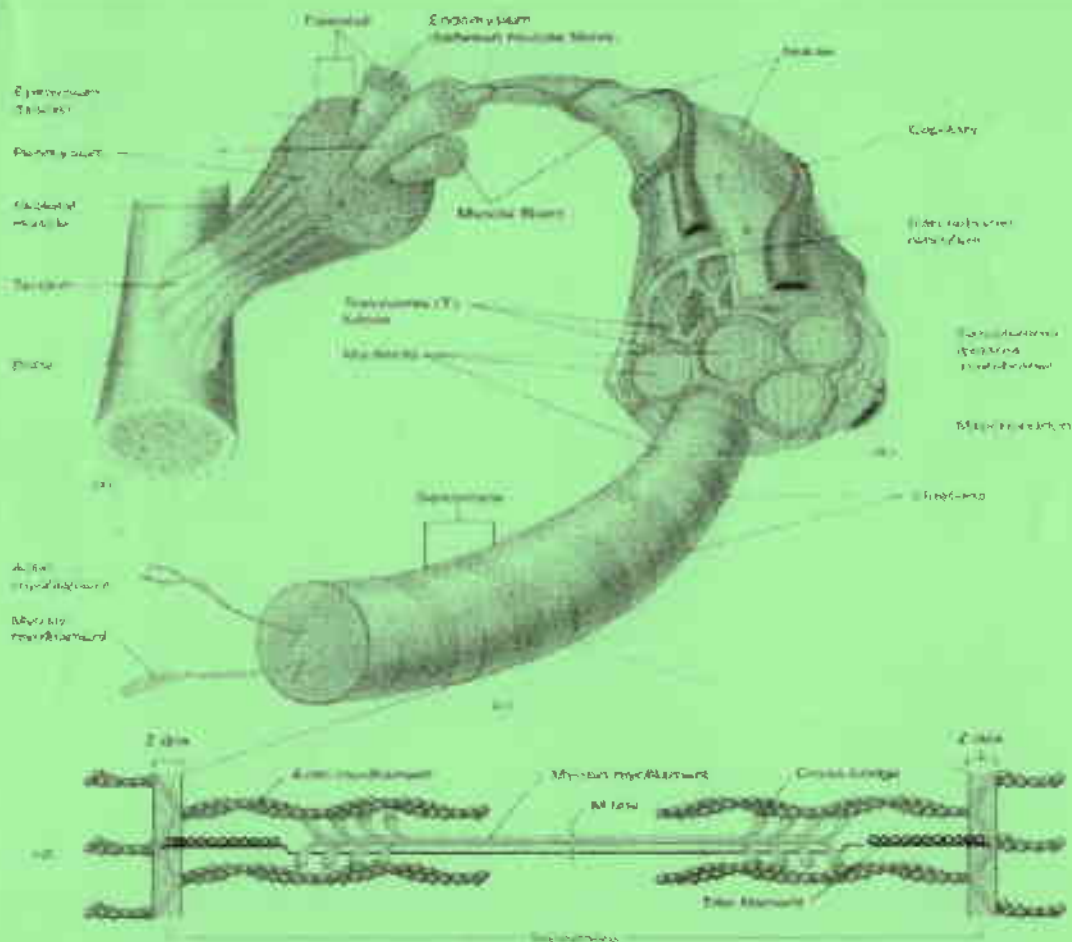




Department of Examinations - Sri Lanka
G.C.E. (A/L) Examination - 2018

09 - Biology

Marking Scheme



This document has been prepared for the use of Marking Examiners. Some changes would be made according to the views presented at the Chief Examiners' meeting.

Amendments to be included



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தீர்மான வினாவுகளுக்கானதே
இலங்கைப் பரீட்சைத் திணைக்களம்

த.பொ.க. (ப.பெ) வினாவுக/ க.பொ.த. (உயர் தர)ப் பரீட்சை - 2018

வினா எண்
பாட இலக்கம்

09

வினா
பாடம்

BIOLOGY

ஒவ்வொரு திணைக்களத்திலும்/புள்ளி வழங்கும் திட்டம்
I பகுதி/பத்திரம் I

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

❖ வினா பகுதி/ வினா அறிவுறுத்தல் :

வினா பகுதி/ ஒரு சரியான விடைக்கு 02 ஒவ்வொரு திணைக்களத்திலும்/புள்ளி வீதம்

மொத்தம்/மொத்தம் புள்ளிகள் 2 × 50 = 100

Part A - Structured Essay

1. (A) (i) Following are some of the characteristics seen in living organisms. Explain what is meant by each of these characteristics.

