

Answer to this Paper must be written on the paper provided separately.

You will not be allowed to write during first 15 minutes.

This time is to be spent in reading the question paper.

The time given at the head of this Paper is the time allowed for writing the answers.

Section A is compulsory. Attempt any four questions from Section B.

The intended marks for questions or parts of questions are given in brackets [].

SECTION A (40 MARKS)

(Attempt all questions from this Section)

QUESTION 1

Choose the correct answers and write the correct option.

[15]

(i) What does lymph contain?

- (a) RBCs and platelets (b) red colour
(c) only WBCs (d) more proteins and calcium than blood

(ii) If a sperm cell of a buffalo contains 30 chromosomes, how many chromosomes will be found in a skin cell of the buffalo?

- (a) 30 (b) 15 (c) 60 (d) 90

(iii) Which of the following is responsible for controlling body temperature?

- (a) Liver (b) Spinal cord (c) Lungs (d) Hypothalamus

(iv) Assertion (A): Thyroxine hormone controls tissue metabolism and growth.

Reason (R): Secretion of thyroxine hormone is regulated by pituitary gland.

- (a) Both (A) and (R) are true (b) Both (A) and (R) are false
(c) (A) is true and (R) is false (d) (A) is false and (R) is true

(v) In the figure, a jar packed with dry kidney beans bursts open with force after adding a small amount of water and sealing the lid for 5-6 hours. This force is called



- (a) Osmotic pressure (b) Turgor pressure
(c) Imbibition pressure (d) Wall pressure

- (vi) An example of radiation pollutants is:
- (a) Sulphur dioxide (b) Ozone
(c) Iodine-131 (d) Fused electric bulbs
- (vii) Antiserum contains :
- (a) antibodies (b) platelets
(c) antigens (d) WBCs
- (viii) Assertion (A): Lamarck's theory of inheritance of acquired characters is mainly based on "survival of the fittest".
Reason (R): Lamarck has explained his principle of 'use and disuse' with the example of Giraffe's neck.
- (a) Both (A) and (R) are true (b) Both (A) and (R) are false
(c) (A) is true and (R) is false (d) (A) is false and (R) is true
- (ix) The pre-human ancestor was :
- (a) Ramapithecus (b) Australopithecus (c) cro-magnon (d) Neanderthal man
- (x) The 3-carbon stable product of photosynthesis is :
- (a) glucose (b) ribose (c) phosphoglyceric acid (d) ribulose diphosphate
- (xi) The blood cell which helps in blood clotting is :
- (a) RBC (b) WBC (c) Platelet (d) Plasma
- (xii) The human heart contains a network of blood vessels that supply oxygen and nutrients to its own muscle tissue, ensuring its proper functioning. These vessels are exclusively designed to carry either oxygenated or deoxygenated blood. Among the listed blood vessels, identify those which carry oxygenated blood only.
1- Pulmonary artery 2- Hepatic artery 3- Pulmonary vein 4- Vena cava
- (a) 1 and 2 (b) Only 2 (c) 2 and 3 (d) 1, 2, 3
- (xiii) In a dihybrid cross, the 9 : 3 : 3 : 1 ratio appears due to
- (a) crossing over (b) independent assortment
(c) segregation (d) linkage
- (xiv) Astigmatism can be corrected by:
- (a) concave lens (b) convex lens (c) cylindrical lens (d) both a and c
- (xv) Pituitary gland regulates urine formation through:
- (a) oxytocin (b) TSH (c) ACTH (d) ADH

QUESTION 2

- (i) Name the following. [5]
- (a) The earliest human ancestor resembling modern humans.
(b) Instrument used to measure plant water intake rate.
(c) Process of delivering a fully developed fetus from the mother's body.
(d) Species studied to understand industrial melanism.
(e) Strategy involving tree planting outside forests to enhance environmental and social benefits.
- (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. [5]
- (a) Vagina, Ovary, Uterus, Oviduct, Cervix
(b) Motor Neuron, Receptor, Sensory Neuron, Effector, Association Neuron
(c) Pupil, Yellow Spot, Cornea, Lens, Aqueous humour
(d) Stoma, Mesophyll cells, Xylem, Substomatal space, Intercellular space
(e) Cortical cells, Root hair, Soil water, Endodermis, Xylem

- (iii) Match the items given in Column I with the most appropriate ones in Column II and rewrite the correct matching pairs. [5]

Column I

- (a) Pituitary gland
- (b) Sulphur dioxide
- (c) oviduct
- (d) Clotting of blood
- (e) Guttation

