

Date: 18/03/2024



Question Paper Code

T24 523

Aakash

Medical | IIT-JEE | Foundations

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Time: 2 Hrs.

BIOLOGY

Max. Marks: 80

(Science Paper 3)

ICSE Board Class X Exam (2024)

Answers & Solutions

GENERAL INSTRUCTIONS

Read the following instructions very carefully and follow them:

- (i) Duration for the Test is 2 hours.
- (ii) Maximum Marks for Section-A and B is 40 each.
- (iii) The intended marks for questions or parts of questions are given in brackets [].
- (iv) **Section A** is compulsory. Attempt all questions from this section.
- (v) Attempt **any four** questions from **Section B**.
- (vi) Use of calculator is not permitted.
- (vii) It is mandatory to use Blue/Black ballpoint pen to write the answer.

SECTION-A (40 Marks)

(Attempt **all** questions from this Section.)

1. Select the correct answers to the questions from the given options.

(i) Duplicated chromosomes are joined at a point termed

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

Answer (b)

[1]

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

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

Answer (c)

[1]

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

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

Answer (d)

[1]

(iv) The hormone that affects urination is

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

Answer (b)

[1]

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

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

Answer (b)

[1]

(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

Answer (d)

[1]

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

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

Answer (a)

[1]

(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

Answer (d)

[1]

(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 |

Answer (c)

[1]

(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 |

Answer (b)

[1]

(xi) Osmosis takes place when there is:

- | | |
|--------------------------------------|-----------------------------|
| (a) A freely permeable membrane | (b) A cell wall |
| (c) A selectively permeable membrane | (d) An impermeable membrane |

Answer (c)

[1]

(xii) A male gorilla has 48 chromosomes in each of its body cells. How many chromosomes will each of the sperms have?



- | | |
|--------|--------|
| (a) 24 | (b) 48 |
| (c) 12 | (d) 16 |

Answer (a)

[1]

(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?

- | | |
|------------------------------|----------------------------|
| (a) Both A and R are True | (b) A is True, R is False |
| (c) A is False but R is True | (d) Both A and R are False |

Answer (a)

[1]

(xiv) Birth rate is the number of live births per thousand persons in:

- (a) 1 year (b) 2 years
(c) 10 years (d) 20 years

Answer (a)

[1]

(xv) Industrial Melanism was observed in:

- (a) Mice (b) Peppered Moth
(c) House Flies (d) Crow

Answer (b)

[1]

2. (i) **Name the following:**

[5]

- (a) Unicellular outgrowths from the epidermis of roots.
(b) A defect in our eyes, in which some parts of the object are in focus while the other parts are blurred.
(c) The tropic movement of plant parts in response to chemicals.
(d) The main nitrogenous waste formed in the body.
(e) The process of attachment of fertilized ovum to the wall of uterus.

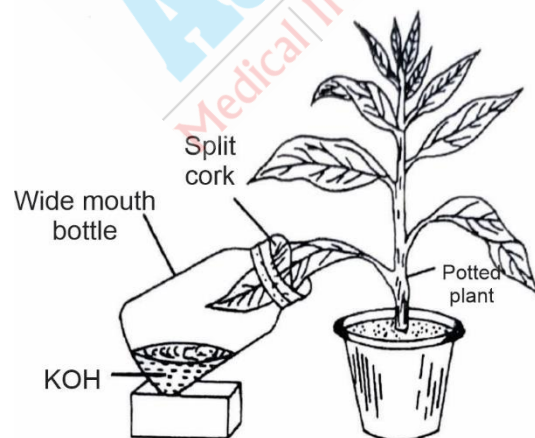
(ii) **Arrange and rewrite the terms in each group in the correct order to be in a logical sequence beginning with the term that is underlined:**

[5]

- (a) Australopithecus, Cro-Magnon, Homo erectus, Neanderthal man.
(b) Pupil, Aqueous humour, Retina, Vitreous humour.
(c) Effector, Receptor, Motor neuron, Sensory neuron.
(d) Loop of Henle, Distal convoluted tubule, Bowman's Capsule, Proximal convoluted tubule.
(e) 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

