



- a) aorta  
b) renal vein  
c) hepatic portal vein  
d) pulmonary vein
- (f) **Assertion (A):** Ozone is very important layer of atmosphere. [1]  
**Reason (R):** Ozone protects the living organisms from harmful UV radiation of sun.
- a) Both A and R are true and R is the correct explanation of A.  
b) Both A and R are true but R is not the correct explanation of A.  
c) A is true but R is false.  
d) A is false but R is true.
- (g) Which method of contraception can provide protection against transmission of AIDS, syphilis and gonorrhoea? [1]  
a) Male sterilisation (cutting sperm ducts)  
b) Female sterilisation (tying oviducts)  
c) Condoms  
d) Oral contraceptive pills
- (h) The chief nitrogenous waste in mammals is [1]  
a) uric acid  
b) amino acids  
c) urea  
d) ammonia
- (i) The function of light energy used in photosynthesis is to [1]  
a) activate chlorophyll  
b) reduce CO<sub>2</sub>  
c) Deactivate chlorophyll  
d) split CO<sub>2</sub>
- (j) The site of maturation of human sperm is the [1]  
a) seminiferous tubule  
b) interstitial cells  
c) prostate gland  
d) epididymis
- (k) The chromosomes are joined together at a point called [1]  
a) centromere  
b) chromatid  
c) centrosome  
d) centriole
- (l) A gland which secretes both hormone and enzyme is [1]  
a) adrenal  
b) thyroid  
c) pituitary  
d) pancreas
- (m) Which one of the following is non-biodegradable? [1]  
a) DDT  
b) Cardboard  
c) Vegetable peel  
d) Bark of trees
- (n) A destarched plant is one whose [1]  
a) Leaves are free from chlorophyll  
b) leaves are free from starch  
c) Aerial parts are free from starch  
d) Plant is free from starch.
- (o) The cerebral hemispheres in mammals are connected by [1]  
a) corpus luteum  
b) pons varolii  
c) corpus callosum  
d) hypothalamus

2. **Question 2** [25]

(a) **Name the following:**

- i. The process which causes raisins to swell, when kept in water. [1]
- ii. An apparatus that measures the rate of water uptake in a cut shoot due to transpiration. [1]
- iii. The wax-like layer on the epidermis of leaves which reduces transpiration [1]
- iv. A condition that results in abnormally long bones, long lower jaw bone due to the hypersecretion of a pituitary hormone. [1]
- v. The pituitary hormone which stimulate the contraction of uterus during child birth. [1]

(b) **Arrange and rewrite the terms in each group in the correct order so as to be in a logical sequence beginning with the term that is underlined.**

- i. Gestation is the process of fixing of the zygote to the uterine wall. [1]
- ii. Correct and rewrite the statements by changing the biological term that is underlined for each statement:  
The part of the eye which can be donated from a clinically dead person is the Retina. [1]
- iii. The first process by which water gets into the seed coat during germination is osmosis. [1]
- iv. Osmosis is active transport of molecules in cells. [1]
- v. Centromere is the organelle of the cell that initiates cell division. [1]

(c) **Fill in the blanks with suitable words:**

- i. Copy and complete the following by filling in the blanks 1 to 5 with appropriate words. [5]  
The human female gonads are ovaries. A maturing egg in the ovary is present in a sac of cells called (i)\_\_\_\_\_. As the egg grows larger, the follicle enlarges and gets filled with a fluid and is now called the (ii)\_\_\_\_\_ follicle. The process of releasing the egg from the ovary is called (iii)\_\_\_\_\_. The ovum is picked up by the oviduct funnel and fertilization takes place in the (iv)\_\_\_\_\_. In about a week the blastocyst gets fixed in the endometrium of the uterus and this process is called (v)\_\_\_\_\_.

