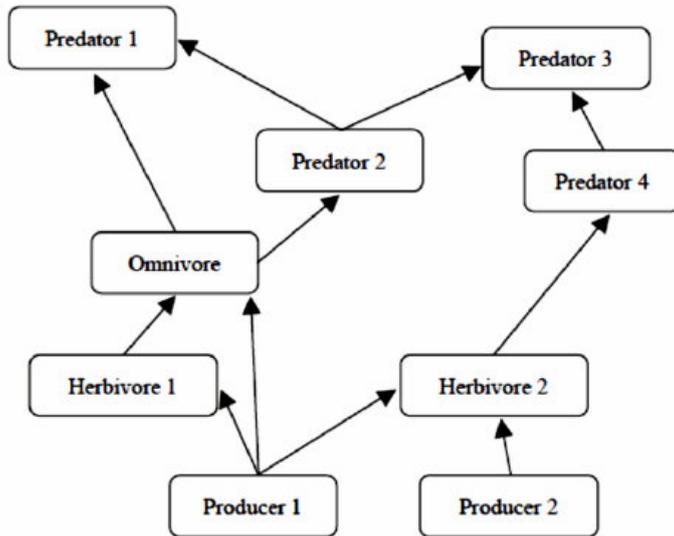
Indicate if each of the following statements is true or false

	True	False
1. Number of different alleles appear in the blot is six		x
2. The largest fragment size is present at A	✓	
3. Individuals number 2 and 3 have only one restriction site for <i>EcoRI</i>		x
4. Maximum number of restriction sites per individual is 4		x
5. Individual 5 would be a child of individuals 1 and 2	✓	

18. Indicate whether each of the following statements regarding nitrogen cycle is correct (✓) or incorrect (X).

- |   |   |
|---|---|
| (1) Due to lightening nitrogen is converted into ammonium ions  | x |
| (2) Proper sequence of nitrogen cycling is nitrogen fixation → Nitrification → Ammonification → Denitrification | x |
| (3) <i>Nitrobacter</i> converts nitrates to nitrites  | x |
| (4) Nitrifying bacteria are autotrophic   | ✓ |
| (5) <i>Acetobacter</i> and <i>Clostridium</i> are nitrogen fixing bacteria                                      | x |

19. In the food web given below, the population of Predator 4 has been declining sharply due to hunting by humans. This is expected to affect the population of the other species.



Indicate whether each of the following statements is correct (✓) or incorrect (✗).

- (1) Decrease in the population of Predator 4 will result in an increase in the population of Herbivore 2
- (2) Decrease in the population of Predator 4 will result in an increase in the population of Predator 3
- (3) Decrease in the population of Predator 4 will result in a decrease in the population of Omnivore
- (4) There are four tertiary consumers in the food web above
- (5) Highest trophic level in this ecosystem is 4

✓
✗
✗
Any
✗

20. Indicate whether each of the following statement is correct (✓) or incorrect (✗)

- (1) *Staphylococcus aureus* causes food borne infections
- (2) *Halobacterium* is a thermophilic bacterium
- (3) Cyanobacteria has chlorophyll pigments
- (4) *Clostridium tetani* is a chemoheterotrophic bacterium
- (5) *Candida* is a bacterium which can be used as single cell proteins

✗
Any
✓
✓
Any