ජීව විද්‍යාව I உயிரியல் I Biology I	09 E I	පැය දෙකයි இரண்டு மணித்தியாலம் Two hours

Instructions:

* *Answer **all** questions.*
* *Write your **Index Number** in the space provided in the answer sheet.*
* *Instructions are given on the back of the answer sheet. Follow those carefully.*
* *In each of the questions 1 to 50, pick one of the alternatives from (1), (2), (3), (4), (5) which is **correct** or **most appropriate** and **mark your response on the answer sheet with a cross** (x) on the number of the correct option in accordance with the instructions given on the back of the answer sheet.*

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1. Which of the following chemical elements is the most abundant in living organisms by mass?
   (1) Hydrogen (2) Carbon (3) Sodium (4) Oxygen (5) Nitrogen

2. Which of the following polymers is found only in plants?
   (1) Glycogen (2) Chitin
   (3) Ribonucleic acid (4) Inulin
   (5) Keratin

3. Which of the following is **incorrect** regarding living cells?
   (1) All organisms are composed of cells.
   (2) The basic structural unit of life is the cell.
   (3) The basic functional unit of life is the cell.
   (4) All cells have a cytoskeleton.
   (5) Any organisational level of matter below the level of the cell is not considered as living.

4. Which of the following processes takes place in the inner membrane of mitochondria?
   (1) Conversion of pyruvate to acetyl co-enzyme A
   (2) Production of NADH (3) Ethanol fermentation
   (4) Oxidative phosphorylation (5) Release of CO_2

5. At which of the following stages of the cell cycle does DNA synthesis take place?
   (1) Interphase (2) Prophase (3) Metaphase
   (4) Anaphase (5) Telophase

6. Following features were observed in a plant which is commonly found in moist terrestrial environments.
   (a) Vascular tissue
   (b) Dominant sporophyte
   (c) Requirement of external water for fertilization
   This plant may most likely belong to the phylum
   (1) Bryophyta. (2) Lycophyta.
   (3) Cycadophyta. (4) Coniferophyta.
   (5) Anthophyta.

7. Which of the following features is **not** found in class Monocotyledoneae?
   (1) Perianth (2) Trimerous flower parts
   (3) Parallel venation in leaves (4) Tap root system
   (5) Scattered vascular bundles in the stem

8. Which of the following features can be used to distinguish an annelid from a nematode?
   (1) Well developed body cavity (2) Cuticle
   (3) Hydrostatic skeleton (4) Gonads with ducts
   (5) Cerebral ganglia

9. Which of the following animal groups is poikilothermic, oviparous and possesses 12 pairs of cranial nerves?
(1) Chondrichthyes (2) Osteichthyes
(3) Amphibia (4) Reptilia
(5) Aves

10. In a molar tooth of man
(1) outer covering is composed of dentine and enamel.
(2) the thickest layer is dental cement.
(3) root is longer than the crown.
(4) nerve endings extend to dentine.
(5) the most abundant substance is enamel.

11. Which of the following is incorrect regarding insectivorous plants?
(1) They are photoautotrophic.
(2) They are saprophytic.
(3) They obtain nitrogen by digesting insects.
(4) Some of them are aquatic.
(5) They often grow in soils that do not have sufficient amount of nitrogen.

12. Which of the following may not be a reason for hypotension?
(1) Shock (2) Addison's disease
(3) Weakening of heart (4) Heavy haemorrhage
(5) Kidney damage

13. Which of the following best represents the number of eosinophils present in 1 mm^3 of blood of a healthy adult person?
(1) 25 – 100 (2) 100 – 175 (3) 60 – 600 (4) 200 – 250 (5) 250 – 350

14. Which of the following is incorrect regarding transport of plant growth substances?
(1) IAA is transported through parenchyma cells from stem apices.
(2) Cytokinins are transported from root apices through xylem.
(3) Gibberellins produced in young leaves are transported through xylem.
(4) Abscisic acid produced in root caps is transported through xylem.
(5) Ethylene produced in fruits is transported in phloem.

