

ICSE Board Examination - 2024

BIOLOGY (SCIENCE PAPER-3)

Solved Paper

Class-10th

Maximum Marks: 80

Time allowed: Two hours

Answers 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

Select the correct answers to the questions from the given options. [15]

(Do not copy the questions, write the correct answer only).

(i) Duplicated chromosomes are joined at a point termed:

- (a) Centrosome (b) Centromere
(c) Centriole (d) Chromatid

(ii) The process of conversion of ADP to ATP during photosynthesis is called:

- (a) Photolysis (b) Phagocytosis
(c) Photophosphorylation (d) Polymerisation

(iii) The process in which water is lost from the margins of strawberry leaves is:

- (a) Osmosis (b) Imbibition
(c) Diffusion (d) Guttation

(iv) The hormone that affects urination is:

- (a) Adrenaline (b) Vasopressin
(c) Oestrogen (d) Thyroxine

(v) Which one of the following helps in the opening of stomata:

- (a) Cobalt ions (b) Potassium ions
(c) Magnesium ions (d) Aluminium ions

(vi) A zygote which has Y chromosome inherited from the father will develop into a:

- (a) Will depend on the chromosome inherited from the mother

(b) Girl

(c) Either boy or a girl

(d) Boy

(vii) The ear ossicle that transports sound vibrations to the inner ear:

- (a) Stapes (b) Malleus
(c) Incus (d) Cochlea

(viii) If a person has a heart attack, what must be done immediately?

- P. Loosen his/her clothing
Q. Make him/her lie down in an airy room
R. Rush him/her to the hospital
S. Engage him/her in a conversation

- (a) P and Q (b) P and S
(c) R and S (d) P, Q and R

(ix) Adjusting the focal length of the eye lens to view objects at different distances is done by:

- (a) Cornea (b) Iris
(c) Ciliary muscles (d) Sclera

(x) Four friends P, Q, R and S were discussing the examples of genetic disorders. The examples they quoted were as follows:

- P. Colour blindness and malaria
Q. Albinism and cholera
R. Haemophilia and colour blindness
S. Haemophilia and albinism

Who gave the correct examples?

- (a) P and Q (b) R and S
(c) P and R (d) Q and S

- (xi) Osmosis takes place when there is:
- A freely permeable membrane
 - A cell wall
 - A selectively permeable membrane
 - An impermeable membrane
- (xii) A male gorilla has 48 chromosomes in each of its body cells. How many chromosomes will each of the sperms have?



- 24
- 48
- 12
- 16

(xiii) **Assertion (A):** Sympathetic nervous system prepares the body for violent action against abnormal conditions.

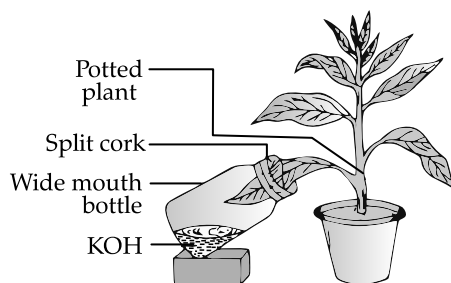
Reason (R): Sympathetic nervous system accelerates heartbeat.

Which of the following is correct?

- Both A and R are True
 - A is True, R is False
 - A is False but R is True
 - Both A and R are False
- (xiv) Birth rate is the number of live births per thousand persons in:
- 1 year
 - 2 years
 - 10 years
 - 20 years
- (xv) Industrial melanism was observed in:
- Mice
 - Peppered moth
 - House flies
 - Crow