- Sol.** (i) (a) Root hair [1]
 (b) Astigmatism [1]
 (c) Chemotropism [1]
 (d) Urea [1]
 (e) Implantation [1]
- (ii) (a) *Australopithecus*, *Homo erectus*, Neanderthal man, Cro-magnon [1]
 (b) Aqueous humour, Pupil, Vitreous humour, Retina [1]
 (c) Receptor, Sensory neuron, Motor Neuron, Effector [1]
 (d) Bowman's Capsule, Proximal convoluted tubule, Loop of Henle, Distal convoluted tubule [1]
 (e) Soil water, Ascent of Sap, Leaves, Water vapour [1]
- (iii) (a) Photosynthesis [1]
 (b) Destarch [1]
 (c) Carbon dioxide [1]
 (d) Colourless [1]
 (e) Bluish-black [1]
- (iv) (a) **Odd term** : Albumin [½]
Category : Blood clotting factors [½]
 (b) **Odd term** : Glomerulus [½]
Category : Lymphatic organs [½]
 (c) **Odd term** : Monocytes [½]
Category : Granulocytes [½]
 (d) **Odd term** : Styrofoam [½]
Category : Biodegradable wastes [½]
 (e) **Odd term** : Pulmonary artery [½]
Category : Blood vessels carry oxygenated blood. [½]

(v)	Column I	Column II	
(a)	Leydig cells	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
			[5×1=5]

SECTION-B (40 Marks)

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

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.
- Sol.** (i) NADP stands for Nicotinamide adenine dinucleotide phosphate. [1]
- (ii) (a) The root hair represents a large surface area in contact with the soil particles.
- (b) The root hair can penetrate between soil particles. [2×1]
- (iii) (a) Afferent arterioles deliver blood to the glomerulus of the nephron and efferent arterioles carry blood away from the glomerulus.
- (b) The average diameter of afferent arteriole is much larger than efferent arteriole due to which blood pressure in the efferent arteriole is higher than the blood pressure in the afferent arteriole. [2×1]
- (iv) **Examples of water pollutants are:**
Chemical wastes, heavy metals, pollutants from live stock operations, sewage, industrial wastes, etc. (Any two) [2×1]
- (v) (a) Thigmotropism [1]
- (b) Thigmotropism can be defined as the movement of plant part in response to stimulus of contact. [1]
- (c) Leaf tendril. [1]
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.

Sol. (i) Tubectomy [1]

(ii) **Harmful effects of acid rain on the environment are:**

- (a) Acid rain water accumulates in river causing death of aquatic life.
 (b) It damages the buildings and monuments made up of stones and metals.
 (c) It causes damage to crops.

(Any two) [2×1]

(iii) **The advantages of transpiration are as follows :**

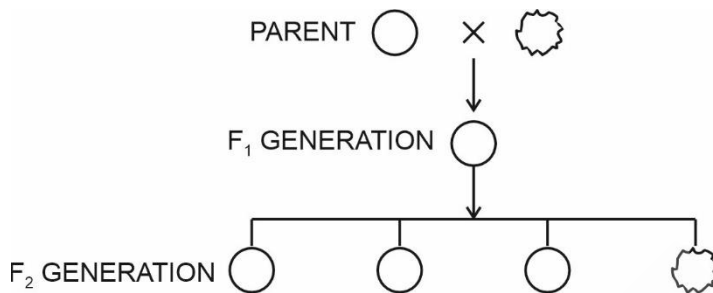
- (a) The absorption of water and ascent of sap to various parts of the plant body is mostly due to transpiration. Transpiration pull is responsible for mass movement of water and solutes in upward direction.
 (b) Plants receive solar energy in very large amounts for the synthesis of carbohydrates. If there is no dissipation of energy, the temperature of leaf surface would rise to a lethal level in less than two minutes. Transpiration plays an important role here. It helps in dissipation of this excess energy by evaporating water from the leaf surface and thus, helps in keeping the plant cool.
 (c) Transpiration helps in removing excess of water.
 (d) The transpiration from leaf surface draws water from the soil. This rising column of sap contains mineral salts. Thus, mineral salts are distributed to all parts of the plant.
 (e) Development of mechanical tissues, growth of root system, increasing mineral and sugar content of fruits and development of resistance are other beneficial effects of transpiration. **(Any two) [2×1]**

