ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව
இலங்கைப் பரீட்சைத் திணைக்களம்

අ.පො.ස. (උ.පෙළ) විභාගය / க.பொ.த. (உயர் தர)ப் பரீட்சை - 2022 (2023)

විෂය අංකය
பாட இலக்கம் **09**

විෂයය
பாடம் **ජීව විද්‍යාව**

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

✪ විශේෂ උපදෙස් / விசேட அறிவுறுத்தல் :

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

මුළු ලකුණු / மொத்தப் புள்ளிகள் 1 × 50 = 50

G.C.E. (A/L) Examination - 2022 (2023)

09 - Biology

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

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A – 1.2
B – 20
C – 08

Part A
Structured Essay
Answer all questions on this paper itself
(Each question carries 100 Marks)

1. (A) (i) Name two monosaccharides that form a non-reducing disaccharide.

Glucose, fructose

(2 pts)

(ii) (a) What is a cell junction?

Structure at which plasma membranes / cytoplasm of neighbouring / adjoining cells are joined

(1 pt)

(b) Name a cell junction that carries out each of the following:

Preventing leakage of extracellular fluid :

Tight junction

(1 pt)

Allowing exchange of materials

Gap junction / Communicating junction

(1 pt)

(iii) State a main function of each of the following cells:

(a) Chondrocytes :

Secretion / production of chondroitin sulphate / collagen fibers

(1 pt)

(b) Osteocytes :

Maintain bone tissue

(1 pt)

(iv) Name one product each of the carboxylase and oxygenase reactions of Rubisco.

(a) Carboxylase reaction :

3 - phosphoglycerate / 3 - PGA

(1 pt)

(b) Oxygenase reaction :

3 - phosphoglycerate / 3 - PGA / 2 - phosphoglycolate / & Carbon Compound

dash ?

(1 pt)

(v) What are integrated in Neo-Darwinism?

- Darwin's theory / theory of natural selection
- Mendelian genetics
- Population genetics

(3 pts)

(12)

(B) (i) Complete the following dichotomous key using relevant numbers and the organisms given below.

Amoeba, *Euglena*, Annelid, Arthropod, Cnidarian, Mollusk, Nematode

(1) Multicellular	2
Unicellular	6
(2) Bilateral symmetry or asymmetrical	3
Radial symmetry	Cnidarian
(3) Segmented body	4
Unsegmented body	5
(4) Legs present	Arthropod
Legs absent	Annelid
(5) Body cylindrical	Nematode
Body not cylindrical	Mollusk
(6) Flagella present	*Euglena*
Flagella absent	*Amoeba*

• Should underline

(If any step is wrong, no marks should be given beyond that step.) (12 pts)

(ii) State **two** functions of a zygosporangium.

- Resists adverse environmental conditions / drying / freezing
- Produces (Genetically diverse, haploid) spores

(2 pts)

(iii) State **three** structural features unique to phylum Echinodermata.

- Penta radial symmetry
- water vascular system
- Tube feet
- Endoskeleton of calcareous plates
- Nerve ring and radial nerves

• Closed circulatory system without heart

(any three) (3 pts)

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(iv) State two differences between a monocot flower and a dicot flower.

- Monocot flower is trimerous while dicot flower is pentamerous or tetramerous.
- Monocot flower has a perianth / no distinct calyx and corolla while dicot flower has distinct calyx and corolla / perianth is differentiated to form calyx and corolla.
- monocot pollen grains have one opening/ aperture while dicot pollen grains have three openings / apertures.

(Both conditions of each point should be written to get marks)

(2 pts)

(v) What are known as hard wood and soft wood?

(a) Hard wood :

Secondary xylem of dicots

(b) Soft wood :

Wood of gymnosperms / wood without xylem vessels

(2 pts)

(C) (i) Leaves of plants are generally arranged horizontally or vertically. State one advantage of each of these arrangements.

(a) Horizontal arrangement :

Capture light effectively in low light conditions

(b) Vertical arrangement :

Avoid damage caused due to (exposure to) over intense light

(2 pts)

(ii) State the generic names of two photosynthetic plants that obtain nitrogen and minerals from insects.

- *Nepenthes*
- *Drosera*
- *Utricularia*

(any two) (2 pts)

(iii) What is known as double fertilization in angiosperms?

Fusion of one sperm nucleus with the egg cell and the other with two polar nuclei

(1 pt)

(iv) Name the ion responsible for gravitropism in plants.

Ca^{2+} / Calcium

(1 pt)

(v) When examining a stained temporary preparation of onion root tips under the light microscope, a student observed cells with short, thick chromosomes surrounded by nuclear envelope. In which phase of mitosis could those cells be?