Question 2

- (i) **Name the following:** [5]
- Unicellular outgrowths from the epidermis of roots.
 - A defect in our eyes, in which some parts of the object are in focus while the other parts are blurred.
 - The tropic movement of plant parts in response to chemicals.
 - The main nitrogenous waste formed in the body.
- (e) The process of attachment of fertilised ovum to the wall of uterus.
- (ii) **Arrange and rewrite the terms in each group in the correct order to be in a logical sequence beginning with the term that is underlined:** [5]
- Australopithecus, Cro-Magnon, Homo erectus, Neanderthal man.
 - Pupil, Aqueous humour, Retina, Vitreous humour.
 - Effector, Receptor, Motor neuron, Sensory neuron.
 - Loop of Henle, Distal convoluted tubule, Bowman's Capsule, Proximal convoluted tubule.
 - Water vapour, Soil water, Leaves, Ascent of Sap
- (iii) **Study the diagram given below and fill in the blanks with suitable words:** [5]



In order to prove that carbon dioxide is necessary for (a) _____ a potted plant is placed in dark for 48 hours to (b) _____ the leaves. A part of a leaf is inserted into a conical flask containing potassium hydroxide solution. This is to absorb (c) _____ from the flask. The plant is then placed in sunlight for a few hours. The experimental leaf is tested for starch. The part of the leaf that was inside the conical flask turns (d) _____, whereas the part of the leaf outside turns (e) _____ in colour.

- (iv) Choose the **odd** one out from the following terms and name the **category to which the others belong:** [5]
- Prothrombin, Thrombin, Fibrinogen, Albumin
 - Tonsils, Glomerulus, Spleen, Lymph nodes
 - Neutrophils, Basophils, Monocytes, Eosinophils
 - Leaves, Styrofoam, Grass, Cow Dung
 - Pulmonary artery, Renal artery, Coronary artery, Hepatic artery

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

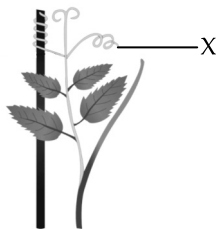
Column I	Column II
(a) Leydig Cells	1. Lack of thyroxine in children
(b) Stoma	2. 12 pairs
(c) Ova	3. Testosterone
(d) Cranial nerve	4. Diffusion of respiratory gases
(e) Cretinism	5. Haploid cells
	6. 31 pairs
	7. Diploid cells

SECTION B 40 MARKS

(Attempt *any four* questions from this Section.)

Question 3

- (i) Expand the abbreviation–NADP. [1]
- (ii) Mention *two* adaptations in roots for absorption of water from the soil. [2]
- (iii) Differentiate between Afferent arteriole and Efferent arteriole (**diameter**). [2]
- (iv) Give *two* examples of water pollutants. [2]
- (v) Ali has some pea plants in his garden which need a support to grow as seen in the picture given below: [3]



- (a) Name the phenomenon depicted by the shoot in the given figure.
- (b) Define the above phenomenon.
- (c) Write the name of the part marked X.

Question 4

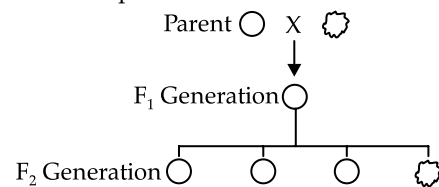
- (i) Give the biological term for the surgical method of contraception in human females. [1]
- (ii) State *two* harmful effects of acid rain on the environment. [2]
- (iii) Mention *two* advantages of transpiration. [2]
- (iv) Write *any two* objectives of Swachh Bharat Abhiyan. [2]
- (v) Mohan is fond of playing basketball. His concentration is on shooting the ball into the opponent's basket as given in the picture. [3]



- (a) Which part of the brain helps Mohan to concentrate in putting the ball into the basket?
- (b) Name the sense organ that helps to gauge the distance between the ball and the basket.
- (c) Name the part of the brain that co-ordinates all the voluntary muscles of his body.

