G.C.E. (A/L) Examination - 2019

09 - Biology (OLD)

Distribution of Marks

- **Paper I - 1 x 50 = 50**

Paper II

Part A - Structured Essay (Answer all four questions)

Question No. 01 - 100

Question No. 02 - 100

Question No. 03 - 100

Question No. 04 - 100

100 x 4 = 400

Part B - Essay (Answer four questions only)

Question No. 05 - 150

Question No. 06 - 150

Question No. 07 - 150

Question No. 08 - 150

Question No. 09 - 150

Question No. 10 - 150

150 x 4 = 600

Total Marks = 400 + 600 = 1000

Paper II Final Marks = 100

Common Techniques of Marking Answer Scripts.

It is compulsory to adhere to the following standard method in marking answer scripts and entering marks into the mark sheets.

1. Use a red color ball point pen for marking. (Only Chief/Additional Chief Examiner may use a mauve color pen.)
2. Note down Examiner's Code Number and initials on the front page of each answer script.
3. Write off any numerals written wrong with a clear single line and authenticate the alterations with Examiner's initials.
4. Write down marks of each subsection in a △ and write the final marks of each question as a rational number in a □ with the question number. Use the column assigned for Examiners to write down marks.

Example: **Question No. 03**

(i) ..... √ △ 4/5
....

(ii) ..... √ △ 3/5
....

(iii) ..... √ △ 3/5
....

03 (i) 4/5 + (ii) 3/5 + (iii) 3/5 = □ 10/15

MCQ answer scripts: (Template)

1. Marking templets for G.C.E.(A/L) and GIT examination will be provided by the Department of Examinations itself. Marking examiners bear the responsibility of using correctly prepared and certified templates.
2. Then, check the answer scripts carefully. If there are more than one or no answers Marked to a certain question write off the options with a line. Sometimes candidates may have erased an option marked previously and selected another option. In such occasions, if the erasure is not clear write off those options too.
3. Place the template on the answer script correctly. Mark the right answers with a 'V' and the wrong answers with a 'X' against the options column. Write down the number of correct answers inside the cage given under each column. Then, add those numbers and write the number of correct answers in the relevant cage.

Structured essay type and assay type answer scripts:

1. Cross off any pages left blank by candidates. Underline wrong or unsuitable answers. Show areas where marks can be offered with check marks.

2. Use the right margin of the overland paper to write down the marks.

3. Write down the marks given for each question against the question number in the relevant cage on the front page in two digits. Selection of questions should be in accordance with the instructions given in the question paper. Mark all answers and transfer the marks to the front page, and write off answers with lower marks if extra questions have been answered against instructions.

4. Add the total carefully and write in the relevant cage on the front page. Turn pages of answer script and add all the marks given for all answers again. Check whether that total tallies with the total marks written on the front page.

Preparation of Mark Sheets.

Except for the subjects with a single question paper, final marks of two papers will not be calculated within the evaluation board this time. Therefore, add separate mark sheets for each of the question paper. Write paper 01 marks in the paper 01 column of the mark sheet and write them in words too. Write paper II Marks in the paper II Column and wright the relevant details. For the subject 51 Art, marks for Papers 01, 02 and 03 should be entered numerically in the mark sheets.

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පැරණි නිර්දේශය/பழைய பாடத்திட்டம்/Old Syllabus

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2019 අගෝස්තු
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2019 ஓகஸ்ற்
General Certificate of Education (Adv. Level) Examination, August 2019

ජීව විද්‍යාව I உயிரியல் I Biology I	09 E I	05.08.2019/1300 – 1500 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 them carefully.*
* *In each of the questions from* **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*** (×) *on the number of the correct option in accordance with the instructions given on the back of the answer sheet.*

1. In the scientific method,
   (1) it is essential to have a control experiment.
   (2) hypotheses are confirmed by supporting evidences.
   (3) theories that are formulated are not changed subsequently.
   (4) predictions are not made.
   (5) observations are not essential to formulate hypotheses.

2. Which of the following statements is correct regarding the importance of physical properties of water for organisms?
   (1) High adhesive forces are important for water skaters.
   (2) High surface tension is important for absorption of minerals by plants.
   (3) High specific heat capacity supports cooling of the body surface of terrestrial animals.
   (4) Low transparency of light helps to grow plants in deep areas of water bodies.
   (5) High latent heat of fusion helps organisms to survive at low temperatures.

3. Which of the following statements regarding organelles is correct?
   (1) Ribosomes consist of large and small subunits composed of proteins and t-RNA.
   (2) Rough endoplasmic reticulum is composed of tubular sacs.
   (3) Golgi complex synthesizes steroids.
   (4) Lysosomes transport residue materials out of cells by exocytosis.
   (5) Peroxisomes synthesize hydrogen peroxide.

4. Select the correct statement regarding cell junctions.
   (1) Cell walls of adjoining cells are joined at cell junctions.
   (2) Plasmadesmata are found in animal cells.
   (3) Anchor junctions allow the exchange of materials between adjacent cells.
   (4) Tight junctions prevent leakage of substances through inter-cellular space.
   (5) Gap junctions are weak connections found between epithelial cells of the skin.

5. Which of the following statements regarding the cell cycle is correct?
   (1) DNA synthesis takes place during G1 phase.
   (2) Nuclear envelope is reformed during anaphase.
   (3) Alignment of chromosomes in the middle of the cell takes place in metaphase.
   (4) Condensation of chromosomes takes place in S phase.
   (5) Formation of spindle takes place in G2 phase.

[See page two

6. Which of the following statements regarding glycolysis is correct?
   (1) It takes place only under aerobic conditions.
   (2) It occurs in the cytoplasm.
   (3) Glucose is first converted to fructose-6-phosphate.
   (4) Its end product is Acetyl CoA.
   (5) The total number of ATP molecules produced from one glucose molecule is two.

7. Select the correct statement regarding Krebs cycle.
   (1) It takes place in the cytoplasm.
   (2) It operates in both aerobic and anaerobic conditions.
   (3) During cellular respiration, most of the ATP is produced in the Krebs cycle.
   (4) Carbon dioxide is produced in the Krebs cycle.
   (5) Oxidation of $FADH_2$ takes place in the Krebs cycle.

8. Kingdom Protista
   (1) does not contain organisms with cilia.
   (2) does not contain multicellular heterotrophs.
   (3) does not contain organisms having cell walls.
   (4) contains organisms with the same origin.
   (5) does not contain organisms that store starch.

9. Grouping of organisms based on which of the following is an example for natural classification?
   (1) Number of legs
   (2) Number of stamens in the flowers
   (3) DNA base sequence
   (4) Presence of claws
   (5) Colour of feathers

10. Select the correct statement regarding kingdom Plantae.
   (1) All heterosporous plants do not need external water for fertilization.
   (2) All homosporous plants do not have vascular tissues.
   (3) All plants that do not bear flowers are seedless.
   (4) All plants with vascular tissues do not have dominant gametophytes.
   (5) All plants with photosynthetic gametophytes do not have vascular tissues.

11. Which of the following can be used to determine the class of an animal that belongs to phylum Platyhelminthes?
   (1) Presence of mouth
   (2) Absence of eye spots
   (3) Structure of the body covering
   (4) Absence of scolex
   (5) Leaf-like body

12. When examined under the light microscope, a cross section of the duodenum of man can be distinguished from the cross sections of other regions of the alimentary canal due to presence of
   (1) villi.
   (2) longitudinal muscles.
   (3) circular muscles.
   (4) lacteals.
   (5) Brunner's glands.