Prophase

(1 pt)

(40 pts x 2.5 marks = 100marks)

C - 20

2. (A) (i) State the specific locations of the following valves in the human heart:

(a) Tricuspid valve :

? ← Between the right atrium and right ventricle (1 pt)

(b) Semilunar valves :

or at the beginning of pulmonary sk

- At the place where pulmonary artery leaves the right ventricle and
- at the place where aorta leaves the left ventricle

at the beginning of the.

(2 pts)

(ii) What are known as chordae tendinae?

AV valves

(fibrous) Cords that connect artrioventricular valves to papillary muscles

capital AV / tricuspid / bicuspid (1 pt)

(iii) State the reason for each of the following:

(a) Angina

Narrowing of coronary arteries

(1 pt)

(b) Myocardial infarction :

Blockage of (one or more) coronary artery / arteries

(1 pt)

(iv) What are known as diastolic pressure and systolic pressure?

(a) Diastolic pressure :

(Blood) pressure within arteries following ejection of blood at complete cardiac diastole / when the heart is at rest

(1 pt)

(b) Systolic pressure :

Pressure produced within arterial system / arteries when the left ventricle contracts / blood is pushed in to aorta

(v) What is represented by the P wave in an ECG tracing? (1 pt)

Atrial depolarization / impulse from SA node as it sweeps over atria

(1 pt)

(B) (i) (a) What is known as basal metabolic rate (BMR)? (1 pt) (09)

Minimum metabolic rate at rest when in a post absorptive stage and not experiencing stress

(b) State the range of average BMR of an adult human male. (1 pt)

1600 - 1800 kCal / day

Un. L

Range (1 pt)

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(ii) Name two enzymes of man that catalyse the breakdown of small peptides into amino acids.

- Dipeptidase
- Carboxy dipeptidase
- Amino peptidase

(any two points) (2 pts)

(iii) What is acquired immunity?

- Ability of the body to defend itself against foreign agents / pathogens/ microbes through specific defense responses
- mediated by T lymphocytes and B lymphocytes / T cells and B cells

(2 pts)

(iv) State the exact location of the green glands in crustaceans.

- Ventrally in the head and anterior to the oesophagus

(2 pts)

(v) Give three causes for formation of kidney stones.

- Dehydration (due to not drinking enough fluids)
- Alkaline urine
- Infections that alter urinary pH
- Metabolic conditions
- Family history

(any three) ((3 pts)

(C) (i) (a) Name a phylum which includes animals with a brain and longitudinal nerve cords.

Platyhelminthes

(1 pt)

(b) State two functions of the cerebrospinal fluid other than circulation of nutrients and hormones.

- Helps to maintain uniform pressure within central nervous system / CNS
- Acts as a shock absorber between brain and skull / Cranium
- Helps to remove waste products

(any two) (2 pts)

(ii) (a) Name two structures of the human brain which are developed from the forebrain of the embryo.

- Cerebrum
- Thalamus
- Hypothalamus
- Pineal body / gland

(any two) (2 pts)

(b) State the function of motor neurons in the peripheral nervous system of man.

Carry nerve impulses / signals to skeletal muscles / effector tissues / effector organs (there by controlling voluntary activities)

(1 pt)

(iii) (a) State the factors that are important for maintaining the resting membrane potential of a neuron.

- Distribution of ion concentrations inside and outside of the neuron
- Selective permeability of plasma membrane to K^+ and Na^+
- Sodium - potassium pump

(3 pts)

(b) Write in correct sequence, the pathway of nerve impulses for the vision of humans after photoreceptor cells are stimulated.

Bipolar cells ⟶ ganglion cells ⟶ optic nerve ⟶ occipital lobe of cerebrum

Bipolar neurons

(1 pt)

(iv) (a) Name a phylum which includes animals that reproduce by budding and fragmentation.

Cnidaria

(1 pt)

(b) State two functions of the semen of human males.

- Provides a liquid medium for sperm movement
- Helps to neutralize acidity in the female reproductive tract / acidic urine remaining in male urethra
- Provides energy / nutrients to sperm
- Lubricates lining of urethra

Any two

(2 pts)

(c) What is menopause?

Cessation of ovulation and menstruation in a woman between the age of 45 - 55 years

(Permanant)

(v) (a) State two sources of progesterone during pregnancy.

(1 pt)

- Corpus luteum
- Placenta

(b) State the functions of chorion during embryonic development.

(2 pts)

- Exchanging materials between embryo / fetus and mother
- Protecting embryo / fetus from immune responses of mother
- Producing hCG (to maintain corpus luteum)
- Formation of placenta

(3 pts)

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(c) State a method that can be used to determine the size and condition of the fetus during pregnancy.

Ultra sound Images / ultra sound scanning

(1 pt)

(40 pts x 2.5 marks = 100marks) (20)

3. (A) (i) Name two hormones which mediate long term stress responses in man.