Question 5

- (i) Name the type of nerve which has the fibres of both sensory and motor neurons. [1]
- (ii) Differentiate between Australopithecus and Modern man based on body hair. [2]
- (iii) "Birth rate in India is very high." Mention *two* reasons in support of the statement. [2]
- (iv) Give the exact location of: [2]
- (a) Pericardium
- (b) Bicuspid valve
- (v) Given below is a schematic representation of the inheritance of the shape of seeds of garden pea. Answer the questions that follow: [3]

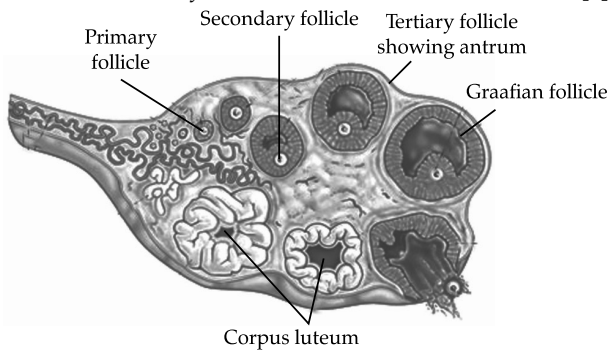


- (a) Which is the dominant and recessive allele of the trait?
- (b) What does the ratio 3: 1 in the F₂ generation represent?
- (c) State Mendel's Law of Dominance.

Question 6

- (i) Define the term–Diapause. [1]
- (ii) Distinguish between diabetes mellitus and diabetes insipidus (**endocrine gland concerned**). [2]
- (iii) Carbon monoxide is dangerous when inhaled in excess. Comment on the statement. [2]

- (iv) The diagram given below shows a section of the human ovary. [2]



- (a) Name the process for the release of the part labelled 1.
 (b) Write the name of the structure marked 2.
 (v) Draw a neat, labelled diagram of a chloroplast. [3]

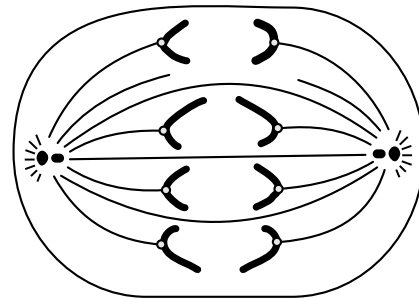
Question 7

- (i) Define the term hormone. [1]
 (ii) Which parts of the ear are responsible for:
 (a) Static equilibrium?
 (b) Dynamic equilibrium?
 (iii) Mention *two* structural differences between an artery and a vein. [2]
 (iv) Write *any two* limitations of using a Ganong's Potometer to demonstrate the uptake of water. [2]
 (v) A teacher drew the diagram of heart on the blackboard and told the students to copy it in their notebooks. Mahesh couldn't see the diagram clearly as it appeared blurred to him. [3]

- (a) Name the defect of the eye Mahesh is suffering from.
 (b) Where is the image formed in this defect?
 (c) Mahesh consults an eye doctor and is prescribed suitable lenses to correct the defect. Which type of lens do his spectacles have?

Question 8

- (i) Define the term ultrafiltration. [1]
 (ii) Name the mineral elements required for:
 (a) Clotting of blood
 (b) Synthesis of thyroxine
 (ii) Mention *two* harmful effects of noise pollution. [2]
 (iv) Why are RBCs efficient in their functions though they lack nucleus and mitochondria? [2]
 (v) The diagram given below represents a stage in mitosis. [3]



- (a) Identify the stage given above.
 (b) Give *one* reason to support your answer in (a).
 (c) Mention the number of chromosomes given in the diagram.



ANSWERS

SECTION A

Answer 1

(i) **Option (b) is correct.**

Explanation: Duplicated chromosomes consist of two identical sister chromatids joined together at a point called the centromere.

(ii) **Option (c) is correct.**

Explanation: Photophosphorylation involves the phosphorylation of ADP (adenosine diphosphate) to form ATP (adenosine triphosphate) using the energy derived from light during photosynthesis.

(iii) **Option (d) is correct.**

Explanation: Guttation is the exudation of water droplets from the margins or tips of leaves of some vascular plants. It typically occurs at night. Special pore-bearing structures called hydathodes present on the margins of the leaf allow this exudation.