Column II

- 1. Estrogen
- 2. Calcium
- 3. Growth hormone
- 4. Acid rain
- 5. Fertilisation
- 6. Global warming
- 7. Magnesium
- 8. Hydathodes

- (iv) Choose the odd one out from the following terms and name the category to which the others belong: [5]

- (a) Haemoglobin, Glucagon, Iodopsin, Rhodopsin
- (b) Urethra, Uterus, Urinary bladder, Ureter
- (c) Transpiration, Photosynthesis, Phagocytosis, Guttation
- (d) Cyton, Photon, Axon, Dendron
- (e) Oxytocin, Insulin, Prolactin, Progesterone

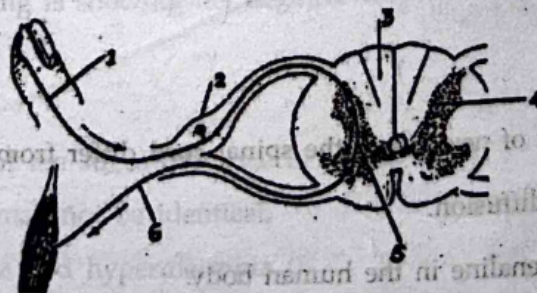
- (v) State the exact location of the following structures: [5]

- (a) Tricuspid valve
- (b) Amnion
- (c) Yellow spot
- (d) Seminal vesicle
- (e) Cowper's gland

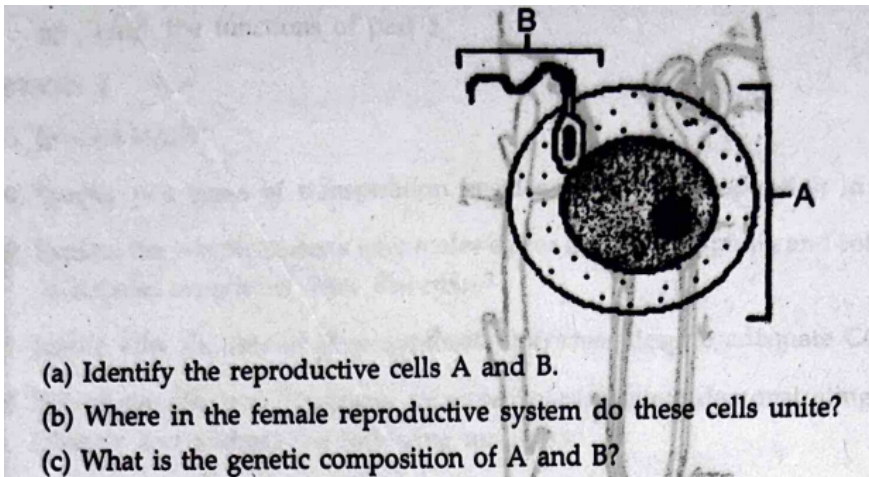
SECTION B
(Attempt any four questions)

QUESTION 3

- (i) Define osmoregulation. [1]
- (ii) Contrast between Corpus callosum and Corpus luteum in terms of function. [2]
- (iii) Enumerate two detrimental effects of noise pollution on human health. [2]
- (iv) Illustrate Mendel's monohybrid cross using a Punnett square to show F_1 and F_2 outcomes. [2]
- (v) The diagram below portrays a phenomenon related to the nervous system. Examine the diagram and respond to the following inquiries : [3]



- (a) The phenomenon which is depicted is controlled by which part of the body?
- (b) Label 1, 2 and 6.



- (a) Identify the reproductive cells A and B.
- (b) Where in the female reproductive system do these cells unite?
- (c) What is the genetic composition of A and B?

ANSWER 1

- (i) (c) (ii) (c) (iii) (d) (iv) (a) (v) (c) (vi) (c) (vii) (a) (viii) (d) (ix) (b) (x) (c)
(xi) (c) (xii) (c) (xiii) (b) (xiv) (c) (xv) (d)

ANSWER 2

- (i) (a) Homo habilis (b) Potometer (c) Parturition (d) peppered moth (e) Social forestry

- (ii) (a) Ovary, Oviduct, Uterus, Cervix, Vagina

- (b) Receptor, Sensory neuron, Association neuron, Motor neuron, Effector

- (c) Cornea, Aqueous humour, Pupil, Lens, Yellow spot

- (d) Xylem, Mesophyll cells, Intercellular space, Substomatal space, Stoma

- (e) Soil water, Root hair, Cortical cells, Endodermis, Xylem

- (iii) (a) Pituitary gland — 3. Growth hormone

- (b) Sulphur dioxide — 4. Acid rain

- (c) oviduct — 5. Fertilisation

- (d) Clotting of blood — 2. Calcium

- (e) Guttation — 8. Hydathodes

- (iv) (a) Odd term : Glucagon

Category : Pigments in humans

- (b) Odd term : Uterus

Category : Parts of urinary system

- (c) Odd term : Phagocytosis

Category : Processes in plants

- (d) Odd term : Photon

Category : Parts of a neuron

- (e) Odd term : Insulin

Category : Hormones secreted during pregnancy

- (v) (a) Tricuspid valve consisting of three flaps is situated between the right atrium and the right ventricle of mammalian heart.