(d) **Choose the odd one out from the following terms and name the category to which the others belong:**

- i. Bile, Urea, Uric acid, Ammonia [1]
- ii. ACTH, TSH, ADH, FSH [1]
- iii. Cortisone, somatotropin, adrenocorticotropic hormone, vasopressin [1]
- iv. Detergents, sewage, X-rays, oil spills [1]
- v. Sewage, Newspaper, Styrofoam, Hay [1]

(e) **Match the items given in Column I with the most appropriate ones in Column II and rewrite the correct matching pairs.**

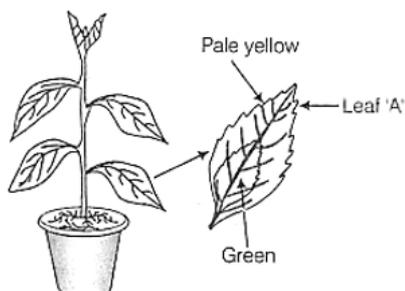
- i. Match the following columns. [5]

Column I	Column II
(a) Liver	(i) Knot-like tuft of blood capillaries in Bowman's capsule.
(b) Skin	(ii) Breakdown of proteins.
(c) Kidney	(iii) Sweat glands.
(d) Glomerulus	(iv) Bean-shaped excretory organ.

**Section B**

Attempt any 4 questions

3. **Question 3** [10]
- (a) Write the genotype of haemophilic son and carrier daughter. [1]
  - (b) Explain briefly: [2]
    - i. Mutation
    - ii. Homologous chromosomes
    - iii. Alleles
  - (c) Discuss with your teacher about [2]
    - i. haploid insects and lower plants where cell division occurs.
    - ii. some haploid cells in higher plants where cell division does not occur.
  - (d) In a cross between a pure breed, red-eyed female fruitfly and a white-eyed male, what percentage of the male offsprings will have white eyes? (White eyes are X-linked, recessive). [2]
  - (e) Draw a well labelled diagram to show the metaphase stage of mitosis in an animal cell having four chromosomes. [3]
4. **Question 4** [10]
- (a) If someone receives a blow on the back of neck, what would be the effect on the person's CNS? [1]
  - (b) Given below are two structures, write their special functional activity. [2]
    - i. Myelin sheath
    - ii. Relay neuron
  - (c) Explain, what does nervous system consist of? [2]
  - (d) Explain the mechanism of focusing the image of a distant object in our eye when we raise our head after reading a book. [2]
  - (e) Draw a well labelled diagram of a neuron showing the following parts: Dendrites, axon, node of Ranvier and myelin sheath. [3]
5. **Question 5** [10]
- (a) State the main function of guard cells. [1]
  - (b) Plants have several pigments that can catch light energy. Two of these are chlorophyll-a and chlorophyll-b, which harness light of different wavelengths. What advantage does a plant obtain by having molecules that act at different wavelengths? [2]
  - (c) What conditions enable RuBisCO to function as an oxygenase? Explain the ensuring process. [2]
  - (d) Explain the mechanism of opening and closing of stomata. [2]
  - (e) A potted plant with variegated leaves was taken in order to prove a factor necessary for photosynthesis. The potted plant was kept in the dark for 24 hours and then placed in bright sunlight for a few hours. Observe the diagrams and answer the questions [3]



- a. What aspect of photosynthesis is being tested in the above diagram?
- b. Represent the process of photosynthesis in the form of a balanced equation.

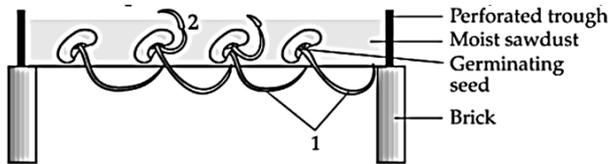
c. Why was the plant kept in the dark before beginning the experiment?

6. **Question 6**

[10]

- (a) What is the number of chromosomes in the gametes of human beings? [1]
- (b) Mention the differences between mitosis and meiosis with reference to [2]
  - i. Number of daughter cells formed at the end of cell division.
  - ii. The number of chromosome received

- (c) Given below is an experimental setup to demonstrate a particular tropic movement in germinating seeds. Study the diagram and answer the questions that follow: [3]



(i) Label the parts 1 and 2.

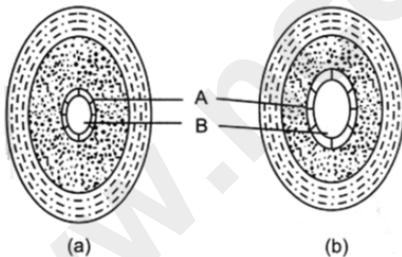
- a. Label the parts 1 and 2
- b. Name the tropic movement shown by part 1.
- c. What is thigmotropism? Give one example.