(a) Growth

An irreversible increase in dry mass of organisms 1pt

(b) Development

Irreversible changes that occur during the life span of an organism 1pt

(c) Reproduction

Ability to produce new offspring for continuous existence of species /
Production of new generation of individuals of the same species 1pt

- (ii) There are four main types of organic compounds found in organisms. State the mostly found main type of organic compound in each of the following.

(a) Egg White:	Protein	1pt
(b) Coconut milk:	Lipid	1pt
(c) Primary cell walls:	Carbohydrate	1pt
(d) Arthropod exoskeleton:	Carbohydrate	1pt

- (iii) Name a laboratory test used to identify the following.

(a) Main type of organic compound found in egg white

Biuret test 1pt

(b) Main type of organic compound found in coconut milk

Sudan III test 1pt

(c) Main storage substance of Chlorophyta

Iodine test 1pt

(d) Reducing sugars

Benedict test 1pt

- (B) (i) Name four monosaccharides according to the number of carbon atoms and give an example for each of them.

	Monosaccharide	Example	
(a)	Triose	Glyceraldehyde	1+1pt
(b)	Tetrose	Erythrose	1+1pt
(c)	Pentose	Ribose / Ribulose / Deoxyribose	1+1pt
(d)	Hexose	Glucose / Fructose / Galactose	1+1pt

- (ii) What is a disaccharide?

A (Sugar) molecule formed when two molecules of monosaccharides are joined by a glycosidic bond
1pt

(iii) (a) State the common characteristic of all monosaccharides and some disaccharides.

Reducing nature

1pt

(b) Describe a simple laboratory test used to identify sugars with the characteristic stated as the answer for (iii) (a) above.

- Take aqueous solution of sugar and
- Add an equal volume of Benedict's solution, mix well
- and boil (in a water bath)
- Brick red precipitate is formed

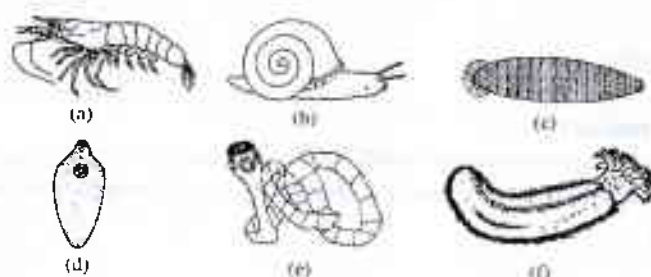
4pts

(C) (i) State the generic names of two homosporous, seedless plants with vascular tissues.

- *Nephrolepis*
- *Lycopodium*

2pts

(ii)



Complete the following dichotomous key using appropriate numbers and letters to distinguish the animals shown in the diagrams (a)-(f) above.

(1) Tentacles present	5	1pt
Tentacles absent	2	1pt
(2) Suckers present	3	1pt
Suckers absent	a	1pt
(3) Hooks present	e	1pt
Hooks absent	4	1pt
(4) Segmented body	c	1pt
Unsegmented body	d	1pt
(5) Large foot present	b	1pt
Large foot absent	f	1pt

(iii) Structures known as pedicellaria are present in some echinoderms such as starfishes.
Draw the external appearance of a pedicellaria.

(v) (a) What are the three factors that contribute to the resting membrane potential of neurons?

- Differences in the concentrations of specific ions inside and outside the cell (membrane)
- Selective permeability of plasma membrane for K^+ ions and Na^+ ions
- $Na^+ K^+$ pump

3pts

(b) Which lobe of the human cerebrum controls muscle movement needed for speech?

Frontal (lobe)

1pt

(C) (i) (a) What is a hormone?

- A chemical (messenger) secreted/released by endocrine glands into blood
- which acts (usually) on a distant organ to modify its physiology/ function.

2pts

(b) Where does ADH act on the kidney tubules of man?

- Distal convoluted tubule
- Collecting duct

2pts

(ii) State two main differences between nervous coordination and endocrine coordination.