- Cortisol
- Aldosterone

A → 09
B — 20
C — 11

(2 pts)

(ii) What is the cause of hyperthyroidism?

Exposure of body tissues to excessive levels of T_3 and T_4 / tri - iodothyronine and thyroxin /thyroid hormones

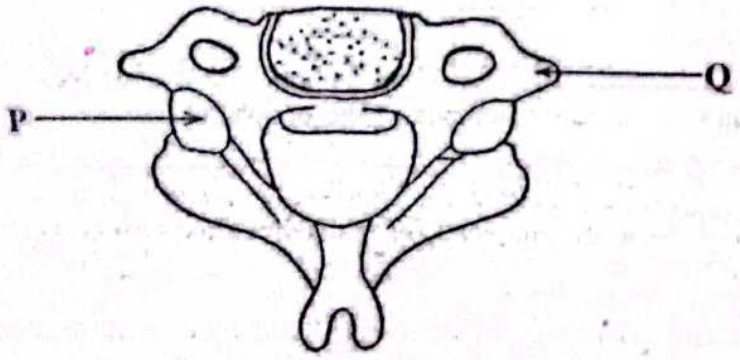
(1 pt)

(iii) What is the reason for slipped disc condition in man?

Protrusion of inner portion of intervertebral disc (of vertebral column through outer ring)

(1 pt)

(iv) This question is based on the following diagram.



(a) Identify the structure given in the above diagram.

3rd to 6th cervical vertebrae / Typical cervical vertebrae

(1pt)

(b) State two features used for its correct identification.

- Transverse processes have a foramen on each side
- Bifid spinous process

(2 Pts)

(c) Name the parts labelled as P and Q.

P : (articular process with) Facet for articulation with adjacent vertebrae

Q : Transverse process

If the answer for (a) is wrong , no marks for (b) and (c) (2 Pts)

(B) (i) (a) Name a human genetic disorder caused due to gene mutations.

Colour Blindness / Sickle cell anemia / Phenylketourea / Cystic fibrosis

Sickel cell disease
Haemophelia. (1 Pt)

(b) Name three human genetic disorders caused due to chromosome mutations and state the specific reason for each of them.

Genetic disorder	Reason
• Down syndrome	Trisomy – 21 / extra copy of chromosome 21
• Klinefelter syndrome	XXY / extra X chromosome (in men)
• Turner syndrome	XO / Monosomy of X chromosome (in Females)

(If disorder is not written or incorrect, no marks for the reason)

(6 Pts)

(ii) How does epistasis occur?

• As a result of alteration in the phenotype / phenotypic expression of a gene due to interference of another gene / gene at another location / interaction between gene at different loci

Due to factors other than DNA sequence / genetic code
due to Switching (2 pts)

(iii) What are the two main intentions of a genetic counseling service?

• Estimating the risk (a couple may have) in conceiving a child with genetic disorders
• Providing necessary advice to avoid such instances

(2 pts)

(iv) (a) Name the enzyme required for making DNA on a RNA template.

• Reverse transcriptase

(1 pt)

(b) What is contained in a cDNA library?

Complementary DNA obtained by reverse transcription of mRNA isolated from tissues / cells / (1 pt)

transcription
transcription
[transcriptome ?]

(v) (a) How is the gene gun used to get foreign DNA into a cell?

Small particles of a heavy metal are coated with a large number of DNA copies (of interest) and these particles are shot (in to the cells to be ~~transferred~~ transformed) at high velocity

(3 pts)

(b) State the advantages of using Small Tandem Repeats (STR markers) in DNA fingerprinting.

- They occur frequently in the genome
- Easily amplified by PCR
- Highly variable polymorphism
- Availability of a large number of a characterized STRs

(4 pts)

(C) (i) What is known as primary consumer and niche in an ecosystem?

(a) Primary consumer :
Organisms that feed on / consume primary producers | autotrophs (1)

(b) Niche
The role that a particular organism plays in the ecosystem / how an organisms makes its living (1)

(2 pts)

(ii) State the main anthropogenic activity that has severely affected each of the following biomes.

(a) Tundra

Extraction of minerals / oil

(b) Temperate grasslands

Agriculture / Conversion to agricultural lands / farmlands

(c) Northern coniferous forests :
Logging

(3 pts)

(iii) State four main features of a savanna ecosystem.

- Thick grass cover
- Few scattered trees
- Periodic fires / fire during the dry period
- Fire resistant trees
- Thin layer of soil

(any four)
(4 pts)

(iv) State the two main goals of Convention on Biological Diversity other than conservation of biodiversity.

- Sustainable use of components of biodiversity
- Fair / equitable sharing of benefits of genetic resources

(2 pts)

40 x 2.5 marks = 100 marks

A - 80
B - 25
C - 5

4. (A) (i) What is known as species diversity?