13. Which of the following indicates the correct pathway that a red blood corpuscle in the hepatic artery in man reaches the lung?
   (1) hepatic vein → inferior vena cava → heart → pulmonary vein
   (2) hepatic portal vein → hepatic vein → inferior vena cava → heart → pulmonary artery
   (3) hepatic vein → inferior vena cava → heart → pulmonary artery
   (4) hepatic portal vein → inferior vena cava → heart → pulmonary artery
   (5) hepatic portal vein → hepatic vein → inferior vena cava → heart → pulmonary vein

[See page three

14. Select the correct statement regarding white blood corpuscles.
(1) Eosinophils act against parasitic infections.
(2) Basophils destroy bacteria by phagocytosis.
(3) Monocytes produce antibodies.
(4) Lymphocytes secrete heparin.
(5) Neutrophils secrete histamine.

15. Which of the following statements regarding transport of materials in plants is correct?
(1) Endodermis acts as a barrier for the passage of all ions from cortex to xylem.
(2) Vacuolar pathway is less resistant than apoplast and symplast pathways for water movement in plants.
(3) Pits do not play a role in the transport of water through xylem.
(4) Transport of K^+ from guard cells into adjoining epithelial cells helps to open stomata in the presence of sunlight.
(5) Transport of K^+ into guard cells during stomatal movement is an active process.

16. Select the correct statement regarding the transport of materials in phloem.
(1) Phloem transports growth substances and chemicals applied to plants.
(2) Phloem transport is unidirectional.
(3) Starch is the major organic substance transported in phloem.
(4) Inorganic ions are not transported in the phloem.
(5) Removal of organic substances from sieve tubes does not require ATP.

17. Spinal nerves of man consist of
(1) axons and dendrites of sensory neurons.
(2) axons and dendrites of motor neurons.
(3) axons of sensory neurons and dendrites of motor neurons.
(4) axons of motor neurons and dendrites of sensory neurons.
(5) axons of sensory neurons and axons of motor neuons.

18. Select the correct statement regarding autonomic nervous system of man.
(1) Stimulation of sympathetic division increases the secretion of saliva.
(2) Skin receives both sympathetic and parasympathetic nerves.
(3) Effectors for both sympathetic and parasympathetic divisions are glands, cardiac muscle and smooth muscles.
(4) Parasympathetic activity predominates in stressful conditions.
(5) Sympathetic preganglionic axons are longer than parasympathetic preganglionic axons.

19. Which of the following combinations is **incorrect** regarding sensory reception in humans?
(1) Olfactory epithelium - Mechanoreception
(2) Free nerve endings - Thermoreception
(3) Taste buds - Chemoreception
(4) Rods - Photoreception
(5) Organ of Corti - Mechanoreception

20. ADH in humans
(1) is produced in the posterior pituitary.
(2) is secreted in response to low osmotic pressure of blood.
(3) increases blood pressure by dilation of arterioles.
(4) acts on proximal and distal convoluted tubules of nephrons.
(5) conserves water in the body by decreasing urine volume.

21. A blood constituent remaining in glomerular capillaries after ultra-filtration in a healthy normal adult person is
(1) amino acids. (2) creatinine. (3) plasma proteins.
(4) mineral salts. (5) urea.

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22. In the human skull,
(1) cranium is made up of 21 bones.
(2) maxilla is the only movable bone.
(3) sphenoid, nasal, maxilla and frontal contain sinuses.
(4) frontal contributes to form cranium and face.
(5) mastoid process of the temporal bone forms part of the zygomatic arch.

23. Which of the following statements is correct regarding human upper limb?
(1) Shallow ball and socket joint in the glenoid cavity of humerus permits movement in a wide range.
(2) Elbow joint formed by distal end of humerus and the radius permits flexion and extension of the fore arm.
(3) All carpal bones contribute to form the wrist joint.
(4) Phalanges in three fingers articulate with carpal bones and with each other by hinge joints.
(5) Special joint between the first metacarpal and relevant carpal bone permits opposability of the thumb.

24. A few characteristics of some muscle cells are given below.
a - Elasticity **b** - Unbranched **c** - Fatigue easily
d - Uni-nucleate **e** - Presence of sarcomeres
Which of the above characteristics are shown by the muscle cells in the small intestine of man?
(1) **a**, **b** and **c** (2) **a**, **b** and **d** (3) **a**, **c** and **d**
(4) **b**, **c** and **d** (5) **b**, **d** and **e**

25. Select the correct statement regarding plant movements.
(1) Tropic movements are a type of growth movement exhibited by the whole plant in a given time.
(2) Auxins are responsible for tropic movements.
(3) Equal distribution of auxins in stem apex is responsible for its phototropic movement.
(4) Pollen tubes growing towards ovules show a nastic movement.
(5) Direction of the stimulus is important for nastic movement.

26. Which of the following combinations is **incorrect** regarding the modes of asexual reproduction in organisms?

	Mode of asexual reproduction	**Examples**
(1)	Binary fission	- Bacteria, *Paramecium*
(2)	Multiple fission	- *Spirogyra, Amoeba*
(3)	Budding	- Cnidarians, Yeast
(4)	Fragmentation	- Ribbon worms, *Planaria*
(5)	Formation of spores	- *Agaricus, Selaginella*

27. Human sperms acquire motility and ability to fertilize an ovum in the
(1) testis. (2) epididymis. (3) vas deferens.
(4) ejaculating duct. (5) prostate gland.

28. A feature seen in the sexual reproduction of all land plants is
(1) non-requirement of external water for fertilization.
(2) internal fertilization.
(3) dominant sporophyte.
(4) production of two types of spores.
(5) having two types of sporophytes.

29. Select the correct statement regarding the life cycle of *Pogonatum*.
(1) Gametophyte is dioecious.
(2) Sporophyte is photosynthetic.
(3) Sporophyte lives longer than the gametophyte.
(4) Archegonium contains more than one ovule.
(5) Diploid sporophyte depends on the gametophyte and consists of only foot and sporangium.

[See page five

30. Which of the following statements is correct regarding the fertilization in angiosperms?
(1) Pollen grain can germinate before it is placed on stigma.
(2) Generative nucleus divides forming three sperm nuclei.
(3) Double fertilization is not a unique characteristic of angiosperms.
(4) Endosperm is developed from the triploid nucleus.
(5) Fertilization is essential for the development of fruit from the ovary.

31. In a test cross, an organism with
(1) dominant trait is crossed with one of its parents.
(2) recessive trait is crossed with one of its parents.
(3) dominant trait is crossed with an organism showing recessive trait.
(4) recessive trait is crossed with an organism showing dominant trait.
(5) dominant trait is crossed with an organism of the F_1 generation.

32. Inbreeding
(1) increases genetic diversity.
(2) always increases productivity in plants.
(3) increases hybrid vigour.
(4) contributes to develop pure lines.
(5) occurs naturally in all plants.

33. A cross between two individuals having heterozygous genotype for two characters usually results in 9 : 3 : 3 : 1 ratio of phenotypes in their progeny. In some cases however, the phenotypic ratio in the progeny is 3 : 1. This may be due to
(1) codominance.
(2) interaction of genes.
(3) incomplete dominance.
(4) polygenic inheritance.
(5) gene linkage.

34. In the earth atmosphere,
(1) small dust particles are present in stratosphere.
(2) water vapour is present in mesosphere.
(3) ozone layer is found between stratosphere and troposphere.
(4) temperature continuously decreases from sea level to mesosphere.
(5) mesosphere is present from about 50 km to about 85 km above sea level.