- Pathway is specific in nervous coordination; Pathway is not specific in endocrine coordination
- Nervous coordination is chemical and electrical; Endocrine coordination is chemical
- Nervous coordination is rapid / rapid response; Endocrine coordination is slow / slow response
- Response is often localized in nervous coordination; Response may be diffused / widespread in endocrine coordination.

(Both conditions have to be written)

any 2 2pts

(iii) (a) Briefly describe what are known as sinuses located in some bones of the human skeleton.

Air filled cavities/ sacs/ spaces lined with ciliated mucous membrane

1pt

(b) Name a bone that contains sinuses but does not take part in the formation of human cranium.

Maxillary (bone)

1pt

(iv) State two functions of sinuses.

- Give resonance to the voice
- Lighten the bones of face / skull / cranium
- Make it easier for the head / skull to balance on top of the vertebral column

any 2 2pts

(v) Name the two processes found in human mandible and state the function of each of them.

Process	Function	
Condylloid process	Articulates with the temporal bone	2pts
Coronoid process	Gives attachment to muscles and ligaments	2pts

Total 40 x 2½ marks = 100 marks**3. (A) (i) State the location of the pacemaker in the human heart.**

On the wall / myocardium of right auricle close to the opening of the superior vena cava

1pt

(ii) Name the arteries that arise first from the aorta and state the structure to which they supply blood.

Arteries	Structure	
Coronary arteries	Heart	1+1 2pts

(iii) State how blood circulatory system contributes to maintain constant body temperature in man.

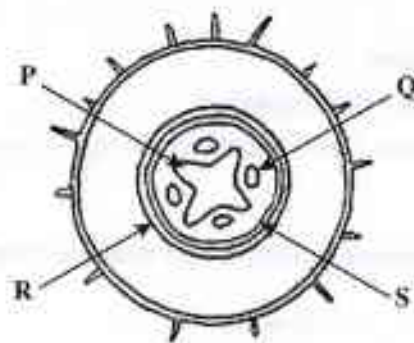
- Transfer heat from active tissues
- constriction and dilation of skin blood vessels

2pts

(iv) Considering the ABO blood groups and Rh factor, state the blood groups of the following persons

Universal donor	O ⁻	1pt
Universal recipient	AB ⁺	1pt

(B)



(i) Identify the structure shown in the above diagram.

T.S./ C.S. of a primary dicot root

1pt

(ii) (a) Name the tissues labeled as P, Q, R and S in the above diagram.

P - (Primary) xylem

Q - (Primary) phloem

R - Endodermis

S - Pericycle

1 pt each

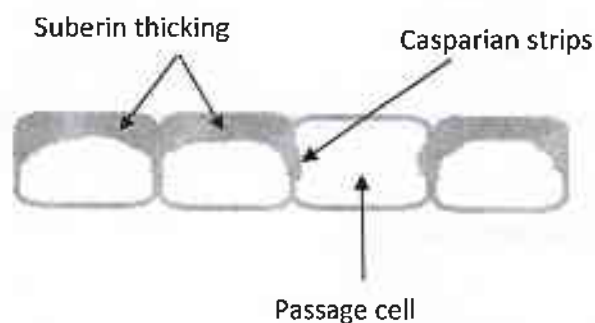
4pts

(b) What is the tissue of the above diagram that appears in red when stained with Safranin?

Xylem

1pt

(iii) Draw and label a few cells of tissue R when it is at matured stage.



Correct diagram 1pt + 1 pt each for labeling

4pts

(Incorrect diagram or no labeling – No marks)

(iv) What are the features of gymnosperms that enable them to be more successful on terrestrial habitats than bryophytes?

- Presence of well differentiated roots, stem and leaves
- Presence of vascular tissues/ xylem and phloem
- Presence of seeds
- (Diploid) sporophyte is dominant
- Presence of cuticles (on leaves/ aerial parts of the plant)
- Not dependent on external water for reproduction/ fertilization

any 5 5pts

(v) State three uses of plant tissue culture other than the propagation of plants with desired characters.

- Cryopreservation of germplasm
- Producing genetically modified plants
- Obtaining haploid plants
- Obtaining disease free plants

any 3 3pts

(C) (i) What is the main purpose of examining a bacteria smear stained with methylene blue under high power of a light microscope.

Observing (basic) shape

1pt

(ii) (a) Name the forms of arrangement of cells of cocci shown in the diagrams A—D write given below.