7. **Question 7**

[10]

- (a) What does the inheritance of acquired characters mean? Who gave this idea? [1]
- (b) Explain how vestigial organs give an idea about evolution. [2]
- (c) Describe Lamarck's theory of evolution. [2]
- (d) List the effects of following on human population of an area [2]
  - i. Immigration
  - ii. Emmigration

- (e) The diagram given alongside show the cross section of two kinds of blood vessels. [3]



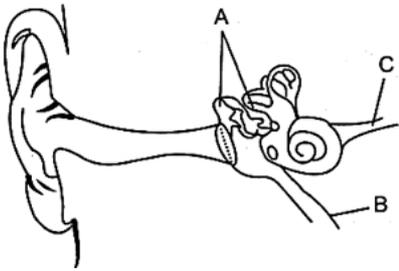
- a. Identify the blood vessels A and B. In each case give a reason to support your answer.
- b. Name the parts numbered A and B.
- c. When are the sound **Lubb** and **Dubb** produced during a heartbeat?

8. **Question 8**

[10]

- (a) Briefly explain the term osmosis. [1]
- (b) Why renal portal system is absent in mammals? [2]
- (c) Answer the following. [2]
  - i. Name the greenhouse gases that cause global warming.
  - ii. Which of them caused ozone hole and how?

- (d) Given below is the diagram of the human ear. Study the same and answer the questions that follow: [3]



- Name the part labelled **B** and state its function.
- Name the part labelled **C** and state its function.
- Give the function of ear wax.

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# Solution

## Section A

1. Question 1: Choose the correct answers to the questions from the given options. (Do not copy the question, write the correct answers only.)

- (i) **(d)** the turgid and flaccid state of the guard cells

**Explanation:**

the turgid and flaccid state of the guard cells

- (ii) **(c)** Option (d)

**Explanation:**

- a. The smallest entity of the living organism
- b. The structural and functional unit of life

- (iii) **(d)** 31 pairs

**Explanation:**

In humans, there are 31 pairs among them 8 cervical, 12 thoracic, 5 lumbar, 5 sacral, and 1 coccygeal.

- (iv) **(b)** methane

**Explanation:**

methane

- (v) **(c)** hepatic portal vein

**Explanation:**

hepatic portal vein

- (vi) **(a)** Both A and R are true and R is the correct explanation of A.

**Explanation:**

Both A and R are true and R is the correct explanation of A.

- (vii) **(c)** Condoms

**Explanation:**

Condoms provide a barrier while sexual intercourse.

- (viii) **(c)** urea

**Explanation:**

urea

- (ix) **(a)** activate chlorophyll

**Explanation:**

activate chlorophyll

- (x) **(d)** epididymis

**Explanation:**

Sperm production occurs in the testis, but sperm maturation and storage take place in the epididymis.

- (xi) **(a)** centromere

**Explanation:**

centromere

- (xii) **(d)** pancreas

**Explanation:**

Pancreas is the gland which secretes both hormones and enzymes.

- (xiii) **(a)** DDT

**Explanation:**

DDT

(xiv) **(b)** leaves are free from starch

**Explanation:**

leaves are free from starch

(xv) **(c)** corpus callosum

**Explanation:**

The cerebral hemispheres are connected by the tract of nerve fiber corpus callosum in mammals.

2. Question 2

(i) Name the following:

- i. 1. Endosmosis
- ii. 1. Potometer
- iii. 1. Cuticle
- iv.
- v. 1. Oxytocin

(ii) Arrange and rewrite the terms in each group in the correct order so as to be in a logical sequence beginning with the term that is underlined.

- i. False. Implantation is the process of fixing of the embryo to the uterine wall.
- ii. The part of the eye which can be donated from a clinically dead person is the Cornea.
- iii. The first process by which water gets into the seed coat during germination is imbibition.
- iv. Osmosis is passive transport of molecules in cells.
- v. False, Centrosome is the organelle of the cell that initiates cell division.

(iii) Fill in the blanks with suitable words:

- i. (i) follicle, (ii) graafian, (iii) ovulation, (iv) fallopian tube/oviduct/uterine tube, (v) implantation

(iv) Choose the odd one out from the following terms and name the category to which the others belong:

i. **Odd term:** Bile

**Category:** Nitrogenous wastes/Excretory substances

ii. **Odd term** - ADH

**Category** - Hormones of anterior lobe of pituitary gland.

iii. **Odd term** - Cortisone

**Category** - Pituitary hormone.

iv. Odd term - X-rays

**Category** - Sources of water pollution

v. Odd term- Styrofoam is non-biodegradable, pollutant

**Category**- Biodegradable pollutants.

(v) Match the items given in Column I with the most appropriate ones in Column II and rewrite the correct matching pairs.