Variation that can be recognized among different species and includes number of species and abundance

(3 pts)

(ii) Name two types of extremophiles that are present in the deep sea.

- Psychrophiles
- Barophiles

(2 pts)

(iii) What is the source of carbon used by chemoautotrophic bacterial species?

CO_2 / Carbon dioxide / Inorganic Carbon

(1 pt)

(iv) State two characteristics common to mycoplasma and phytoplasma.

- Similar in size
- Aerobic respiration / facultative anaerobic respiration
- Same shape / spherical or filamentous shape
- Absence of cell wall
- Reproduce by budding and binary fission
- Prokaryotic

Shape varies from Spherical to filamentous/ pleiomorphic

(any two)
(2 pts)

(v) What is known as invasiveness of a pathogen?

Ability to invade host tissues (by overcoming host's defense mechanisms) and multiply (for colonizing)

(2 pts)

(B) (i) Name two bacterial species that are used to add flavour during yoghurt production.

- *Lactobacillus bulgaricus*
- *Streptococcus thermophilus* / *Streptococcus* sp.

(2 pts)

(ii) Name one enzyme each, other than amylase, produced commercially using the following microorganisms.

(a) *Aspergillus niger* :

Cellulase

(b) *Aspergillus oryzae*

Protease

(2 pts)

(iii) Why is alum added during drinking water treatment?

To remove / enhance sedimentation of microorganisms and (finely) suspended matter

(2 pts)

(iv) State two physical changes that take place in food due to growth of microorganisms.

- Softening
- Pigmentation
- Ropiness
- Slime or gum formation

(2 pts)

(C) (i) State four issues faced by growers in plant nursery management other than those associated with providing optimum environmental conditions.

- Lack of access to modern technology
- Lack of financial incentives (to improve facilities)
- Shortage of quality planting / propagating materials
- Inadequate knowledge on techniques / growth conditions

(4 pts)

(ii) Why is a gelling agent added to a tissue culture medium?

To provide physical support for the explant

(1 pt)

(iii) What are the conditions that a seed has to complete to initiate germination?

- Must be viable
- Must be subjected to suitable environmental conditions
- Must overcome dormancy

(3 pts)

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(iv) (a) What are the three principles of food preservation?

- Prevention of entry of microorganisms
- Prevention of growth and activity of microorganisms
- Removal or killing of microorganisms

(3 pts)

(b) State the role of salt in the production of dry fish.

Removal of water (fast) and
inhibition / control of microbial growth

(2 pts)

(v) (a) What are known as nanoshells?

Spherical nano particles consisting of a dielectric core

(2 pts)

(b) State two uses of nanoshells.

- Cancer treatment
- Enhancement of bio imaging

(2 pts)

(25)

(c) State five benefits of sequencing of human genome.

- Improved diagnosis of (various) diseases
- Identification of mutations linked to cancer
- Design of medication / more accurate prediction of medication / drugs effects
- Gene therapy
- Study of human evolution / anthropology
- Control systems of drugs

(any five)

(5 pts)

40 pts x 2.5 marks = 100 marks

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5. Describe the nuclear division where the chromosome number is reduced during meiosis.

1. This cell division is meiosis I.

It consists of four phases.

2, 3, 4, 5. Prophase I, Metaphase I, Anaphase I and Telophase I.

Prophase I:

6. Chromosomes begin to condense.
7. Nucleolus begins to disappear.
8. Synaptonemal complex is formed.
9. Synapsis occurs
10. 11. due to pairing and physically connecting of homologous chromosomes.
12. Crossing over takes place
13. where the part of DNA molecule/strand of non-sister chromatids of paired (homologous) chromosomes breaks,
14. 15. exchange and rejoin (at corresponding points)
16. (and these are visible) as chiasmata.
17. Synaptonemal complex breaks/dissembles and
18. homologous chromosomes slightly part from each other.
19. Nuclear envelope breaks.
20. Centrosomes move towards opposite poles.
21. Spindle is formed in animal cells.'
22. Kinetochore of each homologue attaches to microtubules from one pole.
23. Homologous pair moves towards metaphase plate.

Metaphase I

24. Homologous pairs (of chromosomes) arrange on metaphase plate
25. randomly,
26. one chromosome of each pair facing each pole.

