

Index Number:

Sri Lankan Biology Olympiad 2014



Answer Sheet for Part A and Part B

Please handover this part to the Invigilator.

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

Answer Sheet for Part A Mark the correct answer with a X

:01*	1	2	3	4	5	:21*	1	2	3	4	5
:02*	1	2	3	4	5	:22*	1	2	3	4	5
:03*	1	2	3	4	5	:23*	1	2	3	4	5
:04*	1	2	3	4	5	:24*	1	2	3	4	5
:05*	1	2	3	4	5	:25*	1	2	3	4	5
:06*	1	2	3	4	5	:26*	1	2	3	4	5
:07*	1	2	3	4	5	:27*	1	2	3	4	5
:08*	1	2	3	4	5	:28*	1	2	3	4	5
:09*	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. Some structures found in eukaryotic cells are listed (A) to (I) below.
- | | | | |
|---------------------------------|---------------|----------------------------------|-------------------|
| (A) Plasma membrane | (B) Ribosome | (C) Chloroplast | (D) Mitochondrion |
| (E) Lysosome | (F) Cytoplasm | (G) Golgi body | |
| (H) Rough endoplasmic reticulum | | (I) Smooth endoplasmic reticulum | |

Indicate the structure/structures in which each of the following processes take place.

- | | |
|--------------------------------|---------------|
| (1) Synthesis of lipids |I..... |
| (2) Synthesis of glycoproteins |G H..... |
| (3) Synthesis of NADH |D..... |
| (4) Synthesis of ATP |C D..... |
| (5) Hydrolysis of Proteins |E |
| (6) Oxidation of carbohydrates |D |

2. Sequence of stages of cell cycle of a eukaryotic cell is given as G1-S-G2-M-C
Indicate the stage/stages in which each of the following takes place

- | | |
|------------------------------------|------------------|
| 1. Mitochondria divide |G2 |
| 2. Centrioles are synthesized |G2 |
| 3. Chromosomes are replicated |S |
| 4. Proteins are synthesized |G1/ G2..... |
| 5. Microtubules are well organized |M |
| 6. Plasma membrane grows rapidly |G1 |

3. Some substances used in the metabolism of a photosynthetic plant cell is given below.

- | | | | | |
|-----------|--------------------|---------|----------------|---------------------|
| (A) NADPH | (B) O ₂ | (C) ATP | (D) Acetyl CoA | (E) CO ₂ |
| (F) NADH | (G) Glucose | | | |

Indicate the substance that fits each of the blanks shown in the following metabolic reactions

- | | | |
|-----------------------------|---|------------------------|
| (1) Fructose + ...G..... | ⇨ | Sucrose |
| (2) RuBP +B..... | ⇨ | PGA + Phosphoglycolate |
| (3) PEP +E..... | ⇨ | Oxaloacetate |
| (4) Oxaloacetate +...D..... | ⇨ | Citrate |
| (5) Oxaloacetate +...A..... | ⇨ | Malate |
| (6) Pyruvate +.....F..... | ⇨ | Lactate |

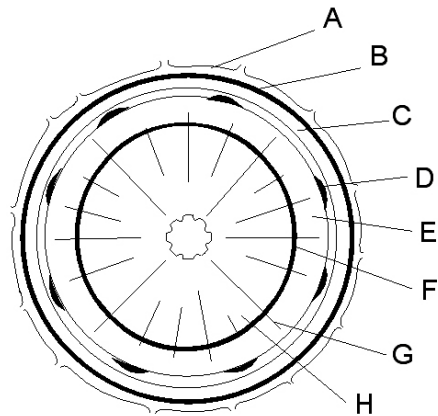
4. Some mineral elements absorbed by plants and used in their metabolic reactions are given below.

(A) Mg (B) Ca (C) Fe (D) K (E) Mo (F) Cl

Indicate the element/elements of the given list that are used by plants in each of the following processes

1. N- fixationE.....
2. Chlorophyll synthesisA.....
3. Respiratory chain reactionsC.....
4. Enzyme activationA D F (Any 2) ..
5. Geotropic responseB.....
6. Stomatal movementD

5. The diagram given below represents a cross section of a stem with secondary growth. Several tissues have been labeled A-H. Indicate the tissues which fit each of the descriptions given below.



1. Tissues with dividing cellsB F
2. Tissues which contain only dead cellsA
3. Tissues containing live cells and dead cellsH E D
4. Tissues with suberised cellsA
5. Tissues of the barkA B C D
6. Tissues performing horizontal conduction of nutrients ...G

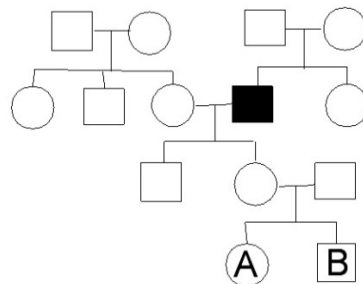
6. In a plant species flowers can be pink, red, blue or white. When a pure line red flowered plant is crossed with a pure line blue flowered plant all plants of the F1 generation produced pink flowers. When these F1 plants were crossed to each other F2 generation produced pink flowered plants, red flowered plants, blue flowered plants and white flowered plants in 9:3:3:1 ratio.