- i. (a) - (iii), (b) - (iv), (c) - (v), (d) - (ii)

**Section B**

3. Question 3

(i)  $X^hY$ -Haemophilic son

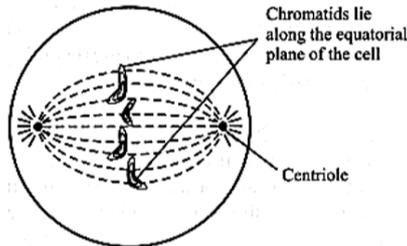
$X^hX$ -Carrier daughter

- (ii) i. Mutation is a rare, random, discontinuous inheritable change in the genetic material of an organism.  
ii. A pair of chromosomes of the same size and shape bearing corresponding genes governing the same set of traits.  
iii. Alleles or allelomorphs are various forms of gene or mendelian factor which occurs on the same locus on homologous chromosomes and control the same character. They control different expressions or traits of the same character (e.g., tallness and dwarfness in Pea).
- (iii) i. Male bees, wasps and ants are haploid organisms, because they are produced from unfertilized eggs.  
ii. Synergids and antipodal cells in the ovule don't undergo cell division.
- (iv) 0%. All the males and females will be red-eyed. Pure breed female (XX) is homozygous for normal X-chromosome. White-eyed male ( $X^oY$ ) is hemizygous for X-chromosome with a white eye mutation.

	Sperm	
	X <sup>o</sup>	Y
Egg	X	XX <sup>o</sup>
	X	XX <sup>o</sup>

Both male and female offspring will inherit a normal X-chromosome from the female.

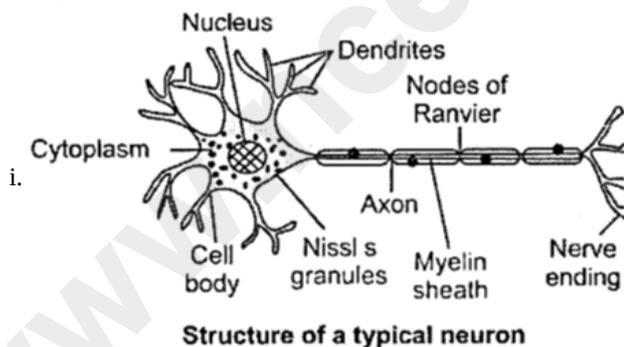
(v) Metaphase stage of mitosis in animal cell is given below:



4. Question 4

- (i) A hard blow on the back can cause injury of the spinal cord. It may result in paralysis, leading to impairment in physical functioning and cognitive abilities of that person.
- (ii) i. **Myelin sheath:** It provides an insulation around the axon for increasing the speed of impulses.  
 ii. **Relay or connecting neuron:** It serves as a link between the sensory and motor neuron. These are mainly found in brain and spinal cord.
- (iii) The nervous system consists of
- Central Nervous System (CNS):** It comprises brain and spinal cord.
  - Peripheral Nervous System (PNS):** It comprises cranial and spinal nerves.
  - Autonomic Nervous System (ANS):** It comprises parasympathetic and sympathetic nerves.
- (iv) While reading a book (near by vision), the lens of our eye is more convex or rounded but when we focus our eye on a distant object, the ciliary muscles are relaxed. The lens becomes concave or flattened. This accommodation power of eye enables us to have a clear vision of objects at varying distances.

(v)



5. Question 5

- (i) Guard cells regulate CO<sub>2</sub> influx from the atmosphere into the leaves for photosynthetic carbon fixation. Stomatal guard cells also regulate water loss of plants via transpiration to the atmosphere.
- (ii) Chlorophyll has various pigments like a and b. These pigments have a tendency to absorb different light or different wavelengths. Thus, this characteristic feature of various pigments of chlorophyll makes them most effective for photosynthesis.
- (iii) Carboxylation is the most crucial step of the Calvin cycle, where CO is utilised for the carboxylation of RuBisCO. This reaction is catalysed by the enzyme RuBP carboxylase which results in the formation of 2 molecules of 3PGA. Since, this enzyme also has an oxygenation activity, it would be more correct to call it RuBP carboxylase-oxygenase or RuBisCO.
- (iv) The opening and closing of stomata are controlled by turgor changes in the guard cells. The inner concave walls of the guard cells are thick than their outer walls. Due to the absorption of water, the guard cells become turgid. Their inner walls are pulled apart by their outer wall. The gap between the guard cells becomes wider. Thus, the stomata are open by

guard cell. When guard cells are flaccid due to loss of water, the outer walls are not stretched, and their inner walls are not pulled apart decreasing the gap between the guard cells. Thus, the stomata close.