35. Which of the following three organisms belong to the same group when endemism or indigenousness or exoticness or migration is considered?
(1) Black ruby barb, snakehead, slender loris
(2) *Hevea brasiliensis, Caryota urens, Dipterocarpus zeylanicus*
(3) Indian fly catcher, barn swallow, Indian pitta
(4) *Loris tardigradus, Garcinia quaesita, Ophicephalus striatus*
(5) Tilapia, rubber, Indian pitta

36. Which one of the following organisms indicate the correct chronological order when their origin is considered?
(1) Mosses, insects, conifers, dinosaurs
(2) Protists, first land plants, trilobites, modern fish
(3) Mollusks, modern fish, early mammals, man
(4) Crustaceans, first land animals, modern fish, dinosaurs
(5) Trilobites, amphibians, first land plants, reptiles

37. Cyanobacteria are
(1) freshwater organisms which use atmospheric nitrogen as source of energy for synthesizing food.
(2) prokaryotic photosynthetic organisms some of which fix atmospheric nitrogen.
(3) organisms that contain heterocysts, endospores and akinetes.
(4) prokaryotic organisms that reproduce by sexual and asexual methods.
(5) organisms having chloroplasts for photosynthesis and heterocysts for nitrogen fixation.

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38. Viruses
(1) multiply in dead cells of the host.
(2) grow in laboratory culture media.
(3) could be retained by a 0.45 µm micro-filter.
(4) cause lysis of some host cells.
(5) cause mad cow disease.

39. Select the correct combination regarding the use of microorganisms in commercial production of some enzymes.

	Enzyme	**Microorganism used in the production**
(1)	Amylase	*Saccharomyces cerevisiae*
(2)	Lipase	*Rhizopus* sp.
(3)	Cellulase	*Aspergillus oryzae*
(4)	Protease	*Saccharomyces cerevisiae*
(5)	Invertase	*Aspergillus niger*

40. Two species of microorganisms that cause food intoxication are
(1) *Vibrio cholerae* and *Clostridium botulinum*.
(2) *Salmonella typhi* and *Shigella* sp.
(3) *Clostridium botulinum* and *Salmonella typhi*.
(4) *Staphylococcus aureus* and *Vibrio cholerae*.
(5) *Staphylococcus aureus* and *Clostridium botulinum*.

● **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 summarised				
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. Which of the following statements regarding cofactors is/are correct?
(A) They are non-protein components.
(B) They are always needed for enzyme activity.
(C) They could be permanently bound to enzyme molecule.
(D) They could be temporarily bound to enzyme molecule.
(E) They are always organic compounds.

42. Select the correct statement/statements regarding nutrition of organisms.
(A) Parasitism is a form of symbiosis.
(B) *Rhizobium* is heterotrophic.
(C) Orchids are mutualistic.
(D) Holozoic nutrition consists of five main steps.
(E) *Cuscuta* is autotrophic.

43. Which of the following parts of the human brain is/are involved in the regulation of normal inspiration and expiration?
(A) Cerebellum
(B) Hypothalamus
(C) Pons Varolii
(D) Medulla oblongata
(E) Red nuclei

[*See page seven*

44. Which of the following is/are a function/functions of medulla oblongata of man?
(A) Regulation of heart beat
(B) Control of blood pressure
(C) Control of reflex movements of eye muscles
(D) Control of involuntary reflexes
(E) Maintaining posture

45. Which of the following comparisons is/are correct regarding nitrogenous waste products of animals?

		Ammonia	**Urea**	**Uric acid**
(A)	Toxicity	High	Low	Least
(B)	Water solubility	High	Low	Least
(C)	Energy cost in production	High	Low	Low
(D)	Water loss during excretion	High	Low	Least
(E)	Carbon loss due to excretion	Low	High	Low

46. Which of the following statements is/are correct regarding human female reproductive cycle?
(A) Ovarian cycle consists of a follicular phase and a luteal phase.
(B) Small secondary follicles in the ovary begin to enlarge during the menstrual phase of the uterine cycle.
(C) LH surge triggers ovulation and shedding of the uterine lining to nourish the released ovum.
(D) If ovum is not fertilized, corpus luteum becomes corpus albicans terminating the secretory phase of the uterine cycle.
(E) If the ovum is fertilized, corpus luteum begins to secrete progesterone and estrogen which continues throughout the pregnancy.

47. Which of the following is/are required for transcription of DNA?
(A) DNA helicase (B) A single strand of DNA
(C) RNA polymerase (D) Gyrase
(E) Ribosomes

48. Which of the following biomes is/are found in the tropical regions?
(A) Savanna (B) Deserts (C) Taiga (D) Chaparral (E) Tundra

49. Genetically modified organisms
(A) carry one or more genes originated in other organisms.
(B) are very similar to their mother organism except for one or a few traits.
(C) are accepted by public as safe.
(D) have not been released to the environment so far.
(E) are produced by hybridizing unrelated organisms.

50. Which of the following combination/combinations is/are correct with respect to nutrition of microorganisms?

	Nutritional type	**Source of energy**	**Source of carbon**	**Example**
(A)	Photoautotrophic	Light	Carbon dioxide	Green sulphur bacteria
(B)	Chemoautotrophic	Organic chemicals	Carbon dioxide	*Nitrosomonas*
(C)	Chemoautotrophic	Inorganic chemicals	Carbon dioxide	*Nitrobacter*
(D)	Chemoheterotrophic	Organic chemicals	Organic carbon	Fungi
(E)	Photoheterotrophic	Light	Organic carbon	Purple sulphur bacteria

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இலங்கைப் பரீட்சைத் திணைக்களம்

අ.පො.ස. (උ.පෙළ) විභාගය/ க.பொ.த. (உயர் தர)ப் பரீட்சை - 2019

පැරණි නිර්දේශය/ பழைய பாடத்திட்டம்

විෂයය අංකය / பாட இலக்கம் **09**

විෂයය / பாடம் **Biology**

ලකුණු දීමේ පටිපාටිය/புள்ளி வழங்கும் திட்டம்
I පත්‍රය/பத்திரம் I

ප්‍රශ්න අංකය / வினா இல.	පිළිතුරු අංකය / விடை இல.	ප්‍රශ්න අංකය / வினா இல.	පිළිතුරු අංකය / விடை இல.	ප්‍රශ්න අංකය / வினா இல.	පිළිතුරු අංකය / விடை இல.	ප්‍රශ්න අංකය / வினா இல.	පිළිතුරු අංකය / விடை இல.	ප්‍රශ්න අංකය / வினா இல.	පිළිතුරු අංකය / விடை இல.
01.	2	11.	3	21.	3	31.	3	41.	2
02.	5	12.	5	22.	4	32.	4	42.	1
03.	4	13.	3	23.	5	33.	5	43.	4
04.	4	14.	1	24.	2	34.	5	44.	1
05.	3	15.	5	25.	2	35.	3	45.	1
06.	2	16.	1	26.	2/ 5	36.	1	46.	5
07.	4	17.	any	27.	2	37.	2	47.	5
08.	2	18.	3	28.	2	38.	4	48.	3
09.	3	19.	1	29.	1/2	39.	2	49.	3
10.	4	20.	5	30.	4	40	5	50	2

✪ විශේෂ උපදෙස්/ விசேட அறிவுறுத்தல் :

එක් පිළිතුරකට/ ஒரு சரியான விடைக்கு ලකුණු 01 බැගින්/புள்ளி வீதம்

මුළු ලකුණු/மொத்தப் புள்ளிகள் 1 × 50 = 50

Part A - Structured Essay

1. **(A) (i) State three characteristics of living organisms.**

- Order and organization
- Metabolism
- Growth and development
- Irritability and coordination
- Adaptation
- Reproduction
- Heredity and evolution **any 3 pts**

(ii) Explain the primary, secondary, tertiary and quaternary structures of proteins.