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

- If all the blue flowered plants of the F2 generation are crossed with white flowered plants blue flowered and white flowered plants will be produced in 1:1 ratio.
- If all pink flowered plants of the F2 generation are crossed with white flowered plants next generation will have plants of all the four colours .
- If all the red flowered plants of the F2 generation are crossed with white flowered plants red flowered and white flowered plants will be produced in 2:1 ratio.
- Red colour and blue colour of the flowers are produced by codominant alleles.
- White colour of the flower is due to double recessive alleles of two genes.
- In the F2 generation 4/9 of the plants are double heterozygotes.

X
✓
X
X
✓
X

7. The diagram below shows a human pedigree in which one male member has a rare genetic disease.



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

- If the disease is a sex linked recessive character the diseased person should have inherited it from his mother.
- If the disease is a sex linked recessive character daughter of the diseased person should be a carrier.
- If the disease is a sex linked recessive character A must be a carrier.
- If the disease is caused by an autosomal recessive allele probability of B being a carrier is less than 0.25.
- If the disease was caused by a dominant mutation which occurred in him it should be on his Y chromosome.
- If the disease was caused by an autosomal dominant mutation which occurred in him none of his descendants will inherit the disease.

✓
✓
X
✓
X
X

8. Some microorganisms inhabiting soil are listed below.

(A) *Streptomyces* (B) *Aspergillus* (C) *Thiobacillus* (D) *Clostridium*
 (E) *Fusarium* (F) *Agrobacterium* (G) *Pseudomonas*

Indicate the microorganism/ microorganisms involved in each of the following processes.

- N- fixationD.....
- AmonificationB (G)
- Plant root diseasesE.....
- Plant wilt diseasesE
- Oxidation of metal ionsC
- Producing antibioticsA.....

9. Some microorganisms used in food and beverage industries are listed below.
 (A) *Gluconobacter* (B) *Aspergillus* (C) *Saccharomyces* (D) *Streptococcus*
 (E) *Lentinus* (F) *Acetobacter* (G) *Mucor* (H) *Lactobacillus*
 Indicate the microorganism / microorganisms involved in each of the following.

1. Preparation of fruit juicesAny
2. Production of cheeseH/ D.....
3. Production of acetic acidF
4. Cultivation as a food itemE
5. Production of milk curdC
6. Source of vitamin rich foodC

10. This question is based on the following animals
 A) Horse B) Cat C) Shrew D) Elephant E) Dog
 Arrange the above animals in increasing order of energy expenditure per unit mass **D A E B C**

11. Indicate whether each of the following statements regarding the nervous system of animals is correct (✓) or incorrect (X).

- | | |
|--|---|
| 1. Synapses first appeared in Platyhelminthes | X |
| 2. Nematodes have longitudinal nerve cords arising from a pair of anterior ganglia | X |
| 3. Annelids differ from arthropods by having a double ventral nerve cord | X |
| 4. Nerve rings are present in Platyhelminthes and echinoderms | ✓ |
| 5. Paired dorsal cerebral ganglia are present in annelids and arthropods | ✓ |

12. Four vitamins, their main dietary sources and major functions of those are given in the following Table

Vitamins	Main dietary sources	Main functions
A) Vitamin A	a) Vegetables	i. Maintenance of a healthy skin
B) Vitamin B ₂	b) Tea	ii. Synthesis of FAD
C) Vitamin C	c) Eggs	iii. Growth of bone
D) Vitamin D	d) Wheat flour	iv. Synthesis of hemoglobin

Write 8 correct “Vitamin – a main dietary source – a main function” combinations.

- 1.....**B a i**..... 2.....**B a ii** ... 3 ...**A a i**.....4.....**D c iii**.....
 5.....**C a i** 6.....**A c i**..... 7.....**B c ii**..... 8.....**B c i**.....

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

- | | |
|---|---|
| 1. Cornea is an extension of sclera | ✓ |
| 2. Fovea does not contain rods | ✓ |
| 3. Ciliary muscles are involved in the control of diameter of pupil | X |
| 4. Vitreous humor controls the amount of light that enters the eye | X |
| 5. Retina lies just inside sclera and contains photoreceptor cells | X |

14. Some hormones of man and their functions are given below. Indicate whether each of these “hormone – function” combinations is correct (✓) or incorrect (X).

- | | |
|---|---|
| 1. Calcitonin – Increase in blood calcium level | X |
| 2. Adrenalin – Dilation of dermal blood vessels | X |
| 3. Thymosin – Maturation of lymphocytes | ✓ |
| 4. Parathormone – Excretion of phosphate ions | ✓ |
| 5. Cortisol – Breakdown of proteins | ✓ |

15. Indicate whether each of the following statements regarding the cardiac muscle fibers is correct (✓) or incorrect (X).