- (v) a. To prove that photosynthesis can take place only in presence of chlorophyll, which is present in the green areas of the leaf.  
 b. The process of photosynthesis in the form of a balanced equation  

$$6\text{CO}_2 + 6\text{H}_2\text{O} \xrightarrow[\text{HV}]{\text{Chl}} \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{CO}_2 \uparrow$$
  
 c. The plant was kept in the dark before beginning the experiment to destarch (free from starch) the leaves.

6. Question 6

(i) 23

(ii)

i.	<b>Mitosis</b>	<b>Meiosis</b>
	Two daughter cells are produced at the end of cell division	Four daughter cells are produced at the end of cell division.
ii.	<b>Mitosis</b>	<b>Meiosis</b>
	Daughter cells receive full set of chromosomes, i.e. diploid (2n) number of chromosomes.	Daughter cells receive only half the number of chromosomes, i.e. haploid (n) number of chromosomes.

(iii) a. Part 1 and 2 is as follows

- 1- Radicle
- 2- Plumule

b. The tropic movement is hydrotropism.

c. Movement of plant in response to touch stimulus.

**Example:** Pea, Vines, Cuscuta, Cucumber

7. Question 7

- (i) Inheritance of acquired characters means organs used more extensively would enlarge and become more efficient and such changed characteristics (acquired traits) would be transmitted to the offsprings. This idea was the central theme of Lamarckism.
- (ii) Those organs, which no longer have a function in our body are known as vestigial organs. These organs have reduced structurally as well as functionally. It appears that these organs were once well-developed and functional in ancestors and later on due to their less use they become reduced, e.g. vermiform appendix in man is reduced and functionless while in herbivores vermiform appendix along with caecum is used for digestion of cellulose. It gives an idea that human had herbivorous food habit and cellulose containing materials were major part of their food.
- (iii) **Lamarck's Theory:** It is known as theory of inheritance of acquired characters. According to this theory, organisms undergo certain changes to adapt themselves to the environment. These characters acquired by an organism during its lifetime, are passed on to the progeny, e.g. the long neck of giraffe was explained by Lamarck, as an outcome of these animals having to stretch their necks constantly to eat the leaves on the upper branches of the trees.
- (iv) i. Immigration is the permanent movement of people from outside to an area thus, it increases the population.  
 ii. Emigration involves permanent movement of people from one area to another. It has negative (decreasing) impact on population.
- (v) a. Blood vessel labelled A is the artery because it has a narrow lumen and thick muscular wall and the blood vessel labelled B is vein because it has wide lumen and thin muscular wall.  
 b. The parts labelled A and B are endothelium and lumen respectively.  
 c. Lubb sound is produced when tricuspid and mitral valves get closed while Dubb sound is produced when pulmonary and aortic semilunar valves get closed.

8. Question 8

- (i) Osmosis is the net flow of solvent (water) molecules from a solution of its higher concentration to a solution of its lower concentration through a semi-permeable membrane without permitting the diffusion of solutes.
- (ii) Renal portal system is absent in mammals due to following reasons
- i. The heart of mammals is four-chambered, due to which there is total separation of oxygenated and deoxygenated blood.
  - ii. Posterior portion of body gets oxygenated blood from heart. After oxidation, the blood does not contain much impurities that it should go to kidneys for filtration.

- (iii) i.  $\text{CO}_2$ ,  $\text{CH}_4$ ,  $\text{N}_2\text{O}$  and CFCs.
- ii. CFCs cause ozone hole. These are used in refrigerators. They travel up to stratosphere. In the stratosphere, UV-rays act on them and a chlorine atom is released. These chlorine atoms act as catalyst and degrade ozone.
- (iv) a. Part 'B' is called a eustachian tube which acts as a ventilator to equalize the pressure of air on both sides of the tympanic membrane that forms the outer boundary of the middle ear.
- b. Part 'C' is the auditory nerve (vestibular and cochlear nerve) which carries hearing impulses to the brain.
- c. Ear wax helps to lubricate the tympanum for proper functioning.

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