(iv) **Option (b) is correct.**

Explanation: Vasopressin, also known as antidiuretic hormone (ADH), plays a crucial role in regulating water balance and urine concentration in the body. Deficiency of ADH causes diabetes insipidus in which urination is frequent and copious.

(v) **Option (b) is correct.**

Explanation: Potassium ions (K^+) play a significant role in the regulation of stomatal opening and closing in plant cells. When potassium ions are actively pumped into guard cells, they cause an osmotic uptake of water, leading to increased turgor pressure within the guard cells. This increased pressure causes the guard cells to swell and the stomatal pore to open, allowing for gas exchange and transpiration. Conversely, the loss of potassium ions from guard cells results in decreased turgor pressure, causing the stomata to close.

(vi) **Option (d) is correct.**

Explanation: In humans, the presence of a Y chromosome in the zygote will develop into a male child. The sperm carries either an X or a Y chromosome, while the egg always carries an X chromosome. If the sperm carrying an X chromosome fertilises the egg, the resulting zygote will be XX, leading to the development of a female child. Conversely, if the sperm carrying a Y chromosome fertilises the egg, the zygote will be XY, resulting in

the development of a male child.

(vii) **Option (a) is correct.**

Explanation: The ear ossicle that transports sound vibrations to the inner ear is stapes. The stapes specifically transfer these vibrations to the oval window, where they are then transmitted into the fluid-filled cochlea of the inner ear, initiating the process of hearing.

(viii) **Option (d) is correct.**

Explanation: Loosening clothing and ensuring the person lies down in a well-ventilated area are important initial steps to alleviate discomfort during a heart attack. However, the most crucial action is promptly transporting the individual to the hospital for immediate medical intervention. Therefore, options P, Q, and R are correct.

(ix) **Option (c) is correct.**

Explanation: The ciliary muscles are responsible for adjusting the shape of the lens within the eye, which in turn alters its focal length. This helps in focusing on objects at varying distances, allowing the eye to accommodate near and far vision effectively.

(x) **Option (b) is correct.**

Explanation: Haemophilia, colour blindness, and albinism are examples of genetic disorders. These conditions are caused by genetic mutations inherited from one's parents.

(xi) **Option (c) is correct.**

Explanation: Osmosis is the movement of solvent molecules (usually water) across a selectively permeable membrane from an area of lower solute concentration to an area of higher solute concentration.

(xii) **Option (a) is correct.**

Explanation: Since a male gorilla's body cells have 48 chromosomes, each sperm cell will contain 24 chromosomes. This reduction occurs during meiosis I, where the chromosome number is halved to produce haploid cells.

(xiii) **Option (a) is correct.**

Explanation: The sympathetic nervous system prepares the body for action in response to stress or danger, including an increase in heart rate to supply more oxygenated blood to the muscles and organs involved in the response.

(xiv) **Option (a) is correct.**

Explanation: The birth rate represents the number of live births per thousand individuals in a population over a specific period, usually one year.

(xv) **Option (b) is correct.**

Explanation: Industrial melanism was observed in the peppered moth. This phenomenon refers to the evolutionary adaptation of the moth's coloration in response to environmental changes, particularly pollution from industrial activities.

Answer 2

- (i) (a) Root hairs
 (b) Astigmatism
 (c) Chemotropism
 (d) Urea
 (e) Implantation
- (ii) (a) *Australopithecus*, *Homo erectus*, *Neanderthal man*, *Cro-Magnon*
 (b) Aqueous humour, Pupil, Vitreous humour, Retina
 (c) Receptor, Sensory neuron, Motor neuron, Effector
 (d) Bowman's Capsule, Proximal convoluted tubule, Loop of Henle, Distal convoluted tubule
 (e) Soil water, Ascent of Sap, Leaves, Water vapour
- (iii) (a) Photosynthesis
 (b) Destarch
 (c) Carbon dioxide
 (d) Brown
 (e) Blue-black
- (iv) (a) Odd One: Albumin
Category: Others are clotting factors.
 (b) Odd one: Glomerulus
Category: Others are parts of lymphatic system.
 (c) Odd one: Monocytes
Category: Others are granulocytes.
 (d) Odd one: Styrofoam
Category: Others are biodegradable waste.
 (f) Odd one: Pulmonary artery
Category: Others carry oxygenated blood.