- | | |
|---|---|
| 1. They are connected to each other by intercalated discs. | ✓ |
| 2. They do not have A bands. | X |
| 3. They need a nervous stimulation to initiate contraction. | X |
| 4. They are innervated by peripheral nervous system. | ✓ |
| 5. They are cylindrical. | ✓ |

16. Indicate whether each of the following reactions prevail (✓) in the red blood corpuscles of the capillaries of the iliac artery or not (X). (Hb = Haemoglobin)

- | | |
|---|---|
| 1. $\text{Hb} + 4\text{CO}_2 \longrightarrow \text{Hb}(\text{CO}_2)_4$ | ✓ |
| 2. $\text{H}_2\text{CO}_3 \longrightarrow \text{H}^+ + \text{HCO}_3^-$ | ✓ |
| 3. $\text{CO}_2 + \text{H}_2\text{O} \longrightarrow \text{H}_2\text{CO}_3$ | ✓ |
| 4. $\text{Hb} + 4\text{O}_2 \longrightarrow \text{Hb}(\text{O}_2)_4$ | X |
| 5. $\text{Hb}(\text{O}_2)_4 \longrightarrow \text{Hb} + 4\text{O}_2$ | ✓ |

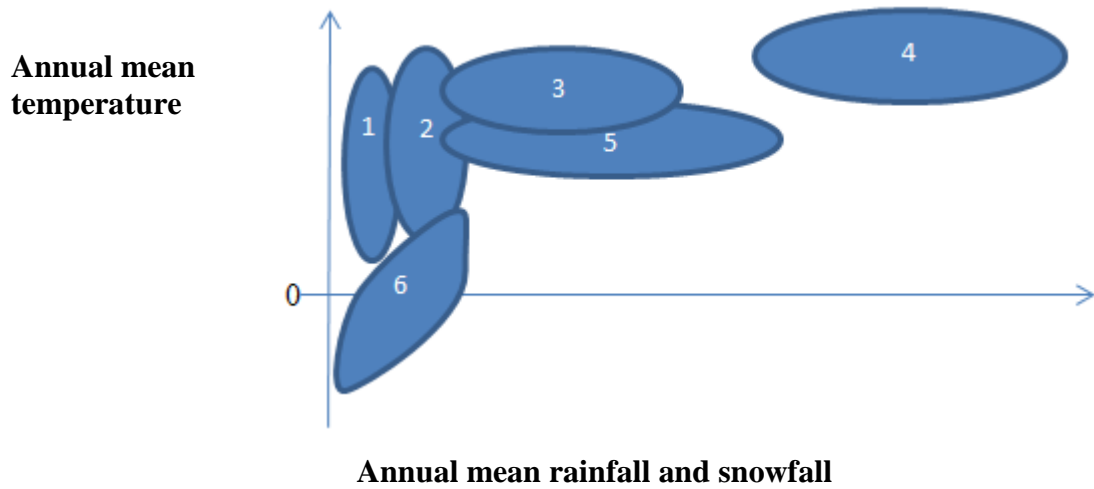
17. Indicate whether each of the following pairs of male and female structures are alike in function (✓) or not (X).

- | | |
|--|---|
| 1. Spermatogonia – Primary oocytes | X |
| 2. Primary spermatocytes – Secondary oocytes | X |
| 3. Vas deferens – Fallopian tube | ✓ |
| 4. Urethra – Vagina | ✓ |
| 5. Leydig cells – Follicle cells | ✓ |

18. Indicate whether each of the following statements regarding the purposes of treating a Rh⁻ mother with anti Rh antibodies after giving birth to a Rh⁺ baby is correct (✓) or incorrect (X).

- | | |
|---|---|
| 1. To protect her from Rh ⁺ antigens of her next baby | X |
| 2. To prevent the generation of anti Rh antibodies in her body | ✓ |
| 3. To protect her next baby | ✓ |
| 4. To induce immune responses to anti Rh antibodies | X |
| 5. To prevent the generation of anti Rh antibodies in her next baby | X |

19. The distribution of six biomes numbered from 1 to 6 in a plot of annual mean precipitation and annual mean temperature is shown in the following figure.



The above biomes are listed below. Identify each of these biomes using the correct number.

Tropical rain forests	4
Deserts	1
Tundra	6
Taiga	5
Temperate broad leaf forests	3
Temperate grasslands	2

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

- | | |
|--|---|
| 1. They contribute for a large amount of atmospheric oxygen | ✓ |
| 2. They help to control the increase in global temperature | ✓ |
| 3. They play a major role in maintaining a constant pH in the atmosphere | X |
| 4. They are the major source of snowfall | ✓ |
| 5. They help to reduce the impact of acid rains | X |