A



B



C



D

A - Cocci

B - Tetrad

C - Streptococci

D - Staphylococci

(1 point each) 4pts

(b) What are the two types of arrangement of cells of bacilli?

- Diplobacilli
- Streptobacilli

2pts

(iii) (a) What are prions?

- Proteinaceous infectious particles

1pt

(b) How could prions be transmitted from human to human?

- During transplanting of tissues / organs
- Transfusion of contaminated blood

2pts

(iv) Some microorganisms in the normal microbiota of humans may become pathogenic when general resistance of the body is lowered. How are these microorganisms called?

Opportunistic pathogens

1pt

(v) Give four reasons for lowering the general resistance of the human body against microbial infections.

- Exhaustion
- Prolonged use of antibiotics
- Use of immune suppressive drugs
- Stress
- Malnutrition
- Use of narcotics

any 4 4pts

Total 40 x 2½ marks = 100 marks

4. (A) (i) (a) What is placenta?

A structure formed between the mother and the foetus (mainly) for exchange of materials (between mother and foetus).

1pt

(b) What is the type of placenta found in humans?

Deciduous alanto-chorion placenta

1pt

(ii) (a) Name a material that passes from mother to foetus and from foetus to mother through placenta.

Water / H₂O

1pt

(b) Name a virus that can pass from mother to foetus through placenta.

Hepatitis B/ Rubella

1pt

(iii) (a) Name a hormone secreted only by the human placenta.

Human placental lactogen/ hCG (Human chorionic gonadotrophin)

1pt

(b) State two functions of placenta other than hormone secretion and exchange of material between mother and foetus.

- Attachment of foetus to mother
- Prevention from coagulation of blood due to Rh factor of different blood groups
- Protection from relatively high blood pressure of maternal circulation
- Acting as a barrier for certain materials

any 2 2pts

(iv) (a) What is lactation?

Synthesis and release of milk

1pt

(b) Name two hormones that are directly involved in lactation.

- Prolactin
- Oxytocin

2pts

(v) What is the reason for menopause?

- Ovaries become less sensitive to FSH and LH

1pt

(B) (i) Where does oxidative phosphorylation take place in an eukaryotic cell?

- Inner membrane / cristae of mitochondria

1pt

(ii) State the events that take place during oxidative phosphorylation in a eukaryotic cell.

- Oxidation of reduced co-enzymes
- ATP formation / Conversion of ADP to ATP
- Hydrogen accepted by molecular oxygen
- forming water
- Electrons transported through electron carriers

5pts

(iii) Name three enzymes involved in DNA replication and state one function of each of them.

Enzyme	Function	
(DNA) Helicase	uncoiling/unwinding/unzipping of DNA	2pts
DNA polymerase	Synthesis/ Polimerization of new (complementary) DNA strand	2pts
(DNA) Ligase	Joining DNA fragments	2pts

(iv) State three traits introduced to agricultural crops by genetic modification for crop protection.

- Pest resistance
 - Climate tolerance
 - Disease resistance
- 3pts

(C) (i) Why is it important to study environmental science?

- Today mankind is faced with many environmental issues
 - They are increasing / growing and
 - become more and more complex day by day
 - To make effective suggestions for these and
 - to take remedial actions
- 5pts

(ii) What is in-situ conservation?

- Species are protected in its natural habitat
 - and their reproduction is facilitated
- 2pts

(iii) State three methods of in-situ conservation other than establishing national reserves.

- Traditional home gardens
 - Establishing sanctuaries
 - Reintroduction of species into natural habitat/ environment
- 3pts

(iv) What is Ramsar convention?

(Convention dealing with) conservation of wetlands of international importance especially as waterfowl habitats

1pt

(v) Name two Ramsar sites located in the north-West of Sri Lanka.