Column I	Column II
(a) Leydig cell	3. Testosterone
(b) Stoma	4. Diffusion of respiratory gases
(c) Ova	5. Haploid cells
(d) Cranial nerve	2. 12 pairs
(e) Cretinism	1. Lack of thyroxine in children

SECTION B

Answer 3

- (i) NADP stands for Nicotinamide Adenine Dinucleotide Phosphate.
- (ii) **Adaptations of root hairs are:**
 (a) Large surface area in contact with the soil particle
 (b) Root hairs have very thin and semi-permeable cell membrane,
 (c) High concentration cell sap **(Any two)**
- (iii) **Afferent arteriole:** It has a larger diameter that carries blood from renal artery to the glomerulus.
Efferent arteriole: It has a smaller diameter that carries blood from the glomerulus and into the renal vein.
- (iv) Industrial chemicals and agricultural runoff.
- (v) (a) Thigmotropism
 (b) The movement of plant parts in response to stimuli caused by contact with foreign body is called thigmotropism.
 (c) Stem tendril

Answer 4

- (i) Tubectomy/tubal ligation
- (ii) **Harmful effects of acid rain:**
 (a) It corrodes buildings and metal structures.
 (b) It can also affect human health by causing respiratory diseases like asthma.
 (c) It leads to the acidification of lakes and rivers, which harms aquatic life. **(Any two)**
- (iii) **Advantages of transpiration:**
 (a) Transpiration helps to cool plants and regulate their temperature. As water evaporates from the leaves, it takes up heat energy, thus lowering the temperature of the plant.
 (b) Transpiration creates a suction force that helps to draw water and nutrients from the soil into the plant roots. This process is essential for the growth and development of plants.
- (iv) (a) To clean roads, streets and buildings in cities and towns.
 (b) To eliminate open defecation.
 (c) To build and monitor the use of latrines.
 (d) To manage solid and liquid waste. **(Any two)**
- (v) (a) The part of the brain that helps Mohan concentrate on putting the ball into the basket is the cerebral cortex, particularly the areas involved in motor planning, attention and decision-making.
 (b) The sense organ that helps to gauge the distance between the ball and the basket is the eyes, particularly through the visual perception of depth and distance.

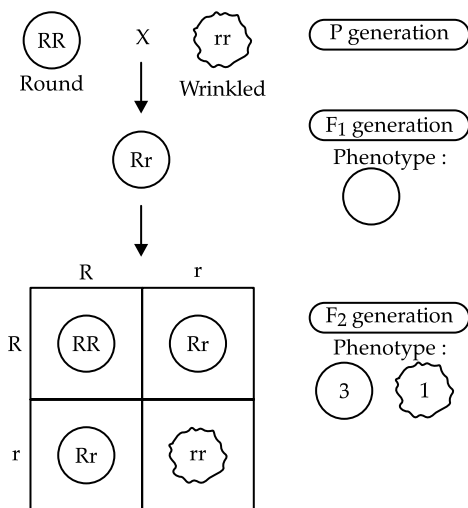
- (c) The part of the brain that co-ordinates all the voluntary muscles of his body is the cerebellum.