(iv) **Objectives of Swachh Bharat Abhiyan are :**

- To eliminate open defecation through the construction of household-owned toilets.
- To establish an accountable mechanism of monitoring toilet use.
- To spread cleanliness awareness among people and strengthening the cleanliness systems in all areas.
- To achieve efficient solid and liquid waste management systems. **(Any two) [2×1]**

- (v) (a) Cerebrum helps Mohan to concentrate in putting the ball into the basket. [1]
 (b) Eyes help to gauge the distance between the ball and the basket. [1]
 (c) Cerebellum is the part of the brain that co-ordinates all the voluntary muscles of the body. [1]

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.

- Sol.** (i) Mixed nerves have the fibres of both sensory and motor neurons. [1]
- (ii) **Difference between *Australopithecus* and Modern man on the basis of body hair:**

<i>Australopithecus</i>	Modern man
Their body is covered with hair.	They have highly reduced body hair.

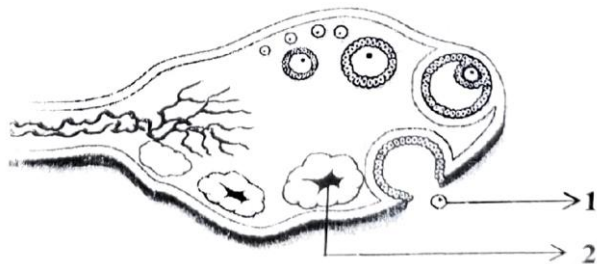
[2]

- (iii) **"Birth rate in India is very high" due to the following reasons:**
- (a) **Illiteracy:** Most of the rural population which forms the bulk of our society are still illiterate, ignorant and superstitious. They also do not know the functioning of the human reproductive system.
- (b) **Traditional beliefs:** Among the people from lower strata of society, children are regarded as a gift of God and a sign of prosperity. Therefore, they make no effort to avoid pregnancy.
- (c) **Mortality rate:** Due to high infant mortality rate in our country, people from the economically weaker section think it safer to produce more children so that at least some may survive.
- (d) **Economic reasons:** Children are considered to be helping hands to increase the family income.
- (e) **Religious and social customs:** India is a centre of various religious and social customs, and as such most people do not accept family planning norms.
- (f) **Desire for a male child:** Most Indian families still hold the view that a male child is essential for keeping up the name of the family. Further, a male child is usually a great help to the aged parents. These two reasons often contribute to getting several children before getting one son or sometimes not even that.
- (g) **Lack of recreation:** Poor standard of living and poverty provide no recreation other than sex.

(Any two) [2×1]

- (iv) (a) Pericardium is a double layered protective covering of heart. [1]
- (b) Bicuspid valve is located between the left atrium and left ventricle. [1]

- (v) (a) Dominant allele is R. [½]
 Recessive allele is r. [½]
 - (b) The ratio 3 : 1 in the F₂ generation represents that 3 - plants have round seeds and 1 - plant has wrinkled seeds. [1]
 - (c) **Mendel's law of Dominance:** In a single individual, when two different alleles of a unit factor or gene responsible for a single character are present, then one allele is dominant over the other. [1]
6. (i) Define the term-Diapyknosis. [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]

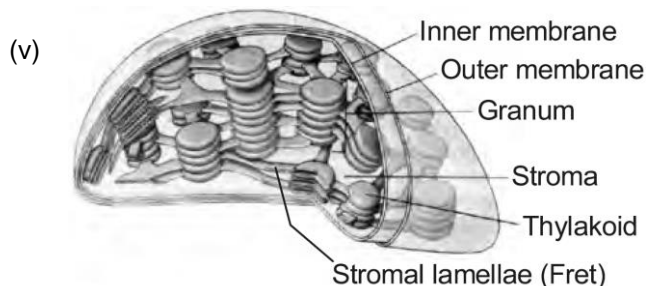


- (a) Name the process for the release of the part labelled 1.
 - (b) Write the name of the structure marked 2.
- (v) Draw a neat, labelled diagram of a chloroplast. [3]
- Sol.** (i) Diapodesis is the process in which white blood cells come out of the blood vessels into the surrounding area in case of injuries. [1]

	Diabetes mellitus	Diabetes insipidus
(a)	It is the disorder associated with pancreas.	It is the disorder associated with posterior lobe of pituitary gland.
(b)	It is caused due to the deficiency of insulin hormone.	It is caused due to deficiency of vasopressin hormone.