(a) Primary structure: Linear sequence of amino acids **1 pt**

(b) Secondary structure: Helical / pleated sheet structure **1 pt**

(c) Tertiary structure: Globular structure of polypeptide chain (formed due to bending and folding of polypeptide chain) **1 pt**

(d) Quaternary structure: Aggregation of two or more polypeptides to form a complex structure **1 pt**

(iii) Briefly explain the structure of a vacuole found in plant cells.

A large, liquid filled structure bound by tonoplast **1 pt**

(iv) State four functions of vacuoles in plant cells.

- Maintain water balance
- Give turgidity/ support
- Produce colours (in some with sap pigments)
- Stores water/ sugars/ ions/ pigments/ storage function
- (provide pathway to) water transport **any 4 pts**

(v) State three functions of smooth endoplasmic reticulum that are not performed by rough endoplasmic reticulum.

- Detoxification
- Storing calcium ions/ Ca^{2+}
- Synthesis of steroids / carbohydrates **3 pts**

(B) (i) State the main difference that can be seen between animal cells and plant cells during cytokinesis.

In animal cells cleavage furrows are formed whereas in plant cells cell plates are formed.

1 pt

(ii) What is kinetochore?

Complex / Structure of proteins on either side of centromere / associated with centromere to which microtubules / spindle fibers attach. **1 pt**

(iii) State the three types of cofactors of enzymes and give one example for each of them.

Type of cofactor	**Example**
(a) Co- enzymes	NAD^+/ $NADP^+$/ ATP/co-enzyme A/thiamin/Folic acid/Vitamin B_{12}
(b) Prosthetic groups	FAD/ Heam / Biotin / Fe / FMN
(c) Inorganic ions	Mg^{2+}/ Cl^-/Zn^{2+}/ $H_2PO_4^-$/HPO_4^{2-}/SO_4^{2-}/Mn^{2+}/Cu^{2+}/ MnO^-_4 **6 pts**

(iv) Name the three structural components of ATP.

- Ribose sugar
- Adenine
- (Three) phosphate groups **3 pts**

(C) (i) Write the scientific name of Sri Lankan leopard.

Panthera pardus kotiya **1 pt**

(ii) State the rules adopted by biologists in naming organisms.

- Two species cannot have the same name.
- Each species has a generic name and a specific name / specific epithet.
- Name is Latinized.
- Written in Roman scripts/ English.
- Underlined when hand written.
- Italicized when printed.
- First letter of generic name is capitalized/ upper case.
- Specific name/ Specific epithet is in simple letters/ lower case.
- Name of the person who gave the name to the organism is indicated by a capital letter/ in full/as an abbreviation at the end.
- Third name can be used to indicate sub species/ variety. **10 pts**

(iii) Name the main storage substance of *Allomyces*.

Glycogen **1 pt**

(iv) The main nitrogenous excretory product of the animal species belonging to a particular class varies according to the environment where they live. What is this class?

Osteichthyes **1 pt**

(v) State the symmetry of adult sea cucumbers.

Pentaradial **1 pt**

Total 40 pts

40 X 2 ½ = 100 marks

2.(A) (i) (a) State two deficiency symptoms of vitamin B_5 in man.

- Fatigue
- Numbness **2 pts**

(b) Write the dentition of a normal healthy adult man.

Incisors/ I	Canines/C	Premolars/PM	Molars/M
2/2	1/1	2/2	3/3

1 pt

(ii) (a) In man, enterogastrone is secreted by

duodenum **1 pt**

(b) What is the function of enterogastrone in man?

Reduce/ delays stomach movements/ emptying of stomach / Gastric inhibition **1 pt**

(iii) (a) Surface: volume ratios of two animals are as follows.

Animal A: 8.3 cm^{-1} **Animal B: 0.25 cm^{-1}**

Which of the above animals may respire through the body surface?

A **1 pt**

(b) Name the muscles involved in the normal inspiration and expiration of man.

- External intercostal muscles
- Diaphragm muscles / Diaphragm **2 pts**

(iv) Name a group of organisms having each of the following excretory structures.

(a) Contractile vacuoles: Protozoans/ Ciliopora/ Rhizopoda/Protists

(b) Salt glands: Marine birds/ Marine reptiles **2 pts**

(v)(a) State one basic difference between cortical nephrons and juxtamedullary nephrons of of man other than their position in the kidney.

Loop of Henle is longer in Juxta medullary nephrons (than that of cortical nephrons) / Loop of Henle is shorter in cortical nephrons (than that of juxta medullary nephrons)

1 pt

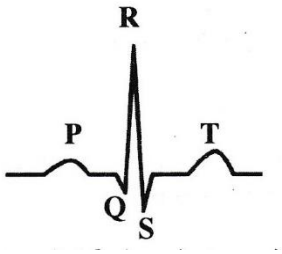
(b) State two major causes for developing kidney stones in man.

- Family history
- Protein rich diet / food
- Not drinking sufficient amount of water **any 2 pts**

(B) (i) What is double circulation?

Passing of blood twice through heart in a complete circulation through the body **1 pt**

(ii) (a) Electrocardiograph of a normal healthy adult person is given below.



State what is represented by each of the P, QRS and T

P:- Depolarization of atria/ Spreading of contraction over atria **1pt**

QRS:- Depolarization of ventricles / Spreading of contraction over ventricles **1pt**

T:- Marks not assigned

(b) What is a bypass surgery?

Surgical procedure to restore normal blood flow in an obstructed coronary artery/
When coronary arteries are blocked, that region is bypassed with a part of a vein (taken from leg) **1 pt**

(iii) Haemoglobin levels in the blood of four adult human males (A, B, C and D) are as follows:
A: 10.5 g/dL; B- 12.5 g/dL; C- 15.0 g/dL; D: 9. 0 g/dL

Of these persons, who is/are having a haemoglobin level below the minimum level of a healthy adult man?

A, B ,D (**All three should be present**) **1 pt**

(iv) What is imbibition?

Adsorption of water molecules onto hydrophilic substances **1 pt**

(v)(a) Name the theory that has been put forward to explain xylem transport.

Adhesion – Cohesion – Tension theory **1 pt**

(b) What are the underlying principles of upward movement of water through xylem?

- Water potential gradient from soil solution to atmosphere through xylem/ plant
- High adhesive/ Cohesive forces of water (in xylem)
- Transpiration pull **3 pts**

(C)(i) (a) What is the functional unit of the human nervous system?

Reflex arc **1 pt**

(b) What is meant by resting potential of a neuron?

The potential difference that exists across the plasma membrane when an impulse is not transmitted / at rest **1 pt**

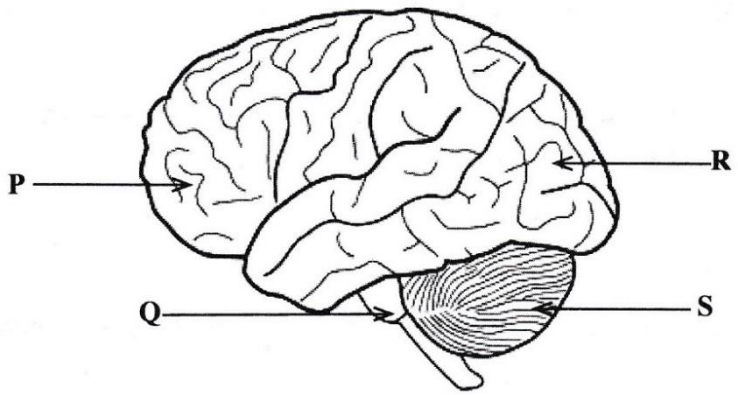
(ii) (a) Name the neurotransmitter released from motor neurons in humans.