15. Synapses were first developed in
(1) cnidarians. (2) flat worms. (3) annelids. (4) echinoderms. (5) arthropods.

16. Which of the following occurs due to stimulation of parasympathetic nervous system?
(1) Increase in urine output (2) Reduction in sweating
(3) Relaxation of hair erector muscles (4) Dilation of skin arterioles
(5) Contraction of anal sphincter

17. Some endocrine glands of man and their locations in the body are given below. Which of the following combinations is correct?
(1) Hypothalamus – Anterior region of the mid-brain
(2) Pituitary – Immediately below the corpus callosum
(3) Thyroid – Mid region of trachea
(4) Thymus – Immediately above the heart
(5) Parathyroid – Anterior surface of thyroid

18. Pons varolii of the human brain
(1) forms a bridge between the fore-brain and hind-brain.
(2) is located in the mid-brain.
(3) controls reflex movements of the head.
(4) controls blood pressure.
(5) regulates ventilation of lungs.

19. In the human eye
(1) reflex movements are controlled by mid-brain.
(2) choroid lines about ¾ of the inner surface of sclera.
(3) ciliary body is the anterior continuation of retina.
(4) vitreous humour is found between the lens and cornea.
(5) the number of rods is about ten times as that of cones.

20. Which of the following statements regarding excretory structures of animals is correct?
(1) Salt glands of turtles are located near the cloaca.
(2) Sweat glands of man are located in the deep layers of the epidermis also.
(3) Green glands of crustaceans are found anterior to oesophagus.
(4) Malpighian tubules of insects open in the ventral surface of the body.
(5) Flame cells are found in flat worms and cnidarians.

○ Question No. 21 is based on the following ions.

(a) Na^+ (b) Cl^- (c) HCO_3^- (d) K^+ (e) H^+

21. Which of the above ions are reabsorbed in the distal convoluted tubule of the human nephron?
(1) (a) and (c) only. (2) (a), (b) and (c) only.
(3) (b) and (c) only. (4) (c), (d) and (e) only.
(5) (a), (b) and (e) only.

22. Which of the following is a supporting tissue in plants that does not contain lignin?
(1) Parenchyma (2) Collenchyma
(3) Epidermis (4) Sclerenchyma
(5) Chlorenchyma

23. Which of the following statements regarding the exoskeleton of animals is correct?
(1) Molluscs are the major group of animals that possess an exoskeleton.
(2) Sea urchins are different from other echinoderms as they have an exoskeleton.
(3) Body of some reptiles is supported only by the exoskeleton.
(4) Exoskeleton of arthropods contains carbohydrates, proteins and calcium carbonate.
(5) Body of some free living nematodes are covered by an exoskeleton.

24. In a typical vertebra of man
(1) two processes that originate from the vertebral body project laterally forming transverse processes.
(2) each transverse process bears an articular surface.
(3) two pairs of articular processes are present in the neural arch.
(4) each transverse process contains a foramen for the vertebral artery.
(5) neural spine is bifid.

25. In which of the following structures do the sperms of man develop the ability to fertilize an ovum?
(1) Seminal vesicle (2) Vagina (3) Urethra
(4) Vas deferens (5) Epididymis

26. Which of the following is an early sign of pregnancy in some women?
(1) Constipation (2) Decrease in the frequency of urination
(3) Lightening of the colour of nipples (4) Enlargement of abdomen
(5) Increase in the firmness of breasts

27. The maximum life expectancy of a human sperm after ejaculation is
(1) 12 hours. (2) 24 hours. (3) 48 hours. (4) 72 hours. (5) 96 hours.

28. Which of the following statements regarding the human ovum is correct?
(1) In a cross section, it is oval in shape.
(2) It contains a minute amount of yolk.
(3) It contains lysosomes.
(4) Its life span is about 12 – 18 hours.
(5) It becomes haploid as soon as a sperm penetrates it.