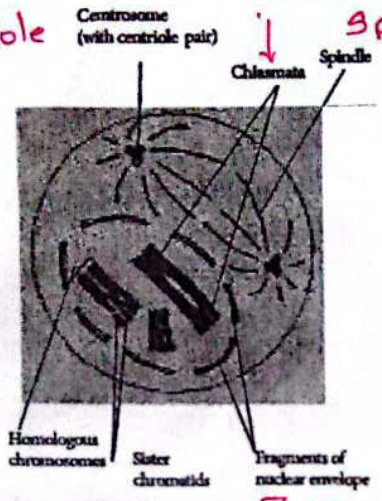
Anaphase I

27 Kinetochore microtubules of the spindle shorten.
28. Homologous pairs separate.
29. One chromosome of each pair moves towards the opposite pole.
30. Sister chromatids remain attached at the centromere and
31. move as a single unit towards the same pole.

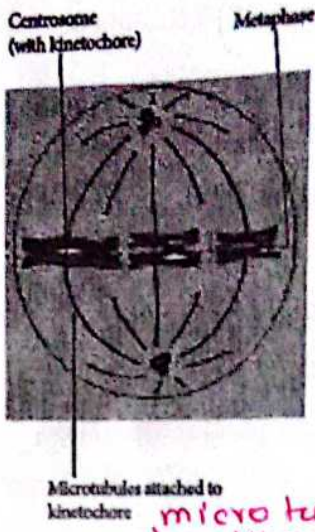
Telophase I

32. One complete haploid set of chromosomes accumulate at each pole.
33. Nuclear envelope forms.
34. around each set of chromosomes.

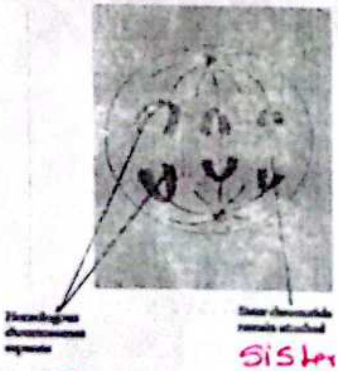
35. Nucleolus reappears.
36. Spindle disintegrates.
37. Chromosomes decondensed in to chromatin.
38. Genetically non-identical two daughter nuclei are formed.



Prophase – I



Metaphase – I



Anaphase – I



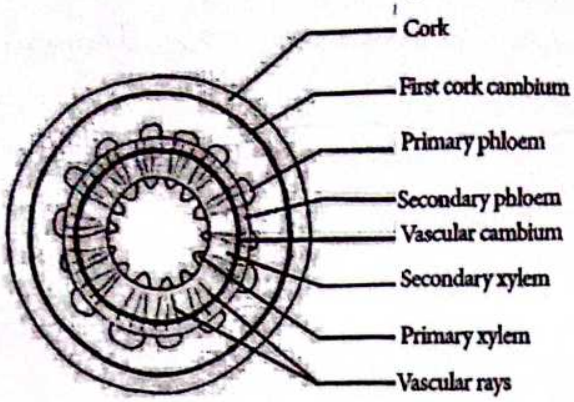
Telophase – I

Any 34 points X 4 marks = 136 marks
Diagrams of Prophase I, Metaphase I, Anaphase I and Telophase I – 3 marks each = 12marks
Fully labelled diagram – 3 marks
Partially labelled / Unlabeled diagram – 2 marks
If more than 34 points are written add 2 marks = 2 marks
Total = 150 marks

6. Briefly describe the process of secondary growth in a dicot stem.

1. Occurs due to formation of new cells to increase the diameter / girth / circumference
2. by lateral meristem / vascular cambium and cork cambium.
3. Vascular cambium consists of a single cell layer
4. which is located outside the pith / primary xylem and
5. interior to primary phloem /cortex.
6. It is formed by meristematic cells
7. as a continuous cylinder.
8. It adds secondary xylem
9. towards primary xylem (initials)
10. and secondary phloem
11. towards primary phloem/outside vascular cambium.
12. 13. Cork cambium produces tough and thick covering
14. consisting of wax impregnated cells / cork cells
15. towards exterior / ~~periderm~~.
16. Secondary growth occurs simultaneously with primary growth.
17. Some initials / cells produced by vascular cambium are elongated and
18. oriented with their long axis parallel to the axis of stem and
19. produce tracheids, vessel elements, xylem parenchyma, xylem fibres (any 2)
20. sieve tube elements, companion cells, phloem fibres and phloem parenchyma (any 2).
21. Some initials (produce by vascular cambium) are short and
22. 23. oriented perpendicular to the axis of the stem and produce vascular rays.
24. When secondary growth continues secondary xylem layers accumulate and
25. their walls lignify.
26. 27. Epidermis is pushed outside, splits
28. 29. dries up and falls off.
30. It is replaced by (two) tissues produced by cork cambium.
31. Cork cells die
32. due to deposition of suberin ~~in their cells~~.
33. (Layers of) cork cambium break and
34. new cork cambium is formed / initiated.
35. 36. Outer layers of cork crack and peel off.
37. Lenticels / small pores are formed (in the periderm)

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Any 35 x 4 = 140 marks

Correct diagram of secondary growth (1 mark for each label) = 8 marks

If more than 35 points are written add 2 marks) = 2 marks

Total 150 marks

7. (a) Explain how Domain Bacteria differs from Domain Eukarya.