Acetyl choline **1 pt**

(b) State two factors that increase the speed of propagation of nerve impulses along a neuron.

- Increase in diameter (of axon)
- Presence of a myelin sheath(of the axon) **2 pts**

(iii) This question is based on the following diagram of the human brain.



(a) Name the parts labeled as P, Q, R and S.

P:	Frontal lobe (of cerebrum)	**Q:**	Pons Varolii
R:	Occipital lobe (of cerebrum)	**S**:	Cerebellum **4 pts**

(b) Which of the above parts has/have been developed from the embryonic hind-brain?

- Cerebellum/ S
- Pons Varolii/ Q **2 pts**

(c) Which of the above parts coordinates the voluntary muscular movements?

S / cerebellum **1 pt**

(iv) (a) What is the main advantage of binocular vision in man?

Enables three dimensional vision/view (of objects) / to judge depth /speed of moving objects **1 pt**

(b) Write in correct sequence, the pathway through which vibration waves are transmitted from external air to the sensory receptors in the human ear during hearing.

(Pinna) → External auditory meatus → Tympanic membrane → Malleus → Incus → Stapes → oval window → Perilymph in vestibular canal → Endolymph in cochlear canal → Organ of Corti

(Basilar membrane)

(Reissner membrane/ Vestibular membrane)

1 pt

(v) (a) State the location of the thyroid gland of man.

- Just below larynx on either side/ in front of trachea
- in the neck region at the level of 5^{th}, 6^{th}, 7^{th} vertebra **2 pts**

(b) Name the hormone secreted by the thyroid gland which contributes o the Calcium homeostasis in the human body.

Calcitonin **1 pt**

Total 40 pts

40 x 2 ½ = 100 Marks

3. (A) (i) (a) What is a hydrostatic skeleton?

A body cavity with a wall composed of antagonistic muscles /longitudinal and circular muscles filled with fluid. **1 pt**

(b) Name the type of bone cells responsible for deposition of inorganic salts in the bone tissue.

Osteoblasts **1 pt**

(ii) (a) Name the bone that forms the sides and most of the roof of the human cranium.

Parietal bone **1 pt**

(b) What are known as fontanelles in the human Skull?

Soft membranous regions in the skull of newborns (which becomes replaced by bone within 1-2 years) **1 pt**

(iii) State two functions of the human vertebral column other than providing support and maintenance of erect posture.

- Protection of spinal cord
- Provide spaces for spinal nerves/blood vessels/ lymph vessels
- Allow movements of body
- Absorb shocks
- Give attachments for ribs/ girdles **any 2 pts**

(iv) State two features of the female pelvis that makes it different from the male pelvis.

- Wider
- Pubic angle is greater
- Brim is oval shaped
- Lighter
- Shallower **any 2 pts**

(v) Give two functional properties of all muscle tissues other than contractility.

- Excitability/ Irritability
- Extensibility
- Elasticity **any 2 pts**

(B) (i) (a) State three advantages of asexual reproduction.

- Only one parent is required
- Genetically identical offspring are produced/ Offspring genetically identical to mother/ parent
- Rapid multiplication (in numbers) **3 pts**

(b) State the main advantage of sexual reproduction.

Produce (new) variations leading to evolution **1 pt**

(ii) (a) Name the gland that secretes the major portion of semen in man.

Seminal vesicle **1 pt**

(b) State the function of Leydig cells.

Secrete testosterone **1 pt**

(iii) (a) When a cross section of a human ovary was examined under the high power of the light microscope, a structure with a spherical cell filled with cytoplasm which was surrounded by a clear layer followed by several layers of cuboidal cells was observed in the cortex region. What would this structure be?

Graffian follicle **1 pt**

(b) What is the structure in the human ovary that secretes progesterone?

Corpus luteum **1 pt**

(iv) (a) What is the average life span of a human ovum?

24 hours **1 pt**

(b) In which trimester of the human pregnancy, the heartbeat of the developing foetus can be detected first?

First (trimester) **1 pt**

(v) Name a sexually transmitted disease in humans caused by a bacterial infection.

Gonorrhea / Syphilis **1 pt**

(C) (i) Name three tissues that provide support in plants.

- Collenchyma
- Sclerenchyma
- Xylem **3 pts**

(ii) (a) What is the significance of seed dormancy?

Prevent germination within fruits/ Inhibits germination until satisfactory environmental conditions are available/found **1 pt**

(b) Give three causes of seed dormancy.

- Presence of thick seed coats/ strong coats
- Seed coats impervious to water
- (Presence of) inhibitors
- Immature embryo **any 3 pts**

(iii) (a) Name a plant growth substance involved in each of the following.

Activation of seed germination: Gibberellins

Inhibition of seed germination: ABA / Abscisic acid **2 pts**

(b) State in correct sequence, the events that take place during seed germination.

1. Absorption of water
2. Activation of enzymes / Hydrolysis of food (reserves) / starch / fat
3. Mobilization of food (resources)/ Transport of nutrients to growing points/places
4. Rapid growth of embryo
5. Extending radicle (through seed coat) and plumule (to make roots) **5 pts**

(iv) Name the type of exotoxin produced by each of the following pathogens.

***Corynebacterium diphtheriae*:** Cytotoxin

***Clostridium tetani*:** Neurotoxin

***Vibrio cholerae*:** Enterotoxin **3 pts**

(v) (a) A person develops immunity against chickenpox when infected once with it.

What is the type of this immunity?

Naturally acquired active immunity **1 pt**

(b) Name the type of specific molecule which causes immunity.

Antibodies **1 pt**

Total 40 pts

<u>40 x 2 ½ = 100 marks</u>

4. (A) (i) Name the type of cross given below and state Its purpose.

An organism of F_1 generation X One of the parents

Cross: Back cross **1 pt**

Purpose: To obtain more parental characters **1 pt**

(ii) In a monohybrid cross, Mendel observed 3:1 ratio between dominant and recessive phenotypes in the F_2 generation of pure line parents. What 'would be the type of inheritance if the following ratios of phenotypes are resulted in the F_2 generation?

Phenotypes	Ratio	Type of inheritance	
(a) Plants bearing red:pink:white flowers	**1:2:1**	Incomplete dominance	**1 pt**
(b) Persons with blood groups A:AB:O	**l:2:1**	marks not assigned	
(c) Plants bearing red:white flowers	**1:1**	marks not assigned	

(iii) What are the factors that contribute to change the allele frequency of a population?

- Mutations
- Non-random mating
- Selection
- Migration / Immigrations and Emigration
- Small population **5 pts**

(iv) State three agriculturally important traits that have been introduced to genetically modified plants.

- Pest resistance / Resistance to insect attack
- Weedicide resistance
- Pathogen/ Disease resistance
- Increased nutritive value/ Beta carotene production **any 3 pts**

(v) State two substances other than hormones produced using recombinant DNA technology that are used in the treatment of human diseases.

- Blood clotting factors
- Interferon
- Hepatitis B antigen **any 2 pts**

(B)(i) What were the sources of energy contributed to form organic compounds from simple molecules during origin of life?

- Lightning/ Electric discharges
- Solar radiation
- Volcanic eruption
- Radioactive decay/ Radioactive substances **4 pts**

(ii) What is extinction of Species?