- (b) Amnion is an extra embryonic membrane that encloses the embryo of reptiles, birds and mammals within the amniotic cavity.

- (c) Yellow spot is a shallow depression in the retina of the eye, opposite to the lens.

- (d) Seminal vesicles are a pair of lobulated glands located between the posterior surface of the urinary bladder and the rectum.

- (e) Cowper's glands are small ovoid glands which open into the urethra in males.

ANSWER 3

- (i) The process of control of water content and other ions in the body fluid to maintain a fixed concentration is called osmoregulation.
- (ii) Differences between Corpus callosum and Corpus luteum

ANSWER 3

- (i) The process of control of water content and other ions in the body fluid to maintain a fixed concentration is called osmoregulation.
- (ii) Differences between Corpus callosum and Corpus luteum

Corpus callosum	Corpus luteum
1. Corpus callosum is a band of white matter that provides a connection between the two halves of the cerebrum in the brain.	Corpus luteum is a yellowish mass of tissues found in the ovary of female mammals.
2. It enables the transfer of information from one cerebral hemisphere to the other.	It secretes the hormone progesterone.

- (iii) 1. A sudden loud noise can damage ear drum and it can lead to deafness.
2. Rise in blood pressure and reduce mental efficiency.
- (iv) A cross in which only one pair of contrasting characters is considered at a time is called monohybrid cross.

For example :

Parents :	TT	×	tt	
	(Tall plants)	↓	(Dwarf plants)	
F ₁		Tt	Self pollination	All tall plants
		T	t	
F ₂	T	TT	Tt	
	t	Tt	tt	

Phenotypic ratio : Tall and dwarf = 3 : 1, Genotypic ratio = 1 : 2 : 1

- (v) (a) Spinal cord
(b) 1- Receptor 2- Sensory neuron 6- Effector
(c) Association neuron (5) interconnects the sensory neuron and motor neuron in central nervous system.

ANSWER 4

- (i) NADP - Nicotinamide Adenine Dinucleotide Phosphate
- (ii) ♦ Lenticular transpiration
♦ Cuticular transpiration
- (iii) Haemophilia and colour blindness are sex-linked disorders, caused by recessive genes located on X-chromosome.
These disorders occur more frequently in men because males are heterozygous for the defect. They have one X-chromosome and one Y-chromosome. Y-chromosome does not carry alleles for these traits, therefore the recessive genes are able to express even in single dose.
- (iv) The process like photosynthesis depends on more than one variable external factors and the rate of the process depends on the factor which is in shortest supply. Therefore, when there is enough carbon dioxide in the air, and the temperature is just below the optimum temperature but the light intensity is very low, the photosynthesis rate will be determined by light intensity. Hence, the rate of photosynthesis would get lowered.

- (v) (a) Ringing or girdling experiment
(b) Ascent of sap
(c) Xylem

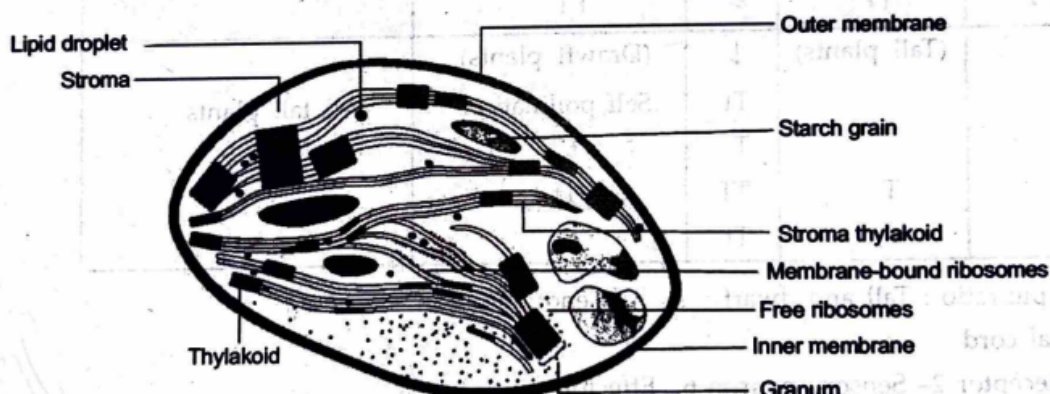
ANSWER 5

- (i) **Phagocytosis** : The process of engulfing and ingesting foreign particles, like bacteria is known as phagocytosis.
(ii) Human ear performs two functions.
(a) Hearing (b) Maintaining the balance of the body.
(iii) The ovum released by the ovary is swept into the uterine tube by the ciliary action of the fimbriae.
The further movement of ovum along the oviduct is carried out by :
(a) ciliary action of the epithelium, (b) fluid currents in the oviduct,
(c) peristaltic contraction of muscles of oviduct.