1, 2. Members of domain Bacteria are prokaryotic while those of domain Eukarya are eukaryotic

3. Cell wall of Bacteria is composed of peptidoglycan while

4, 5, 6, 7. that of Eukarya is composed of cellulose, hemicellulose, pectin and chitin.

8, 9. In Bacteria, histones are not associated with DNA and in Eukarya, histones are associated with DNA.

10, 11. In Bacteria, introns are rare but in Eukarya introns are more abundant (present in many genes)

12, 13. In Bacteria, there is only one kind of RNA polymerase but in Eukarya there are several kinds of RNA polymerase.

14, 15. In Bacteria, initiator amino acid in protein synthesis is formyl methionine while in Eukarya, it is methionine.

16,17. Growth of Bacteria can be inhibited by antibiotics/streptomycin/ chloramphenicol but growth of Eukarya is not inhibited by antibiotics.

(To get marks, each conditions of both domains should be written. If written separately under two subheadings or if given as a table, deduct 10% of the marks scored for the answer).

18,19 In bacteria flagella doesn't have 9+2 structure
Eukarya has 9+2 structure.

• no columns
• 9+2 claim — 10% of marks / one is wrong can give

(b) Describe the vaccines used in controlling microbial diseases.

1. Vaccine is a suspension of weakened pathogens or fractions of organisms.
2. Vaccines are used to induce immunity.

There are several types of vaccines.

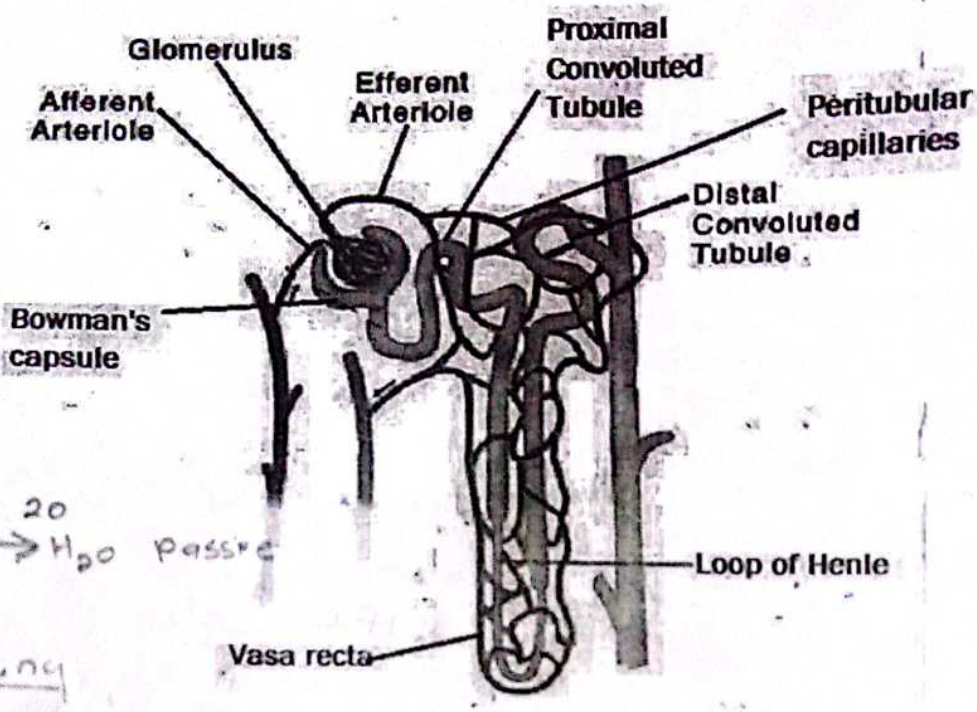
3. Live attenuated vaccines
4,5. contains live and weakened pathogens.
6. Mimics actual infection.
7. Vaccine is active inside the host.
8. provides life-long immunity.
9. Booster/secondary/repeated immunization/vaccination is not required
10. eg. vaccines for measles, mumps and rubella/MMR /vaccine for chickenpox
11. Inactivated vaccines
12. contain inactivated/killed pathogens
13. Booster/secondary/repeated immunization/vaccination is required.
14. eg. vaccines for Rabies/Influenza/Polio/Cholera
15. Subunit vaccines
16. Vaccines containing only the antigenic fragments of a pathogen.
17. eg. Toxoid vaccine,
18 which contains inactivated toxins derived from a pathogen
19. Subunit vaccines are used for Tetanus/Diphtheria/Hepatitis B
20 Presently some subunit vaccines/ Hepatitis B vaccine are produced using genetic engineering techniques.
21. Booster/secondary/repeated immunization/vaccination is required.