Elimination of the last member of a species from the earth **1 pt**

(iii) Briefly explain what a keystone species is.

- The species that plays a (very) important role in the stability and
- functioning of a system/ ecosystem;
- If that species is removed the system tends to collapse. **3 pts**

(iv) What are the objectives of the following conventions?

(a) CITES: To ensure that international trade in specimens of (wild) animals and plants does not threaten their survival **1 pt**

(b) Biodiversity convention:

- Conservation of biodiversity
- Sustainable use of its components
- Fair and equitable sharing of benefits
- from the use of genetic resources **4 pts**

(v) State four adverse impacts of hydrocarbons on human health as air pollutants.

- Eye irritations
- Drowsiness
- Lung diseases
- Cancers **4 pts**

(C)(i) State two morphological forms of viruses.

- Icosahedral
- Helical **2 pts**

(ii) State the method generally used to sterilize each of the following material.

(a) Nutrient agar: Moist heat **1 pt**

(b) Petri dishes: Dry heat **1 pt**

(c) A solution of enzymes: Filtration **1 pt**

(iii) State two adverse impacts of soil microorganisms on plants.

- Cause diseases
- Denitrification **2 pt**

(iv) State two symbiotic associations of microorganisms with the roots of some plants.

- Mycorrhiza / Fungi and roots of higher plants
- Roots of legumes and *Rhizobium* /Root nodules of legumes
- *Cycas* roots and *Anabaena* / Coralloid roots of *Cycas*

Any 2 pts

(v) Name a species of bacteria used in the preparation of biopesticides.

Bacillus thuringiensis **1 pt**

Total 40 pts

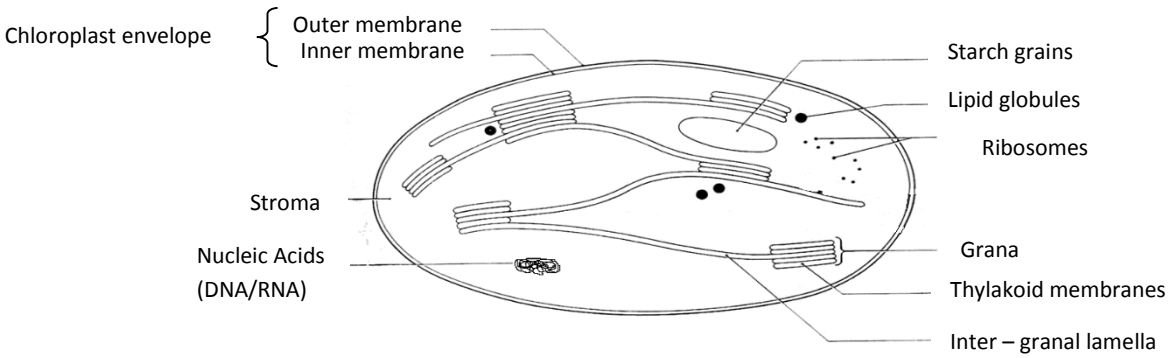
40 x 2 ½ = 100 marks

General Certificate (A/L) Examination – 2019 Old Syllabus
09 – Biology Marking Scheme
PAPER II – PART B

5. (a) Describe the structure of a chloroplast.
(b) Explain what photorespiration is and briefly describe how photorespiration affects the efficiency of photosynthesis.

(a) Describe the structure of a chloroplast.

1. Delimited by two membranes/ an envelope of two membranes/Double membraned
2. enclosing a stroma,
3. which is a (dense) fluid.
4. Thylakoids present.
5. They are sacs formed by an internal membrane system.
6. Thylakoid sacs are stacked
7. to form grana
8. which are interconnected by inter-granal lamella.
9. Chlorophyll (a, b)/ photosynthetic pigments
10. carotenoids,
11. electron carriers are present in thylakoid membranes.
12. Enzymes / RuBP carboxylase / Rubisco
13. Starch grains,
14. Lipid globules,
15. ribosomes and
16. DNA/RNA /nucleic acids are present in stroma.



(Diagram -06 Marks)
Fully labelled (8-10) correct diagram -06 Marks
Partially labelled (<8) diagram -03 Marks
Unlabeled diagram – 00 Marks

(b) Explain what photorespiration is and briefly describe how photorespiration affects the efficiency of photosynthesis.

1. In photosynthesis, carboxylation and
2. oxidation occurs.
3. Carboxylation is catalyzed by Rubisco/ RuBP carboxylase / RuBP reacts with CO_2.
4. Oxidation is catalyzed by Rubisco/ RuBP oxygenase / RuBP reacts with O_2.
5. CO_2 and O_2 are competitive substrates for (these enzymes) Rubisco.
6. When CO_2 concentration is low/ limited in the mesophyll cells,
7. oxygenase reaction of Rubisco takes place,
8. resulting in one molecule of PGA and
9. one molecule of (2-) phosphoglycolate
10. which has no immediate use in the Calvin cycle.
11. It undergoes separate pathways/ reactions in peroxisomes,
12. mitochondria
13. and chloroplasts,
14. consuming O_2 (eventually) and releasing CO_2.
15. This process takes place in light.
16. This happens mostly in C_3 plants,
17. (Intense) in hot/ dry conditions,
18. when stomata are (partially) closed,
19. to conserve water from transpiration.
20. Photorespiration uses energy/ ATP
21. and lose a molecule containing (two) carbons,
22. as (2-) phosphoglycolate.
23. Thus efficiency of carbon fixation/ photosynthesis is low.

Any 20 pts

16 + 20 = 36
36 X 4 = 144 marks
Diagram 6 marks
Total 150 marks

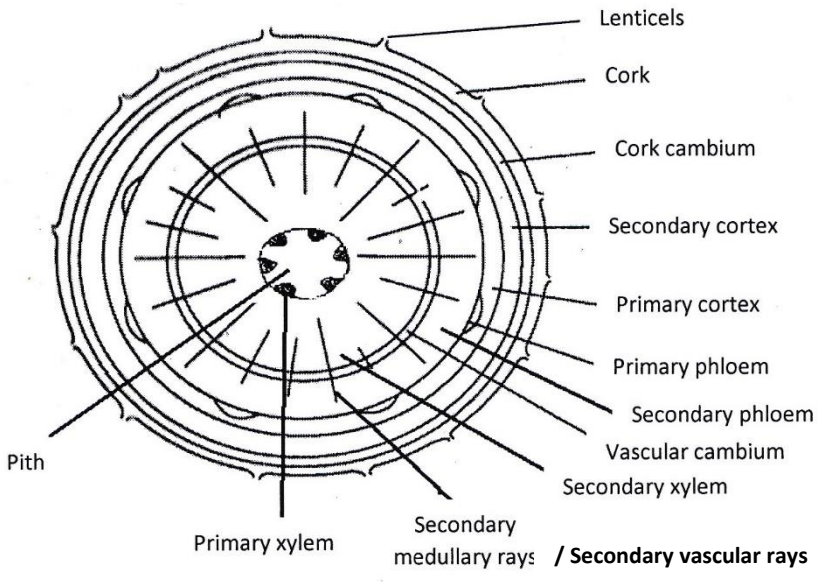
6. (a) Describe the secondary structure of a mature dicot stem as seen in a transverse section under the light microscope.
(b) Explain how secondary growth of dicot stem takes place.

(a)Describe the secondary structure of a mature dicot stem as seen in a transverse section under the light microscope.