29. Which of the following is incorrect regarding parthenocarpy?
(1) Parthenocarpic fruits do not contain seeds.
(2) Parthenocarpy is the development of a fruit from an ovary without fertilization.
(3) Parthenocarpy can be induced by artificial methods.
(4) Parthenocarpy is the development of fruits with infertile seeds.
(5) In some species of plants parthenocarpy occurs naturally.

30. In the pea plant, tall trait (T) is dominant and dwarf trait (t) is recessive; purple flower colour (P) is dominant and white flower colour (p) is recessive; round seed shape (R) is dominant and wrinkled seed shape (r) is recessive. In an F_2 progeny produced by mating two F_1 plants heterozygous for all three genes, what proportion will show the fully recessive phenotype?

(1) $\frac{1}{4}$ (2) $\frac{1}{8}$ (3) $\frac{1}{16}$ (4) $\frac{1}{64}$ (5) $\frac{1}{256}$

31. Five enzymes involved in DNA replication are given below. Which of them catalyses the unwinding of the double stranded structure of DNA?

(1) Helicase
(2) DNA polymerase
(3) Primase
(4) Ligase
(5) DNA gyrase

32. Which of the following is incorrect regarding protein synthesis?

(1) Each amino acid in a protein is determined by a particular codon.
(2) Protein synthesis is regulated by 'start' and 'stop' codons.
(3) Base sequence of DNA determines the amino acid sequence in proteins.
(4) RNA polymerase catalyses the production of a copy of the DNA in transcription.
(5) Amino acids are brought to the ribosome surface by m-RNA during protein synthesis.

33. Which of the following experimental conditions would reduce transpiration without affecting photosynthesis?

(1) Transferring the plant to dry soil
(2) Increasing the level of CO_2 around the plant
(3) Decreasing the relative humidity around the plant
(4) Injecting K^+ into guard cells
(5) Injecting ABA into guard cells

34. Which of the following is most likely to occur if a plant cell with a solute potential of -0.3 MPa and a pressure potential of 0.2 MPa is placed in pure water?

(1) Water will move out of the cell.
(2) Water will move into the cell.
(3) Solutes will move out of the cell.
(4) There will be no net movement of water either into or out of the cell.
(5) Water may move into or out of the cell depending on the direction of the water potential gradient.

35. The growth of which one of the following is responsible for continued growth and elongation of leaves of grass in a lawn, following mowing by machine or grazing by animals?

(1) Apical meristem
(2) Lateral meristem
(3) Intercalary meristem
(4) Axillary buds
(5) Interfascicular cambium

Question No. 36 is based on the following sections of the atmosphere.

(a) Troposphere (b) Stratosphere (c) Mesosphere

36. Which of the above sections of the atmosphere participates/participate in the occurrence of acid rain?

(1) (a) only. (2) (a) and (b) only. (3) (b) only.
(4) (a) and (c) only. (5) (a), (b) and (c).

37. Which of the following pairs of organisms are most similar when biodiversity aspects are considered?

(1) *Puntius nigrofasciatus* and *Oreochromis mossambicus*
(2) Giant panda and *Lingula*
(3) Indian pitta and snakehead
(4) *Lantana camara* and *Chitala chitala*
(5) Blue magpie and *Hevea brasiliensis*

38. Which of the following combinations is correct in relation to the nitrogen cycle?

(1) *Thiobacillus* – conversion of atmospheric nitrogen to nitrates
(2) *Pseudomonas* – conversion of ammonia to nitrites
(3) *Nitrosomonas* – conversion of nitrites to nitrates
(4) *Azotobacter* – conversion of nitrates to atmospheric nitrogen
(5) *Clostridium* – conversion of atmospheric nitrogen to ammonia

39. Which of the following is incorrect regarding fungi?
(1) All fungi are saprophytic.
(2) All fungi show asexual reproduction.
(3) All fungi contain glycogen as a storage material.
(4) All fungi have cell walls made up of chitin.
(5) All fungi are not terrestrial.