Any 37 x 4 = 148 marks

If more than 37 points are given, add 02 marks

Total 150 marks

8 (a) Draw a fully labelled diagram of the functional unit of the human kidney with associated blood vessels.



Correct diagram - 05 marks

Correct labelling (9 x 01) - 09 marks

(b) Describe the process of formation of urine in man.

1. Nephrons and associated blood vessels (in the human kidney) are involved in urine production (through three main activities namely),
2. Ultrafiltration
3. Selective reabsorption and
4. Secretion.
5. (When blood passes) through the capillary walls of glomerulus and inner wall of Bowman's capsule,
6. blood is filtered under high pressure into the cavity of the Bowman's capsule
7. retaining blood cells, platelets and large molecules/ plasma proteins in the blood.

8. 9. Filtrate in the Bowman's capsule contains water, ions, amino acids, glucose, vitamins, nitrogenous waste and other small molecules (any three substances taken as one point)

10. Selective reabsorption (of some substances) occurs in to interstitial fluid / capillary network surrounding the tubules / blood.

11. In the proximal convoluted tubule, (Selective) reabsorption of sodium ions/Na^+, glucose, and amino acids (Any 2) occurs actively/by active transport (into the interstitial fluid:)

12. 13. Reabsorption of potassium ions/K^+, and most of the bicarbonate ions/HCO_3^- occur passively/by passive transport into the interstitial fluid.

14. (As solutes move from filtrate to interstitial fluid) major portion of water is reabsorbed in the proximal convoluted tubule passively / by osmosis

15. and filtrate becomes more concentrated.

16. Secretion of hydrogen ions/H^+ occurs actively/by active transport,

17. ammonia/NH_3 by passive transport / passively and

18. 19. metabolites of drugs and toxins actively / by active transport.

20. In the descending limb of loop of Henle, resorption of water occurs passively / by osmosis.

21. 22. In the ascending limb of the loop of Henle, reabsorption of sodium ions/Na+ occur passively and (mainly) actively without water reabsorption and therefore, NaCl

23. the filtrate becomes diluted (as it moves towards distal convoluted tubule).

24. 25. In the distal convoluted tubule, passive reabsorption of water (can) occurs / is increased due to ADH and

26. 27. 28. reabsorption of sodium ions/Na+ and secretion of potassium ions/K+ (can) occur/ is increased due the action of aldosterone. Na+ R.Ab , K+ Secren

29. 30. (Controlled) secretion of H+ and reabsorption of bicarbonate ions/HCO_3^- in the distal convoluted tubule. HCO_3^- R.Ab , H+ Secn

31. Final processing of the filtrate at the collecting duct forms urine.

32. 33. 34. In the collecting duct filtrate becomes/can be (more) concentrated due to increased water reabsorption due to the action of ADH

35. 36. 37. Reabsorption of sodium ions /Na+ and secretion of potassium ions/K+ can be increased due the action of aldosterone in the collecting duct.

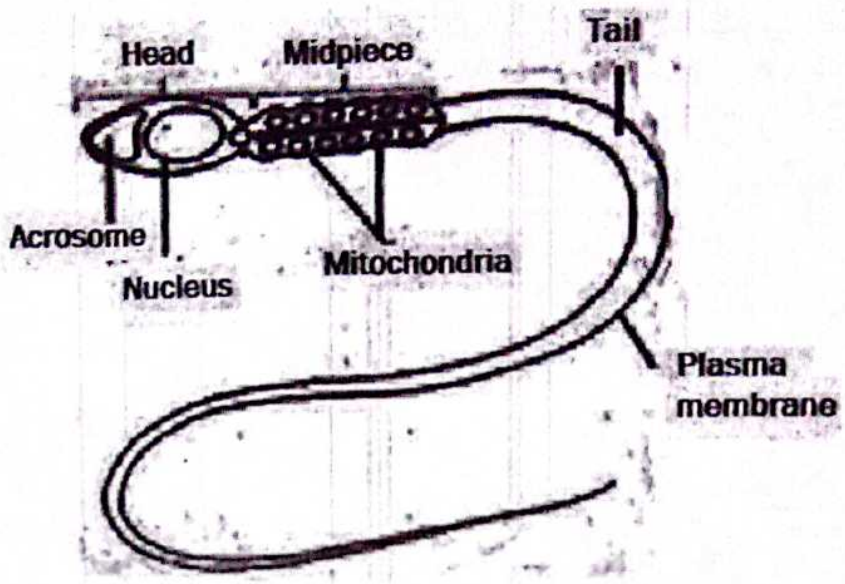
11- Na^+, glucose a.a. actively
PCT → Selective
10 - K^+ } passive
13 - HCO_3^- } passive
14 - H_2O - passive
Secretion
16 - H^+ → active
17 - NH_3 - passive
DCT → H_2O pass
C.T - H_2O reabs
PCT → Common wall Peritubular fluid
18 - Drug → active

Any 34 x 04 = 136 marks

Fully labelled Diagram = 14 marks

Total = 150 marks

09. (a) Describe the basic structure of the human sperm and state the functions of each of its parts.