1. Most peripheral / outermost tissue is the cork layer.
2. It consists of several cell layers,
3. Cork is interrupted at certain places to make lenticels/ within cork there are lenticels
4. which consist of loosely packed cells.
5. Cork cambium is located
6. inner to the cork / outer to secondary cortex
7. as a single layer.
8. Secondary cortex is arranged / located

9. inner to the cork cambium / outer to primary cortex.
10. It is parenchymatous.
11. It consists of several cell layers.
12. Primary cortex is arranged / located
13. inner to the secondary cortex / outer to secondary phloem / outer to primary phloem.
14. It is composed of several cell layers.
15. Primary phloem (masses) is arranged / located
16. at the inner margin of the primary cortex/ outer to secondary phloem.
17. Secondary phloem is located
18. inner to the primary phloem / primary cortex / outer to vascular cambium.
19. Vascular cambium is located
20. inner to the secondary phloem / outer to secondary xylem.
21. Secondary xylem is located
22. inner to the vascular cambium/ outer to primary xylem.
23. Primary xylem is located most internally
24. as few masses.
25. Pith is highly reduced / absent.
26. All tissues outer to the vascular cambium is collectively called bark.
27. There are several radiating parenchymatous strands in secondary vascular tissue.
28. These are called secondary medullary rays.

Any 28 pts



/ Secondary vascular rays

(Diagram -06 Marks)
Fully labelled (8-12) correct diagram -06 Marks
Partially labelled (<8) diagram -03 Marks
Unlabeled diagram – 00 Marks

(b) Explain how secondary growth of dicot stem takes place.

1. Action of lateral meristem/ vascular and cork cambia produces new cells and tissues / increase diameter/girth of the stem.
2. Parenchyma layer between vascular bundles differentiate into inter-fascicular cambium
3. This combines with intra-fascicular cambium
4. making a ring/ continuous vascular cambium.
5. Cells cut outward direction from vascular cambium form secondary phloem and
6. and cells cut inward direction form secondary xylem
7. of which some cells are lignified / Lignin is deposited.
8. (During early stages of secondary growth), epidermis is pushed outwards
9. causing it split
10. and falls off.
11. A layer of cells in the primary cortex forms cork cambium.
12. Cork cambium produces secondary cortex to interior
13. and cork (cells) to exterior.
14. Suberin is deposited in cork (Cells)

Any 10 pts

26+10 = 36
36 X 4 = 144 marks
Diagram 6 marks
Total 150 marks

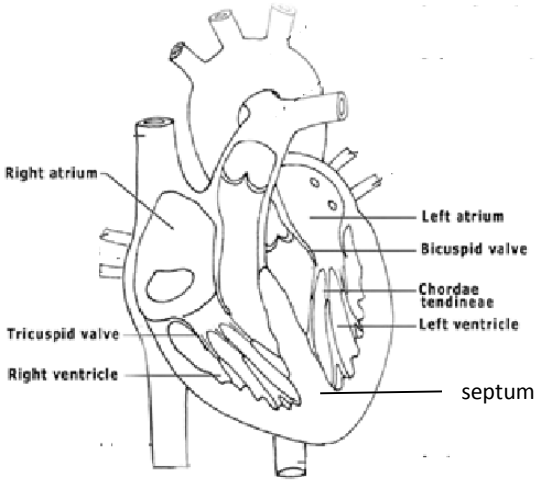
7. (a) Describe the structure of human heart.
(b) Explain the coronary circulation and consequences of blockage of coronary arteries in man.

(a) Describe the structure of human heart.

1. (Roughly) cone shaped
2. hollow muscular organ.
3. Wall is composed of Pericardium
4. which is the outer most layer.
5. Myocardium
6. is the middle layer
7. which is composed of cardiac muscles,
8. network of special conducting fibers
9. and large number of capillaries (derived from coronary arteries are present in myocardium).
10. Endocardium
11. is the innermost layer
12. which lines chambers and valves of heart.
13. Heart is divided into right and left halves by the septum.
14. (Each side is divided into upper) atrium and
15. (lower) ventricle
16. forming four chambers in the heart.
17. Walls of ventricles are thicker than that of atria.
18. Right atrio-ventricular valve/ tricuspid valve is located between right atrium and right ventricle.
19. Left atrio-ventricular valve/ bicuspid valve/mitral valve is located between left atrium and left ventricle.
20. Chordae tendineae

21. extend between atrio-ventricular valves and papillary muscles (of ventricular wall)/ connect atrio-ventricular valves and papillary muscles.
22. Superior vena cava and inferior vena cava open to right atrium/there are openings for superior and inferior vena cava in right atrium.
23. There are four openings for pulmonary veins in left atrium/ four pulmonary veins open to left atrium.
24. Pulmonary artery arises from right ventricle.
25. Its opening is guarded by pulmonary/ semilunar valves.
26. Aorta arises from left ventricle.
27. Opening of aorta is guarded by semilunar valves/ aortic valves.

Any 23 pts



(Diagram -06 Marks)
Fully labelled (6-8) correct diagram -06 Marks
Partially labelled (<6) diagram -03 Marks
Unlabeled diagram – 00 Marks

(b) Explain the coronary circulation and consequences of blockage of coronary arteries in man.

Coronary circulation

1. Heart is supplied with arterial/ oxygenated/ O_2 rich blood by the right and left coronary arteries
2. which branch/ arise from the aorta
3. immediately distal to the aortic valve.
4. Coronary arteries form (vast) network of capillaries.
5. Venous/ deoxygenated/ O_2 poor blood is collected into number of coronary veins
6. that join to form coronary sinus
7. which opens into the right atrium.
8. Some venous blood passes directly into heart chambers
9. through (venous) channels.

Any 7 pts

Consequences of blocking

10. Lowers the efficiency of myocardium/cardiac muscle
11. causing chest pain/angina.
12. Death of cardiac muscles/ heart failure/heart attacks/ myocardial infarction (due to deprivation of oxygen supply).
13. Heart beat rhythm becomes abnormal.
14. Heart becomes unable to act as a good pump.
15. Special organs such as brain do not receive adequate oxygen (through blood/ blood supply).
16. (Can lead to) death (if not treated on time).

Any 6 pts

23+7+6 = 36

36 X 4 =144 marks

Diagram = 06 marks

Total marks = 150 marks

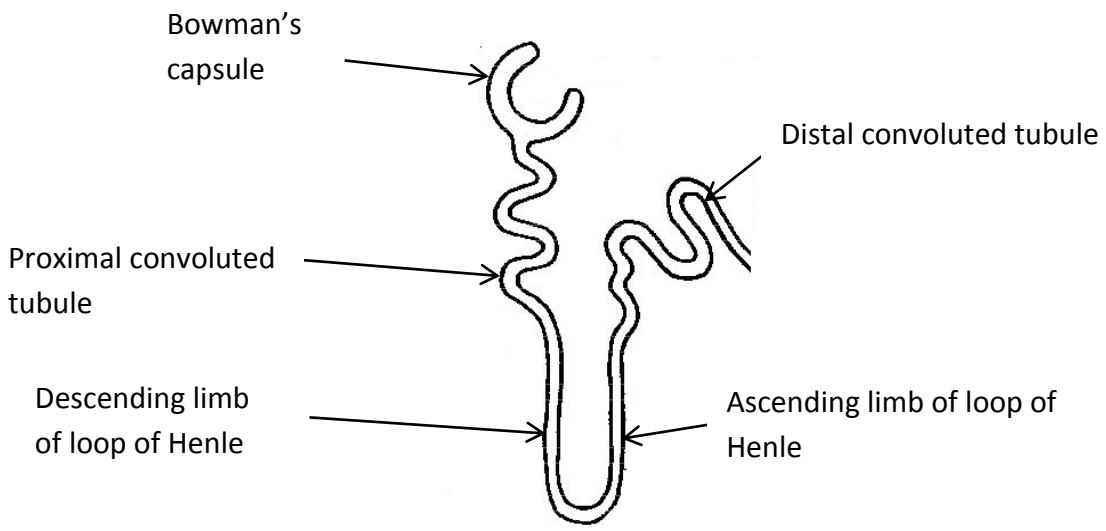
8. (a) Describe the structure of a human nephron.