[2×1]

- (iii) Carbon monoxide is a poisonous gas. It is produced due to incomplete combustion of fuels such as petrol and diesel. It reduces the oxygen-carrying capacity of haemoglobin in our blood.
- In the presence of carbon monoxide, instead of binding with oxygen, haemoglobin combines with carbon monoxide as it has more affinity for carbon monoxide resulting in the formation of carboxyhaemoglobin which is more stable than oxyhaemoglobin (formed when oxygen combines with haemoglobin). It causes headache, nausea, dizziness and may even result in death of the person. [2]
- (iv) (a) The process is called ovulation. [1]
 - (b) The structure marked 2 is corpus luteum. [1]



[Labelled diagram- 3]

Structure of chloroplast

7. (i) Define the term hormone. [1]
- (ii) Which parts of the ear are responsible for : [2]
- (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?

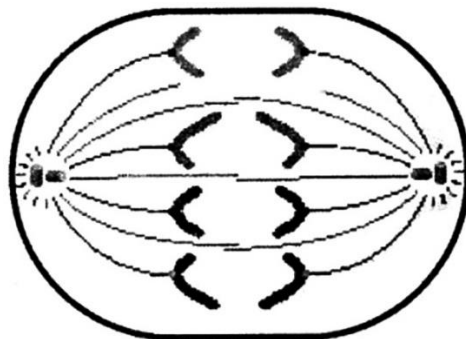
- Sol.** (i) Hormones are chemical compounds which are synthesized at places away from where they act and simply diffuse to the area of action. [1]
- (ii) (a) Vestibule [1]
- (b) Semicircular canals [1]
- (iii) **Differences between arteries and veins are :**

	Arteries	Veins
(a)	These are usually deep seated.	These are usually superficial.
(b)	Internal valves are absent.	Internal valves are present to prevent back flow of blood.
(c)	These carry blood away from the heart.	These carry blood towards the heart.
(d)	Thick walled, strong and muscular.	Comparatively thin walled and less muscular.
(e)	Flow of blood is very fast with jerks.	Flow of blood is slow without jerks.
(f)	At any time arteries contain 16% of the total blood.	64% blood of the body is present in veins.

(Any two) [2×1]

- (iv) **Limitations of Ganong's potometer are :**
- (a) The twig does not remain alive for a long time.
- (b) It is very difficult to introduce the bubble. [2×1]
- (v) (a) Myopia [1]
- (b) The image is formed in front of the retina. [1]
- (c) His spectacles have concave or diverging lens which is used to correct this defect. [1]
8. (i) Define the term ultrafiltration. [1]
- (ii) Name the mineral elements required for : [2]
- (a) Clotting of blood
- (b) Synthesis of thyroxine

- (iii) Mention two harmful effects of noise pollution. [2]
- (iv) Why are RBCs efficient in their functions through 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.

- Sol.** (i) The filtration of blood in glomerulus part of a nephron under high pressure is called ultrafiltration. [1]
- (ii) (a) Calcium [1]
 (b) Iodine [1]
- (iii) **Harmful effects of noise pollution are :**
- (a) It interferes in communication.
- (b) It interrupts concentration of thought and disturbs peace of mind.
- (c) It lowers efficiency of work.
- (d) It disturbs sleep and leads to nervous irritability.
- (e) A sudden loud sound can damage ear drum. Prolonged noise can even lead to deafness.
- (f) Life of animals like birds gets disturbed by aircrafts landing or taking off from the airports.

(Any two) [2×1]

- (iv) Mature erythrocytes lack nucleus and mitochondria so as to make space for haemoglobin. Hence more oxygen can be bind with haemoglobin molecules.

Mitochondria are absent so that oxygen is not utilised by the erythrocytes and all the oxygen is transported to the target organs. [2]

- (v) (a) Anaphase [1]
 (b) During anaphase the centromere of each chromosome splits into two, resulting into two sister chromatids. It leads to the migration of daughter chromosomes towards respective poles. [1]
 (c) 8 [1]