Fully labelled correct diagram -06 marks

Partially labelled (at least 4) correct diagram -~~03~~ 04 marks

unlabelled = 0 03

Structure

1. The sperm comprises (three main parts) head, midpiece/body, tail.
2. Head contains the haploid nucleus.
3. Anterior end of the head contains a special vesicle
4. called acrosome
5. which contains hydrolytic enzymes
6. such as trypsin
7. and hyaluronidase.
8. Midpiece contains many mitochondria.
9. Tail contains a long flagellum
10. with typical 9+2 arrangement of microtubules.

tail is long flagellum covered by plasma membrane

Functions of each part

Head

11. Haploid nucleus: carries paternal genetic material
12. Hydrolytic enzymes of acrosome: help the sperm to penetrate the outer layers of the ovum

Midpiece

13. Mitochondria provide ATP/energy
14. for tail movement/swimming.

Tail

15. 16. helps the sperm to swim along the (female) reproductive tract towards the ovum/egg.

(b) Explain the hormonal regulation of spermatogenesis in man.

1. Just before puberty of males,
2. release of GnRH
3. from hypothalamus
4. stimulates anterior pituitary
5. to release/secrete/produce FSH and
6. LH
7. which act on (different) cells / cell types in the testis
8. to direct spermatogenesis *via* production of sex hormones.
9. LH stimulates Leydig cells
10. 11. to produce testosterone and other androgens (which promote spermatogenesis).
12. 13. FSH stimulates Sertoli cells to nourish the developing sperm.
14. 15. Spermatogenesis is regulated by control of production of sex hormones by two negative feedback systems.
16. 17. (High levels of) testosterone act on hypothalamus to inhibit/reduce GnRH secretion which
18. 19. 20 act on anterior pituitary to inhibit/reduce FSH and LH secretion.
21. 22. 23. Inhibin, produced/secreted by Sertoli cells acts on anterior pituitary to reduce FSH secretion.

16 + 23 = 39 points

Any 36 x 04 = 144 marks

Fully labelled Diagram = 06 marks

Total 150 marks

LH → Leydig → Testosterone

FSH → Sertoli

10. Write short notes on the following.

(a) Disadvantages of artificial breeding of plants.

1. Reduction in/ affects variability among organisms/ within species due to
2. reduction in genetic diversity leading to
3. adverse consequences of evolutionary fitness of the species
4. leading to/resulting in low resistance to infections.
5. Higher prevalence of congenital anomalies and
6. reduction in fertility.
7. Limits/reduces opportunities for natural selection and therefore
8. weak organisms/organisms with disabilities will survive.
9. Population is driven towards a lower fitness plateau/ reduces genetic fitness/ reduces fitness.
10. Increases homozygosis.
11, 12. Increases the expression of recessive deleterious mutations/traits/characters.
13. Results in inbreeding depression.
14. Can exhibit negative correlated responses which
15. lead to deterioration of characters that are not under direct observation.

(b) Okazaki fragments and their synthesis

1,2. These are short fragments of DNA
3. which are formed during DNA replication.
4. Separation of double helix/ strands of DNA start
5. at Ori/ Origin of Replication when
6. the protein that initiates DNA replication binds to it (Ori).
7. Only one of the new DNA strands is synthesized continuously
8. because the enzyme synthesizing the new DNA strands/ DNA Polymerase moves only in one direction / 5' to 3' direction
9. ~~10.~~ (DNA on) other strand is synthesized as small fragments called Okazaki fragments.
10. ~~11.~~ Okazaki fragments are ~~on~~ the lagging strand.
11. ~~12.~~ These fragments are joined to form a complete strand
12. ~~13.~~ by DNA Ligase.

(c) Desert plants

1. Sparse/ sparsely distributed.
2. Widely scattered.
3. Can withstand/ tolerate high temperatures and

4. scarcity of water.
5. Succulent body
6. Most have *C4* pathway (in photosynthesis).
7. *Deep roots*
8. Reduced surface area of leaves/ small leaves
9. Spines/ thorns present.
10. Toxins present (in leaves).
11. eg. Cacti/ Euphorbs

12 38

15+13+11= 39

Any 37 points 37x 4 = 148 marks

If more than 37 points written, add 2 marks

Total 150 marks