(b) Explain the role of human nephron and associated blood vessels in the formation of urine.

(a) Describe the structure of a human nephron.

Nephron consists of

1. Bowman's capsule,
2. Proximal convoluted tubule,
3. Descending limb of loop of Henle,
4. Ascending limb of loop of Henle and
5. Distal convoluted tubule.
6. Bowman's capsule is cup shaped
7. and double walled.
8. Loop of Henle is U shaped.
9. Convoluted tubules / Proximal convoluted tubules/ Distal convoluted tubules are long.



(Diagram -04 Marks)
Fully labelled (5) correct diagram -04 Marks
Partially labelled (<5) diagram -02 Marks
Unlabeled diagram – 00 Marks

(b) Explain the role of human nephron and associated blood vessels in the formation of urine.

Three processes occur in a nephron

1. Ultrafiltration
2. In Bowman's capsule
3. Selective reabsorption
4. In proximal convoluted tubule, loop of Henle and distal convoluted tubule/ tubular parts
5. Secretion
6. In convoluted tubules /proximal convoluted tubule and distal convoluted tubule.

Ultrafiltration

7. Filtration of blood under high pressure into the cavity of Bowman's capsule.
8. (Filtration) occurs through the capillary walls of glomerulus and
9. Inner wall of Bowman's capsule.

10 & 11 Substances filtered are

water, glucose, amino acids, urea, vitamins, drugs, ions and hormones.

(**any 3 substances – taken as 1 pt**)

12. Substances not filtered are blood cells
13. and plasma proteins.

Selective reabsorption

14. Some of the substances in the filtrate/ substances in the filtrate that are useful to the body, are re-absorbed to the capillary network of tubules.

In the proximal convoluted tubule,

15. Obligatory reabsorption of water (80%),
16. by osmosis / passively
17. irrespective of the water content in the body.
18. Some are actively (reabsorbed)
19. Eg: Na^+, glucose, amino acids.
20. Some are (reabsorbed) passively.
21. Eg ; Cl^-, HCO_3^-, Urea, K^+ **(any 3)**

In the descending limb of loop of Henle,

22. Water by osmosis / passively.
23. Na^+ actively (reabsorbed).

In the ascending limb of loop of Henle,

24. Na^+ actively (reabsorbed).
25. Cl^- passively (reabsorbed).

In the distal convoluted tubule,

26. Water in the presence of ADH.
27. Na^+ actively,
28. HCO_3^- passively and
29. Cl^- passively(reabsorbed).

Secretion

30. Some substances/ substances that are not required to the body, in blood capillaries are secreted into tubules (of the nephron)
31. & 32.

Substances secreted are H^+, K^+, NH_4^+, Creatinine, drugs, vitamin B (**any 3 substances = 1 pt)**

09 + 32 = 41 pts

Any 37 x 04 = 148 marks

diagram 04 marks

Total 152 marks

Maximum 150 marks

9. (a) Describe the normal microbiota of humans and their role in human health.

(b) Explain why some recessive traits of humans are either restricted to males or more common in males than in females.

(a) Describe the normal microbiota of humans and their role in human health.

1. (Generally) humans are free of microorganisms at birth./ Fetus is free of microorganisms.
2. Human microbiota consists of about 1 X 10^{14}/ 100 trillion microbial cells
3. They live on skin and
4. mucous membranes of nose, throat, upper respiratory tract, intestinal tract and genitourinary tract (any three).
5. They are commensals.
6. (Most) are harmless.
7. Some are beneficial.
8. They prevent/ control/ reduce entry of pathogens via skin and
9. mucous membranes.
10. (Some) living in the large intestine/ gut/ gastro intestinal tract, produce vitamins (K and folic acid).
11. Internal organs and
12. healthy tissues are usually free of microorganisms.
13. Some (members of normal microbiota) may become infectious
14. when there is skin/ tissue damage or
15. when the general resistance/ immunity of the body is lowered
16. and hence they are called opportunistic pathogens.
17. They (may also) cause disease/ become pathogenic when infect body parts other than where they usually live
18. eg. *E. coli* / *Escherichia coli*
19. living (harmlessly) in large intestine may cause urinary tract infection/ pulmonary infection/ (when it enters urinary bladder/ lungs)
20. When normal microbiota is disrupted/ disturbed
21. by antibiotic therapy,
22. these can be restored by ingestion of live microbial cells (of certain lactic acid bacteria),
23. called probiotics.
24. eg. Yogurt

(b) Explain why some recessive traits of humans are either restricted to males or more common in males than in females.

1. Certain human recessive traits are sex linked.
2. (Majority of) those genes are located on the X chromosome.
3. Females carry two X chromosomes while
4. males have only one X chromosome.
5. Y chromosomes carry very few genes (other than those related to determination of sex).
6. Some disorders are carried on the Y-linked genes
7. and therefore only present in males.
8. eg. inability to produce normal sperms / hair in ear (lobe).
9. In males, a sex linked/ X-linked recessive trait is always expressed when that allele is present

10. because it cannot be masked by its dominant allele
11. due to the presence of only one X chromosome.
12. In females sex linked recessive allele may be masked
13. when they are heterozygous.
14. Therefore these recessive traits are expressed only when they are homozygous (for the character).
15. Heterozygous females are carriers (of X-linked recessive traits).
16. for eg. Haemophilia/ Red green colour blindness

24 + 16 = 40

Any 38 X 4 = 152 marks

Maximum 150 marks

10. Write short notes on the following.

(a) Micropropagation of plants

(b) Global warming

(c) Natural classification of organisms

(a) Micropropagation of plants

1. It is the use of tissue culture techniques to produce plants in large numbers
   Steps involved are
2. preparation of suitable explants and
3. suitable culture medium
4. under sterile conditions.
5. Culture initiation,
6. Induction of shoots,
7. Multiplication of shoots,
8. Induction of roots,
9. and acclimatization of plantlets.
10. It produces plants with same genotypes/ genetically identical plants
11. rapidly,
12. in small spaces,
13. irrespective of climatic conditions.
14. Disease free plants can also be produced.

(b) Global warming

1. It is the increase of average temperature of atmosphere,
2. due to green house gases,
3. such as CO_2,
4. Oxides of nitrogen,
5. Methane,
6. Water vapour,
7. and ozone.

8. These gases prevent (a part of) solar radiation that reach the earth surface being radiated back in to space.

Its impacts are,

9. rise in sea level due to,
10. melting of glaciers/polar ice caps
11. and thermal expansion of water,
12. Change in climatic conditions/ rainfall pattern.
13. Increase of drought condition.
14. Increase of flood,
15. Increase of forest fire,
16. Affects (human) health,
17. and agriculture/agricultural productions.

(c) Natural classification of organisms

1. Grouping based on evolutionary relationships
2. It represents true(natural) relationships based on Phylogeny.
3. This is developed after studying evolution.
4. Characters used in this classification are, morphological
5. anatomical
6. cytological
7. or molecular biological/ DNA and RNA base sequences.

14 + 17+ 07 = 38

38 X 4 = 152 marks

Maximum = 150 marks