- Anawilundawa (tank) sanctuary
 - Vankalai sanctuary
 - Willpattu national park
- any 2 2pts

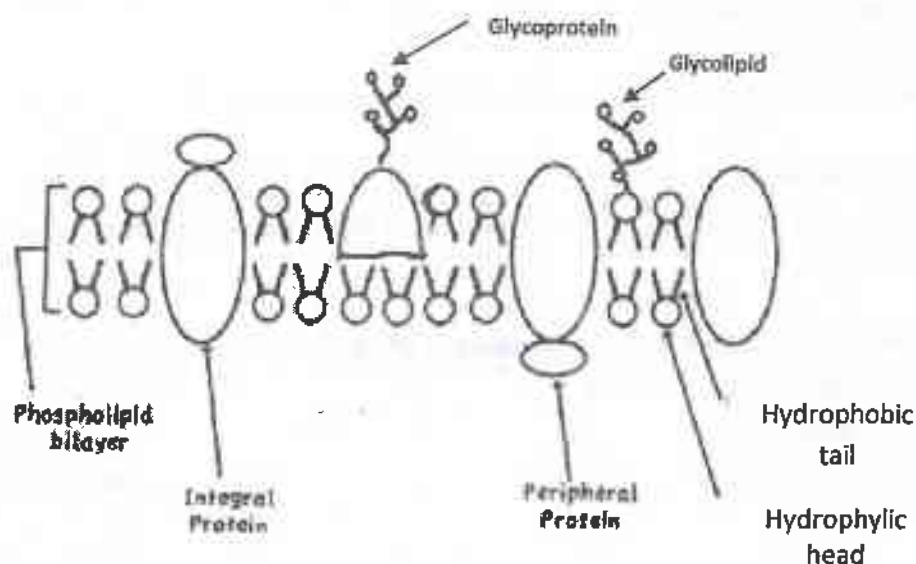
Total 40 x 2½ marks = 100 marks

PART B - Essay

5. (a) Describe the structure of plasma membrane

1. Fluid mosaic model of plasma membrane
2. consists of phospholipids and proteins.
3. Phospholipids form a fluid bilayer / two layers
4. with outer hydrophilic heads
5. and inner hydrophobic tails.
6. Some proteins are fully embedded
7. while some are partially embedded
8. in the fluid matrix and
9. they are called integral proteins.
10. (Some) proteins are (loosely) bound to the membrane and
11. they are called peripheral proteins.
12. (Some) (short) sugar molecules/ (short) chains/ oligosaccharides/ polysaccharides
13. are attached to the surface of proteins
14. to form glycoproteins
15. and to phospholipids
16. to form glycolipids.

16 x 4 marks = 64 marks



Diagram

Fully labeled correct diagram 7

Partially labeled correct diagram 3

Unlabeled diagram no marks

Diagram = 07 marks

Sub total for (a) = 71 marks

(b) Explain how a nerve impulse is generated in the plasma membrane of an axon and how it is conducted along a non-myelinated axon

1. At resting condition axolemma / plasma membrane of axon is polarized.
2. Outside of axolemma is positively (+vely) charged.
3. Inside of axolemma is negatively (-vely) charged.
4. Application of a threshold stimulus,
5. produces influx/flow of Na^+ from extra cellular fluid to intracellular fluid / outside to inside of the axon.
6. This is followed by exflux/flow of K^+ from intracellular fluid to extra cellular fluid/ inside to outside of the axon.
7. This causes an action potential at the site of stimulus / (plasma) membrane of axon depolarizes,
8. causing reversal of polarity.
9. Outside of membrane becomes -vely charged,
10. and inside of the membrane becomes +vely charged.
11. Region of the membrane immediately ahead of this region is still at resting condition / outside is +vely charged and inside is -vely charged.
12. Difference in the (electric) potential now exists between the region of action potential and this.
13. Due to this difference in potential, eddy currents / local circuits will flow
14. from the region to the region of action potential immediately ahead of action potential
15. through extracellular fluid and
16. through the intracellular fluid.
17. These eddy currents / local circuits (eventually) pass through plasma membrane.
18. and the action potential will move forward (as an impulse).
19. Action potential will not be formed in the reverse direction (although eddy currents/ local circuits / flow),
20. because immediately after one action potential 2nd action potential cannot be formed / there is a refractory period.

Sub total for (b): $20 \times 4 = 80$

Total $71 + 80 = 151$

Maximum = 150

b) Describe the economic importance of Fungi

1. Some (heterotrophic / saprotrophic) fungi cause food spoilage,
2. eg. *Mucor*
3. some (pathogenic) fungi cause diseases of plants
4. and reduce the economic benefits / cause economic losses.
5. Some fungi cause decay in furniture / wooden structures.
6. Some fungi are used as food.
7. eg. Mushrooms/ *Pleurotus*/ *Agaricus* / *Lentinus*.
8. Some are used for production of alcoholic beverages/ alcohol/ bakery industry/ bread
9. eg. *Saccharomyces cerevisiae*.
10. Some are used to produce antibiotics.
11. eg. *Penicillium notatum*/ *Penicillium chrysogenum*.
12. Some are used to produce enzymes.
13. eg. *Aspergillus niger*/ *Saccharomyces cerevisiae*/ *Rhizopus sp.* / *Aspergillus oryzae*
14. Some are used to produce compost./ Recycling of wastes.