(iv)

Cerebrum	Spinal Cord
The outer region of cerebrum contains cell bodies of the neurons while inner region of cerebrum consists of white matter containing axons of the neurons.	The outer region of spinal cord contains axons of the neurons while inner region of spinal cord consists of grey matter containing cell bodies of the neurons.

(v) Structure of chloroplast



ANSWER 6

- (i) **Diapedesis** : The migration of blood cells especially leucocytes (WBCs) through an unruptured or intact wall of blood vessel into the surrounding tissue is called diapedesis.
(ii) Difference in arrangement of neurons

Neurons in Brain	Neurons in Spinal Cord
The inner part of the brain (cerebrum) contains white matter of the neurons i.e. axon, while the outer part contains grey matter i.e. cell bodies of neurons.	The inner portion of spinal cord contains grey matter i.e. cell bodies while the outer portion contains white matter i.e. axons of the neurons.

(iii) Significance of diffusion

- * Transpiration of water vapour from stomata occurs through diffusion.
- * Diffusion keeps the walls of the internal plant tissue moist.
- * Ions and other molecules spread into the protoplast through diffusion.

- Pollinators are attracted to flowers due to the diffusion of aromatic compounds in surroundings.
- (iv) Adrenaline is a hormone which prepares the body to meet any emergency situation to 'fight', i.e., to face the danger or for 'flight', to run away from it. An extra energy and strength are provided to the body for this situation. Extra hormone is released into the blood at the time of emotional stress. The gland itself is stimulated by the nerve endings of the autonomic nervous system.
- (v) (a) 1 – Collecting duct
 2 – Bowman's capsule
 3 – Loop of Henle
 4 – Proximal convoluted tubule
- (b) 2 represent Bowman's capsule. It carries out the function of ultra-filtration. 3 represents loop of Henle. Its main function is the reabsorption of water and sodium chloride from the filtrate.
- (c) The two major stages of urine formation are – ♦ ♦ ♦
1. Ultrafiltration
 2. Reabsorption

ANSWER 7

- (i) Acid rain is a form of precipitation that is characterised by pH lower than 5, due to the presence of pollutants like sulphur dioxide and nitrogen oxide in it.
- (ii) **Vasectomy:** It is the surgical technique of sterilisation, used in males.
Tubectomy: It is the surgical technique of sterilisation, used in females to prevent pregnancy.
- (iii) There are many categories of actions that can be taken to mitigate global warming, such as :-
 Shifting from carbon-based fossil fuels to alternative energy sources.
 Carbon capture and storage.
- (iv) **Malpighian capsule:** Bowman's capsule and glomerulus together constitute as Malpighian capsule. It receives blood for filtration.
Bowman's capsule: It is round, double walled cup like structure of a nephron. It receives the filtrate of the glomerulus.
- (v) (a) Hydrotropism is shown by the seedling in the given picture. Phototropism is seen by the stem of the plant.
 (b) Water acts as stimulus responsible for the movement of root.
 (c) Shoot of a plant shows the negative response to the given stimulus i.e., water.

ANSWER 8

- (i) Mutation is a sudden change in the DNA sequence of an organism.
- (ii) Absciscic acid (ABA) is known as stress hormone of plants. It is called so because it increases tolerance or resistance of plants to cold or other stresses.
- (iii) Twins may or may not be identical because :
 – if a single embryo splits into two identical embryos, they develop into identical twins.
 – if two ova are released from the ovary and are fertilised by different sperms, they develop into non-identical twins.

(iv) Differences between :

Myopia	Hypermetropia
Myopia is caused either because the lens has become too convex or due to elongation or lengthening of the eyeball from front to back.	Hypermetropia is caused by either too flattening of the lens or shortening of the eyeball from front to back.

- (v) (a) A is an ovum (female gamete). B is a sperm (male gamete).
(b) These two cells unite in fallopian tube.
(c) The genetic composition of A is $22 + X$ and that of B is $22 + Y$.