40. Growth of which of the following groups of organisms is not desirable in the production of compost?
(1) Thermophillic bacteria
(2) Ammonifying bacteria
(3) Denitrifying bacteria
(4) Nitrifying bacteria
(5) Proteolytic bacteria

○ For each of the questions 41 to 50 one or more of the responses is/are correct. Decide which response/ responses is/are correct and then select the correct number.

If only A, B and D are correct 1
If only A, C and D are correct 2
If only A and B are correct 3
If only C and D are correct 4
If any other response or combination of responses is correct 5

Directions summarized				
1	2	3	4	5
A, B, D correct.	A, C, D correct.	A, B correct.	C, D correct.	Any other response or combination of responses correct.

41. Carbohydrates are commonly stored as starch in plant storage organs. Which of the following properties of starch make/makes it a useful storage material?
(A) It is osmotically inactive.
(B) It is easily translocated.
(C) It is chemically non-reactive.
(D) It is insoluble in water.
(E) It is a macromolecule.

42. Which of the following processes in cellular metabolism require/requires energy in the form of ATP?
(A) Glycolysis
(B) Light reactions of photosynthesis
(C) Reactions of Krebs cycle
(D) Dark reactions of photosynthesis
(E) Electron transport in aerobic respiration

43. Human stomach
(A) is located in the upper right region of the abdominal cavity.
(B) contains endocrine and exocrine tissues.
(C) secretes enzymes that are functionally similar to those in saliva.
(D) absorbs a small amount of end-products of lipid digestion.
(E) contains a fluid which has a pH value of around 4--5.

44. Which of the following is/are correct?
(A) All terrestrial plants have vascular tissues.
(B) All terrestrial plants are heterosporous.
(C) All terrestrial plants have reproductive organs protected by a sterile cell layer.
(D) All terrestrial plants except angiosperms do not show double fertilization in the life cycle.
(E) All terrestrial plants produce seeds as an adaptation to terrestrial life.

45. Which of the following is are considered as non-specific defence mechanism/mechanisms of human body?
(A) Development of antibodies as a result of a natural microbial infection
(B) Antibodies transferred from the mother to the foetus through placenta
(C) Development of inflammatory response to general infections or tissue damage
(D) Production of interferon in blood as a result of a viral infection
(E) Development of antibodies as a result of vaccination of attenuated microbial cells

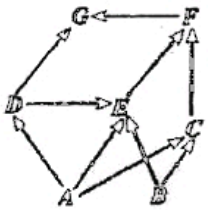
46. The bacterium which causes tetanus in man
(A) is an aerobic organism.
(B) produces an enterotoxin.
(C) is an obligate anaerobic organism.
(D) produces a neurotoxin.
(E) is a facultative anaerobic organism.

47. Which of the following features is/are common to insects and diplopods?
(A) Body divided into head, thorax and abdomen
(B) Presence of one pair of antennae
(C) Presence of three pairs of legs in thorax
(D) Absence of legs in the abdomen
(E) Presence of an exoskeleton with chitin and calcium carbonate

48. Which of the following respiratory structures is/are found in vertebrates as well as in invertebrates?
(A) Internal gills
(B) Book lungs
(C) Body surface
(D) External gills
(E) Trachea

49. Which of the following statements regarding the movement of organisms is/are correct?
(A) Pseudopodial movement is found in vertebrates.
(B) Flagellar movement is found in the spores of some fungi.
(C) Transport of excretory fluid in some nematodes involves ciliary movement.
(D) Ciliary movement is found in flat worms.
(E) Blood is circulated within the haemocoel of some crustaceans by ciliary movement.

○ Question No. 50 is based on the following food web of a terrestrial ecosystem.