26 + 14 = 40;

Any 38 x 4 = 152

Maximum 150 marks

8. (a) Briefly describe the diversity of nutrition seen among protists.

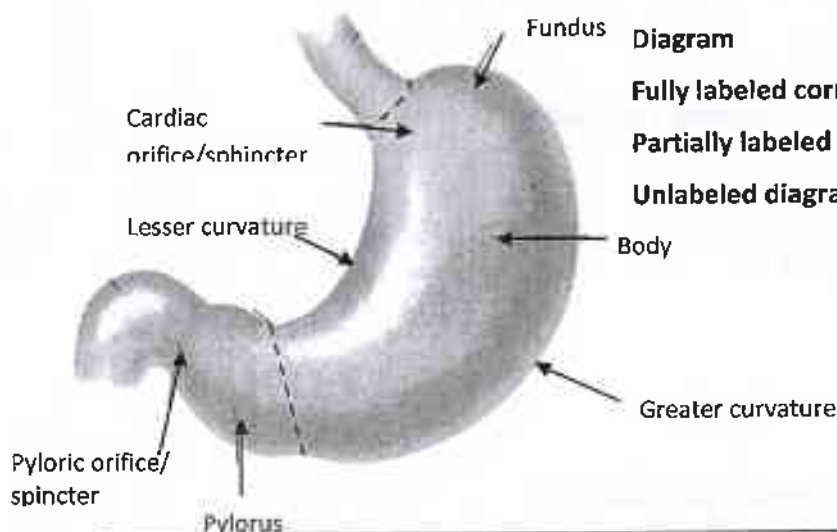
1. Protists can be autotrophic or
2. heterotrophic.
3. In autotrophic nutrition, source of carbon is inorganic/ CO₂.
4. Some protists are photoautotrophic and
5. their energy source is light.
6. eg. Chlorophyta
7. Rhodophyta and
8. Phaeophyta
9. In heterotrophic nutrition, source of carbon is organic.
10. Some heterotrophic protists are holozoic
11. They ingest (food),
12. digest,
13. absorb (nutrients),
14. assimilate and
15. eject (undigestible matter).
16. eg. Ciliophora / *Paramecium*
17. Rhizopoda / *Amoeba*.
18. Some protists are symbiotic and
19. get nutrients by living in association with another species / by two species living together.
20. Some (symbiotic protists) are parasitic
21. eg. *Plasmodium*.
22. Some are mutualistic.
23. eg. algae of lichens

(b) Describe the gross structure of human stomach

1. J shaped
2. muscular sac / dilated sac (in the abdominal cavity).
3. Proximally continuous / Its proximal end connects with oesophagus
4. by cardiac orifice /sphincter and
5. continuous / connects with the duodenum from the distally
6. Pyloric orifice
7. which is controlled by pyloric sphincter.

Stomach is divided into

8. the fundus
9. the body and
10. the pylorus.
11. It has a lesser curvature and a greater curvature.
12. External surface is smooth.
13. Internal surface is folded / contain rugae.

**Diagram**

Fully labeled correct diagram: 7 marks

Partially labeled correct diagram: 3 marks

Unlabeled diagram: No marks

(23+13) 36 x 4 marks = 144 + 7 marks for the diagram = 151 marks

Maximum 150 marks

9. (a) Describe the Hardy-Weinberg equilibrium.

Hardy-Weinberg equilibrium states that

1. Allele /genotype frequencies of a (an ideal) population remain constant from generation to generation (in the absence of other evolutionary influences).

This occurs under several conditions / Several assumptions need to be fulfilled. They are:

2. Population size is very large / infinite;
3. random mating occurs;
4. no mutations take place;
5. no immigration and no emigration / no migration(in to or out of population) /close population;
6. no (natural) selection.
7. Deviations of above assumptions / conditions / if those assumptions are not fulfilled, changes in allele / genotype frequencies / genetic drift occurs
8. leading to evolution.

