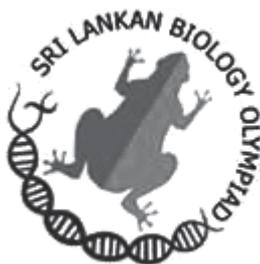


Sri Lankan Biology Olympiad 2011



Instructions:

This paper contains two parts, A and B.

Part A, 40 multiple choice questions, Total Marks 40.

Part B, 20 short answer questions, Total Marks 60.

Answer All Questions Time: 2 hours

Please mark Answers in the Answer sheet

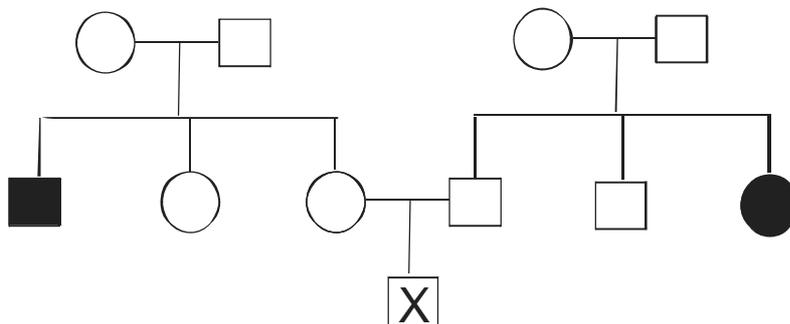
Part A - Multiple Choice Questions

- (1). Which of the following substance-function relationship is **incorrect**?
1. Sucrose - food transport
 2. Chitin - food storage
 3. Suberin - limiting permeability
 4. Hemicellulose - structural support
 5. Collagen - mechanical support
- (2). Which of the following statements of comparison between proteins and DNA is **incorrect**?
1. Both of them are heteropolymers.
 2. DNA forms a helical structure while proteins do not have helical structures.
 3. Denaturation of proteins is usually irreversible while denaturation of nucleic acids is reversible.
 4. Both of them are denatured by higher temperature and extreme pHs
 5. DNA and proteins both have internal H-bonds to stabilize the structure
- (3). Which of the following is most important in determining the structure of an enzyme ?
1. Prosthetic group
 2. Coenzyme
 3. Inhibitors
 4. Inorganic ions
 5. Activators
- (4). Which of the following is an incorrect statement regarding cyclic photo phosphorylation?
1. It produces ATP as the only end product.
 2. It occurs in the bundle sheath cells of C4 photosynthetic plants.
 3. Occurs in intergranal thylakoid membranes.
 4. Occurs only in photosynthetic bacteria.
 5. Occurs in the PSI light reactions of photosynthesis.

- (5) Which of the following is an incorrect statement regarding respiratory metabolism?
1. In the oxidation of fats acetyl Co-A is an important intermediate.
 2. Krebs cycle intermediates can be used in the synthesis of aminoacids.
 3. Oily seeds require less oxygen in respiration than starchy seeds.
 4. Substrate level phosphorylation is essential for use of glucose in respiration.
 5. Synthesis of ATP by mitochondria is associated with a proton pump mechanism.
- (6) Eight types of organisms are given below.
a. Cyanobacteria, b. Green nonsulfur bacteria, c. Purple nonsulfur bacteria, d. Fungi,
e. Red algae, f. Most plants, g. Animals, h. Nitrifying bacteria.
Select **incorrect** statement regarding the nutrition of organisms.
1. Photoautotrophs – a and f
 2. Chemoautotroph – c and h
 3. Photoheterotroph – b and c
 4. Chemoheterotroph – d and g
 5. Photoautotroph – a and e
- (7) Select the **incorrect** statement regarding fungi
1. There are free living symbiotic and parasitic forms
 2. All fungi reproduce by spores
 3. All fungi have methods of sexual reproduction
 4. The diploid stage of life cycle can be very short
 5. Cross walls of fungal hyphae have pores
- (8) Which of the following is a characteristic feature found only in Pterophyta?
1. Sporangia born on vegetative leaves
 2. Two types of spores
 3. Independent gametophyte and sporophyte
 4. Sporangium with an annulus
 5. Sporangia produced in sori
- (9) Select the correct statement.
Photoheterotrophs;
1. use CO₂ as the source of carbon.
 2. fix CO₂ by Calvin cycle
 3. oxidise inorganic compounds to obtain energy
 4. are found only among bacteria
 5. are represented by green sulphur bacteria
- (10) Which of the following is **incorrect** regarding phloem transport?
1. Phloem loading takes place against concentration gradient.
 2. Companion cells supply energy for phloem loading.
 3. In some plants companion cells have much increased membrane surface areas.
 4. Sieve tube elements are dead cells without cytoplasm.
 5. Conduction of water in xylem helps the conduction in phloem opposite direction.