50. Which of the following statements regarding the above food web is/are correct?
(A) Removal of *E* may result in an increase of *D*.
(B) There are three species belonging to the third trophic level.
(C) *F* may be an insectivore.
(D) *E* is an omnivore.
(E) *D* may be cobra.

Part A - Structured Essay

*Answer **all** questions on this paper itself.*
(Each question carries 10 marks.)

1. (A) (i) What is the most abundant group of biological molecules on earth?

.....

(ii) Name the nitrogen containing structural polymer found in exoskeleton of some animals.

.....

(iii) (a) Name a reducing disaccharide.

.....

(b) Name a non-reducing disaccharide.

.....

(iv) (a) In the space given below, show using suitable diagrams, how a peptide bond is formed between two amino acid molecules.

(b) What is the test used to detect the presence of peptide bonds in proteins?

.....

(v) (a) What is a glycosidic bond?

.....

(b) Name two biological compounds containing glycosidic bonds.

.....

(vi) What are the three major chemical constituents of a nucleotide?

.....

.....

.....

(vii) Name three nucleotides and state one function of each of them.

Nucleotide	Function
.....	.....
.....	.....
.....	.....

(B) (i) State benefits of a systematic classification in the study of organisms.

.....

.....

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.....

(ii) What are the molecular level criteria used in the classification of organisms?

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(iii) Arrange the major taxa used in the classification of organisms in the order of increasing number of common characteristics.

.....

(C) (i) State the common characteristics of viruses.

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(ii) Some characteristics of phylum Echinodermata are given in column 1 of the following table. Indicate the presence of these characters in each of the animals listed in columns 2 – 5 using a (✓) mark in the appropriate cage.

Character	Sand dollar	Sea cucumber	Sea lily	Brittle star
Flat body				
Presence of arms				
Mouth and anus at opposite sides/ends of the body				

2. (A) (i) State the types of asexual reproduction seen in the following organisms.

(a) *Paramecium* : .....

(b) *Plasmodium* : .....

(c) *Hydra* : .....

(d) *Spirogyra* : .....

(e) *Agaricus* : .....

(ii) State the advantages of asexual reproduction.

.....

.....

.....

(iii) Write in the correct column, the diploid and haploid cells seen during spermatogenesis of man.

Diploid	Haploid
.....	.....
.....	.....
.....	.....

(iv) Name the hormones involved in spermatogenesis of man and state the endocrine glands that secrete each of them.

Hormone	Gland
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....

(B) (i) What is menopause?

.....

(ii) State the age range of normal healthy women at which menopause occurs.

.....

(iii) What is the reason for menopause?

.....

(iv) What is the disorder of the skeletal system associated with menopause?

.....

(C) (i) Name three vegetative propagules of plants widely used in agriculture for asexual propagation. Give one crop as an example for each propagule.

Propagule	Name of crop
.....	.....
.....	.....
.....	.....

(ii) (a) What is meant by totipotency in plants?

.....

(b) State two uses of tissue culture other than micro-propagation of plants.

.....

.....

(iii) State major features seen in the life cycle of angiosperms which can be considered as evolutionary adaptations for land habitat.

.....

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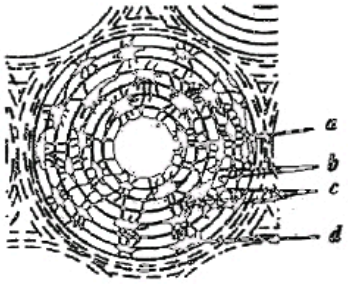
.....

.....

.....

3. (A) Questions A(i) – A(iv) are based on the diagram given below.



(i) What is the structure shown in the above diagram?

.....

(ii) Name the structures labelled as *a* – *d* in the above diagram.

a ..... *b* .....

c ..... *d* .....

(iii) Name the two main types of cells found in the structure shown in the above diagram and state the main function of each of them.