(b) (i) Describe how blood groups are inherited to the children of a mother having blood group AB and a father having blood group A.

1. Genotype of the mother (having blood group AB) is $I^A I^B$.
 2. Genotypes for father are either $I^A I^A$
 3. or $I^A I^0 / I^A i$
 4. Gametes of the mother are I^A
 5. and I^B
 6. in 50% of each/ 1:1 ratio.
 7. If father's genotype is $I^A I^A$, all the gametes are I^A .
 8. The possible genotypes of the children are $I^A I^A$
 9. and $I^A I^B$
 10. in 1:1 ratio / 50% each.
 11. Their phenotypes/ blood groups are A
 12. and AB
 13. in 1:1 ratio / 50% each.
 14. If the father's genotype is $I^A I^0 / I^A i$, gametes produced are I^A
 15. and I^0 / i
 16. in 50% each / 1:1 ratio.
 17. The genotypes of the children are $I^A I^A$,
 18. $I^A I^B$,
 19. $I^A I^0 / I^A i$,
 20. $I^B I^0 / I^B i$
 21. in 1:1:1:1 ratio / 25% each.
 22. Phenotypes / blood groups of children are A, AB and B
 23. in 2:1:1 ratio.
- If points are shown in a diagram, marks should be given. However, correct words should be used.

(ii) Explain how the inheritance of ABO blood groups differs from Medelian inheritance.

1. In Medelian inheritance, a character is controlled/ inherited by two alleles of a gene.
2. ABO blood groups are controlled/ inherited by three alleles.
3. They are denoted as I^A , I^B and I^0/i .
4. In Mendelian inheritance, one allele is dominant over the other (recessive).
5. and in phenotype, dominant character is expressed.
6. In ABO blood groups, I^A and I^B are codominant,
7. and both A and B characters are expressed in the phenotype, (when both I^A and I^B alleles are present).

8+ 23 + 7 =38

38 x 4 marks= 152

Maximum 150 marks

10. Write short notes on the following.**(a) Lymphatic system of man**

1. Lymphatic system consists of lacteals,
2. lymph capillaries,
3. lymph nodes,
4. diffused lymph tissue,
5. lymphatic organs / spleen / thymus
6. and bone marrow.
7. It transports lymph.
8. Lymph capillaries originate blindly / have a blind end
9. and (they join to) form large lymph vessels
10. which join together to form two large ducts,
11. called right lymphatic duct and
12. thoracic duct.
13. Lymph flows due to contraction of nearby muscles and
14. pulsation of large arteries.
15. Lymphatic system involves in / perform specific and non-specific immune responses/ immunity,
16. and helps in absorption of fat / fat soluble material (any example such as Vitamin A, D, E, K is accepted).

(b) Sliding filament theory of muscle contraction

1. This theory explains the mechanism of muscle contraction.
2. (According to this theory) thin actin filaments (of muscle fibers) slide over thick myosin filaments (during muscle contraction).
3. Myosin filaments contain heads and
4. actin filaments contain binding sites/ regions.
5. When a nerve impulse reaches the skeletal muscle fibre (through neuro-muscular junction),
6. sarcoplasmic reticulum releases Ca^{2+} .
7. Ca^{2+} expose binding sites/ regions of actin filaments and
8. myosin heads attach to binding sites/ regions
9. forming (actin-myosin) cross bridges.
10. ATP provides the energy for this/ ATP is needed for this.
11. (When activated) (actin-myosin) cross bridges tilt inwards / towards center of sarcomere
12. in a short powerful stroke.
13. A series of powerful strokes causes the contraction of muscle fibre/ sarcomere
14. (Due to this), the actin filaments slide towards the centre of sarcomere,
15. shortening the I band and
16. H zones while
17. A band remains at the same length.

(c) Ozone layer depletion

1. Depletion of ozone layer occurs due to release of chlorofluorocarbons/ CFCs
2. from refrigerators/ air conditioners/ aerosol cans.
3. This increases the harmful ultra-violet radiation/ rays (coming from the sun)
4. This increases (risk of) cataracts of eyes,
5. skin cancers and
6. lowers crop yield by
7. interfering with photosynthesis.

16+17+07 = 40

Any 38 X 4 marks = 152 marks

Maximum 150 marks

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