- (11) Which of the following is **incorrect** regarding stomata?
1. Guard cells are sensitive to the concentration of CO₂ in the intercellular spaces of leaf.
 2. Transport of ions across cell membrane is mainly responsible for stomatal mechanism.
 3. Guard cells of some monocots are not kidney shaped.
 4. In some plant species stomata open at night.
 5. Increasing ABA concentration in a leaf results in the opening of stomata
- (12) In which of the following the function of the growth substances is **not** correctly indicated?
- | | | |
|------------------|---|--------------------------------|
| 1. Auxin | - | Inhibition of leaf abscission |
| 2. Abscisic acid | - | Inhibition of seed germination |
| 3. Ethelene | - | Ripening of fruits |
| 4. Cytokinin | - | Inhibition of apical dominance |
| 5. Gibberelin | - | Delaying senescence |
- (13) Which of the following is **incorrect** regarding plant movements?
1. Phototropism as well as geotropism are mediated through auxin.
 2. Roots and shoots have different sensitivities to auxin.
 3. Plant roots show negative phototropism
 4. Thigmonastic movements are mediated through transport of ions.
 5. Some cells of plants show chemotaxis.
- (14) Which of the following is least likely to happen when a seed matures in the ovary
1. Seed get dehydrated
 2. Enzymes are activated
 3. Growth inhibitors accumulate
 4. Growth of the embryo stops
 5. Metabolic activities are minimised
- (15) Select the correct statement. In the primary growth of Dicotyledonous plant roots,
1. root cap originate from the protoderm
 2. endodermis originate from procambium
 3. new roots originate from endodermis
 4. outer cortex develops into collenchyma
 5. protoxylem develops close to pericycle
- (16) Select the **incorrect** statement.
- In the secondary growth of plant stems,
1. new cells are added only by lateral meristems
 2. activity of meristems may be discontinuous.
 3. conduction of food substances may take place radially.
 4. bark and wood are separated by vascular cambium.
 5. all cells in the heart wood are dead.

- (17) The pedigree given below shows a family affected by sickle cell anemia. Affected individuals are represented by dark symbols. What is the probability of the individual labeled as X getting the disease.

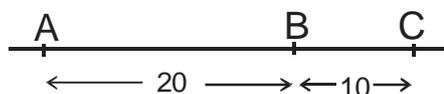


1. $1/2$ 2. $1/4$ 3. $2/9$ 4. $1/9$ 5. $1/36$

- (18) Ability to roll the tongue is determined by a dominant allele R and the inability to roll is a recessive condition with alleles rr. Assume that frequency of R in a population is 0.9. What will be the probability of a student in a class being able to roll the tongue ?

1. 0.9 2. 0.99 3. 0.81 4. 0.18 5. 0.01

- (19) Three genes A B C are linked in a chromosome with map distances as shown in the diagram below.



In a genetic cross of the type $Aa Bb Cc \times aa bb cc$ what percentage of the progeny will have the genotype $aa Bb cc$?

1. 1% 2. 2% 3. 3% 4. 4% 5. 5%

- (20) Which of the following disorder – cause relationship is incorrect?

- | | | | |
|----|----------------------|---|--------------------------|
| 1. | Albinism | - | recessive point mutation |
| 2. | Downs syndrome | - | trisomy |
| 3. | Turner syndrome | - | deletion |
| 4. | Klinefelter syndrome | - | aneuploidy |
| 5. | Polydactyly | - | dominant point mutation |

- (21) Which of the following tool-application relationship is incorrect?

- | | | | |
|----|-----------------|---|--------------------------------|
| 1. | Nitrocellulose | - | blotting |
| 2. | Vector | - | cloning |
| 3. | Agarose gels | - | transformation |
| 4. | DNA probes | - | hybridization |
| 5. | Recombinant DNA | - | genetically modified organisms |

- (22) A student observed a stained blood film of man under the microscope. Which of the following he may **not** have observed?
- A. Granulated cells each with a large spherical nucleus
 B. Ungranulated cells each with a 5 lobed nucleus
 C. Granulated irregular flat cells each with a two lobed nucleus
 D. Ungranulated cells each with a kidney shaped nucleus
1. C only 2. A only 3. A and B only 4. B and D only 5. A, B and C only
- (23) If a needle is inserted through the wall of the descending colon, which one of the following tissues may **not** be penetrated?
1. Mucosa 2. Submucosa 3. Longitudinal muscles
 4. Circular muscles 5. Serosa
- (24) Which of the following enzymes catalyze the reactions that produce amino acids as one of the end products?
1. Pepsin 2. Trypsin 3. Chymotrypsin
 4. Renin 5. Enterokinase
- (25) Which of the following is/are a function/functions of fats?
- A. Transport B. Support C. Production of energy
1. A only 2. A and B only 3. C only
 4. B and C only 5. A, B and C
- (26) Following question is based on the structures given below
- A. Nasal cavity B. Alveolar duct C. Larynx
 D. Respiratory bronchioles E. Epiglottis F. Terminal bronchioles
 G. Bronchioles H. Trachea I. Bronchus
- Which of the following indicates the correct path a molecule of carbon dioxide in an alveolus in the inferior lobe of the left lung takes on its journey to the outside?
1. B → F → D → G → I → H → C → E → A
 2. B → D → F → G → I → H → E → C → A
 3. B → D → F → G → I → H → C → E → A
 4. B → D → F → I → G → H → C → E → A
 5. B → F → D → G → I → H → E → C → A
- (27) A tuna is more likely to survive for an extended period of food deprivation than sea lion with equivalent size because
1. The tuna has a better insulation on its body surface
 2. The tuna maintains a higher basal metabolic rate
 3. The tuna expends more energy/kg of body weight than the sea lion
 4. The tuna requires much less energy in temperature regulation
 5. The tuna metabolizes its stored energy more readily than the sea lion does