Type of cell	Main function
.....	.....
.....	.....

(iv) What are the structures found in *a*?

.....

(B) (i) What is known as a fontanelle in humans?

.....

(ii) Name the main fontanelles found in humans.

.....

.....

(iii) State the main functions of fontanelles.

.....

.....

(iv) What are known as sinuses in the cranium?

.....

.....

(v) Name the cranial bones that do not contain sinuses.

.....

(C) (i) Give three examples for chlorinated hydrocarbon pesticides.

.....

(ii) State the impacts of chlorinated hydrocarbon pesticides.

.....

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(iii) What are the different types of national reserves found in Sri Lanka?

.....

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4. (A) (i) What features of microorganisms are beneficial in using them in microbial industries?

.....

.....

.....

(ii) Give one example each for microbial industries which use the following.

(a) Microbial cells : .....

(b) Microbial metabolic end-products : .....

(c) Microbial processes : .....

(d) Genetically modified microorganisms : .....

(iii) State three types of microbial associations of soil microorganisms and roots of higher plants.

.....

.....

.....

(iv) State three specific roles of soil microorganisms with reference to promoting plant growth.

.....

.....

.....

(v) Name the three major steps in water treatment in an urban water treatment plant and state one function of each step.

Step	Function
.....	.....
.....	.....
.....	.....

(B) (i) What is meant by the following terms used in protein synthesis?

(a) Transcription : .....

.....

(b) Translation : .....

.....

(ii) What is the role of r-RNA in protein synthesis?

.....

(iii) (a) What is a codon?

.....

(b) How many codons are present in the genetic code?

.....

(iv) Which of the molecules involved in protein synthesis contain each of the following?

(a) Anticodon : .....

(b) Codon : .....

(v) Name the two major enzymes used in recombinant DNA technology and state the main function of each of them.

Enzyme	Main function
.....	.....
.....	.....

(vi) What are the two events unique to meiosis that contribute to the production of genetic variation in daughter cells?

.....

.....

(vii) At what stage of cell division does each of the following occur?

(a) Replication of chromosomes .....

(b) Division of centromere .....

(c) Arrangement of chromosomes on the equatorial plate .....

(d) Re-formation of nuclear membrane .....

(C) (i) What is the gas released in light reactions in photosynthesis?

.....

(ii) What is the source of this gas?

.....

(iii) State the two major factors that affect photosynthesis.

.....

.....

(iv) Name the two products of light reactions that are used for the synthesis of carbohydrates in dark reactions of photosynthesis.

.....

(v) (a) What is the function of RuBP carboxylase enzyme in photosynthesis?

.....

(b) Where is this enzyme located?

.....

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கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2015 ஓகஸ்ற்
General Certificate of Education (Adv. Level) Examination, August 2015

ජීව විද්‍යාව II
உயிரியல் II
Biology II

09 E II

Part B - Essay

Instructions:

* *Answer four questions only.*
Give clear labelled diagrams where necessary.
(Each question carries 15 marks.)

5. (*a*) Describe the fine structure of a mitochondrion using a fully labelled diagram.

   (*b*) Explain the role of mitochondria in cellular respiration.

6. (*a*) Describe the structure of human skin.

   (*b*) Explain the role of human skin in homoeostasis.

7. (*a*) What are the major materials generally transported in vascular plants?

   (*b*) State the sources of those materials.

   (*c*) Briefly describe the processes and mechanisms involved in the transport of those materials in vascular plants.

8. Describe the different non-Mendelian patterns of inheritance with suitable examples.

9. (*a*) Describe the nature of normal microbiota of the human body.

   (*b*) Explain the properties of pathogenic bacteria that contribute to their disease causing ability.

10. Write short notes on the following.

    (*a*) DNA fingerprinting and its applications

    (*b*) Implantation of human embryo

    (*c*) Modes of heterotrophic nutrition

* * *