Answer 5

- (i) Mixed nerve
 (ii) *Australopithecus*: *Australopithecus* had body hair covering much of its body.
Modern man: Modern humans have relatively sparse body hair compared to *Australopithecus*. They have hair on limbs.
 (iii) Illiteracy, children are a gift of God, sign of prosperity, due to high infant mortality, more helping hands for family income, do not accept family planning methods, desire for a male child, lack of recreation

(Any two)

- (iv) (a) **Pericardium**: Covers the heart/ around the heart.
 (b) Bicuspid valve: Located between the left atrium and the left ventricle of the heart.
 (v) (a) In the inheritance of the shape of seeds of garden pea, the dominant allele is typically represented by "R" (for round seeds), while the recessive allele is represented by "r" (for wrinkled seeds).
 (b) In F_2 generation, 3:1 indicates that for every 3 individuals displaying the dominant phenotype (i.e., 1RR and 2Rr), there will be 1 individual displaying the recessive phenotype (rr).

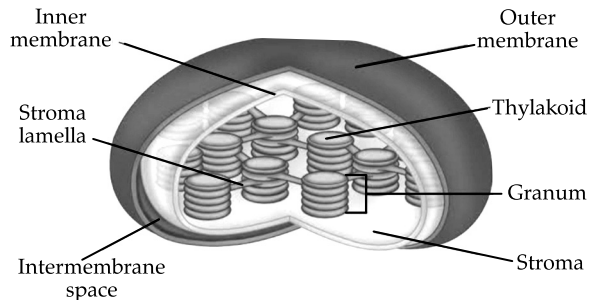
Cross:

- (c) Law of Dominance: In a pair of contrasting characters, only one is able to express itself while the other remains suppressed.

Answer 6

- (i) Diapedesis is the process by which white blood cells squeeze out through the walls of capillaries to reach at the site of infection.
 (ii) Diabetes mellitus – Pancreas
 Diabetes insipidus – Pituitary gland

- (iii) Carbon monoxide easily combines with haemoglobin to form carboxyhaemoglobin, which cuts off supply of oxygen to tissues.
 (iv) (a) Ovulation is the process whereby a mature ovarian follicle releases an egg (ovum) into the fallopian tube.
 (b) The structure marked as 2 is corpus luteum. It develops from the remnants of the ovarian follicle that has released its egg during ovulation.
 (v) Structure of chloroplast:

**Answer 7**

- (i) A hormone is a chemical messenger produced by glands or specialised cells, circulating in bodily fluids to regulate various physiological processes in the body.
 (ii) (a) **Static Equilibrium**: This is maintained by the utricle and saccule, which are parts of the vestibule in the inner ear.
 (b) **Dynamic Equilibrium**: This is maintained by the semicircular canals, also located in the inner ear.

(iii) Differences between artery and vein:

Artery	Vein
They have thicker walls.	They have thinner walls.
They lack valves.	They contain valves to prevent the backflow of blood.

(iv) Limitation of Ganong's potometer:

- (a) Introducing the air bubble in the capillary tube is a difficult process.
 (b) Any changes in air temperature outside may affect the position of bubble in the capillary tube.
 (c) The leafy shoot may not remain fresh for a long time.
 (v) (a) Mahesh is suffering from the defect of the eye known as myopia or nearsightedness.
 (b) In myopia, the image is formed in front of the retina, causing distant objects to appear blurred.

- (c) Mahesh's spectacles has concave lenses to correct the defect of myopia.

Answer 8

- (i) Ultrafiltration is a process of filtration of blood in the glomerulus during which the liquid part of the blood such as urea, glucose, amino acids and other substances enter the renal tubule and large molecules remain in the glomerulus which are carried away by efferent arteriole.
- (ii) (a) Calcium (b) Iodine
- (iii) Damage ear drum / Nervous irritability/ Disturbs sleep (Any two)

- (iv) **Loss of nucleus:** It makes the red blood cells biconcave thus, increasing their surface area volume ratio for absorbing more oxygen.

Lack of mitochondria: This means red cells cannot use oxygen for themselves. Thus, all the oxygen absorbed from the lungs is transported and delivered to the tissues unconsumed.

- (v) (a) Anaphase
(b) As chromatids are being pulled towards the opposite poles.
(c) Number of chromosomes are four in the given diagram.