- (28) Some of the lung volumes of a normal healthy adult man are as follows;
- A. Tidal volume – 500 ml B. Expiration reserve volume – 1500 ml
C. Lung volume – 6000 ml D. Residual volume – 1500 ml
- His Vital capacity and Inspiratory reserve volumes are respectively
1. 4000 ml and 1500 ml. 2. 3000 ml and 3000 ml. 3. 5500 ml and 1500 ml.
4. 4500ml and 2500 ml. 5. 4500 ml and 1500 ml.
- (29) Of the following persons who is most likely to have the lowest blood pressure?
1. A normal healthy 70 year old man after walking
2. A normal healthy 70 year old woman after meditation
3. A normal healthy 40 year old man after walking
4. A healthy 40 year old women with an agitated mind
5. A 40 year old woman with a weakened heart
- (30) Which of the following animals has the largest number of openings through which blood flows into the heart?
1. Shark 2. Starfish 3. Cockroach 4. Toad 5. Man
- (31) Which of the following hormones plays a role in thermoregulation?
- A. Thyroxin B. Adrenalin C. ACTH D. GH E. TSH
1. A, B and E only 2. A, B, C and D only 3. A, B and D only
4. A and B only 5. D and E only
- (32) Melatonin in man
1. is secreted by the pineal gland located in the hypothalamus.
2. controls menstrual rhythm.
3. has the primary function of controlling skin pigmentation.
4. controls biological clock
5. is secreted in higher amounts during the day time than at night.
- (33) Select the **incorrect** statement.
1. *Saccharomyces cerevisiae* is used in production of wine.
2. *Rhizobium* increases the nitrogen in soil
3. *Penicillium* is used for treatment of diseases
4. *Corynebacterium glutamicus* is used for production of amino acid lysine
5. *Bacillus thuringiensis israelensis* can be used to control dengue mosquito larvae
- (34) Two bird species feed on the same insect species in the bark of the trees in a tropical rain forest at two different times of the day. These bird species occupy
1. the same niche in different habitats
2. the same niche in the same habitat
3. different niches in different habitats
4. different niches in the same habitat
5. the same niche in the same ecosystem

- (35) Five types of species considered in Biodiversity conservation are given below.
A – Vulnerable species
B – Endangered species
C – Critically Endangered species
D – Extinct in the wild
What is the correct order of these species according to the importance of their conservation priority?
1. $A > B > C > D$
2. $B > C > D > A$
3. $D > C > B > A$
4. $B > D > C > A$
5. $C > D > B > A$
- (36) After the fertilization ovule of Angiosperms develops into a seed.
Which of the following statements regarding the parts of a seed is incorrect?
1. Endosperm is formed as a result of double fertilization.
2. Protective tissues of the seed has been provided by the mother plant.
3. Position of the funiculus can be identified in the seed.
4. If fertilization did not take place a haploid embryo may be formed in the seed.
5. Nucellus of the ovule is not usually represented in the seed.
- (37) Which of the following statements regarding green house effect is **incorrect**?
1. Water vapour in atmosphere contributes more than CO_2 to the green house effect.
2. CH_4 absorbs infrared radiation more efficiently than CO_2 .
3. Green house effect on earth is as old as the atmosphere.
4. CFC is not a green house gas.
5. Deserts have cool nights because of lesser green house effect.
- (38) Which of the following is **incorrect** regarding transpiration?
1. Most important factor that determines the rate of transpiration is the humidity of the atmosphere.
2. Size of the stomatal pore affects the rate of transpiration more in windy conditions.
3. Xerophytes usually have a higher rate of transpiration than mesophytes.
4. Transpiration can take place through the cuticle of plants.
5. Transpiration is needed for the transport of mineral elements to the crowns of tall plants.
- (39) Of the following animals, which one excretes the most diluted urine
1. Tilapia 2. Tortoise 3. Tuna 4. Sea turtle 5. Otter
- (40) Which of the following is **incorrect** regarding ecosystems of Sri Lanka?
1. In low country rain forests mineral cycling takes place faster than in other ecosystems.
2. Some ecosystems may receive an annual rain fall less than 1250mm.
3. Dry mixed evergreen forests are mostly secondary forests.
4. Montane forests have trees with smooth barks
5. Rain forests have the highest primary productivity

* *