

Date: 29/03/2023



Aakash
+ BYJU'S

Question Paper Code

T23 523

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Time: 2 Hrs.

Max. Marks: 80

Class-X
BIOLOGY
(Science Paper-3)
(ICSE 2022-23)

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 answers on the paper provided separately.

SECTION-A (40 Marks)

(Attempt all questions from this Section.)

Select the correct answers to the questions from the given options:

$$[15 \times 1 = 15]$$

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

1. (i) The sex chromosome in a human ovum is:

[1]

Answer (a)

- (ii) Which one of the following is a biodegradable waste?

 - (a) Metal cans
 - (b) E-waste
 - (c) Plastic
 - (d) Flowers

Answer (d)

- (iii) The heart sound 'Dup' is produced when:

 - (a) Semilunar valves open
 - (b) Atrio ventricular valves close
 - (c) Semilunar valves close
 - (d) Atrio ventricular valves open

Answer (c)

- (iv) Deplasmolysis occurs when a plasmolysed cell is placed in:

 - (a) Concentrated salt solution
 - (b) Tap water
 - (c) Concentrated sugar solution
 - (d) Hypertonic salt solution

Answer (b)

- (v) Alpha cells of Pancreas secrete:

 - (a) Glycogen
 - (b) Glucose
 - (c) Glucagon
 - (d) Insulin

Answer (c)

- (vi) Haploid number of chromosomes are found in:

 - (a) Nephrons
 - (c) Skin cells

Answer (d)

- (vii) The life span of an RBC is:

 - (a) 120 days
 - (b) 220 days
 - (c) 20 days
 - (d) 2 weeks

Answer (a)

- (viii) The statistical study of human population is called:

 - (a) Mortality
 - (b)
 - (c) Natality
 - (d)

Answer (b)

(ix) The pale yellow colour of normal human urine is due to the pigment: [1]

- | | |
|---------------|-----------------|
| (a) Melanin | (b) Anthocyanin |
| (c) Urochrome | (d) Haemoglobin |

Answer (c)

(x) Stimulation of the nerves of the sympathetic nervous system: [1]

- | | |
|---------------------------|------------------------------|
| (a) Accelerates heartbeat | (b) Constricts pupil of eyes |
| (c) Increases peristalsis | (d) Retards heartbeat |

Answer (a)

(xi) The site of light reaction in the cells of a green leaf is: [1]

- | | |
|---------------|---------------------------|
| (a) Nucleus | (b) Grana of chloroplast |
| (c) Cytoplasm | (d) Stroma of chloroplast |

Answer (b)

(xii) The paper used to demonstrate unequal transpiration in a dicot leaf is: [1]

- | | |
|------------------|---------------------------|
| (a) Filter paper | (b) Litmus paper |
| (c) Starch paper | (d) Cobalt chloride paper |

Answer (d)

(xiii) Vitreous humour is present between: [1]

- | | |
|---------------------|---------------------|
| (a) Cornea and Iris | (b) Lens and Retina |
| (c) Iris and Lens | (d) Cornea and Lens |

Answer (b)

(xiv) Oxygenated blood to liver is supplied by: [1]

- | | |
|-----------------------|-------------------------|
| (a) Hepatic artery | (b) Hepatic vein |
| (c) Inferior venacava | (d) Hepatic portal vein |

Answer (a)

(xv) During the synthesis phase of the cell cycle, more of: [1]

- | | |
|------------------------|--------------------------------------|
| (a) RNA is synthesised | (b) RNA and proteins are synthesised |
| (c) DNA is synthesised | (d) Glucose is synthesized |

Answer (c)

2. (i) Name the following [5]

- The organelle that forms the aster during cell division.
- A genetic disorder in which the blood does not clot.
- The permanent stoppage of menstruation in human females around the age of 45 years.
- The openings on the barks of trees through which transpiration occurs.
- A gaseous plant hormone which promotes ripening of fruits.

(ii) Arrange and rewrite the terms in each group in correct order to be in a logical sequence *beginning* with the term that is underlined. [5]

- (a) Snake, Rabbit, Cabbage, Hawk.
- (b) Xylem, Soil water, Cortical cells, Root hair.
- (c) Receptor, Response, Effector, Spinal Cord
- (d) Fovea, Lens, Cornea, Conjunctiva.
- (e) Testis, Urethra, Sperm duct, Epididymis.

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

Column – I

- (a) Hyposecretion of Thyroxine in adults
- (b) Hyposecretion of Insulin
- (c) Hypersecretion of Growth hormone in childhood
- (d) Hyposecretion of ADH
- (e) Hypersecretion of Thyroxine

Column - I

- 1. Diabetes insipidus
- 2. Myxedema
- 3. Dwarfism
- 4. Gigantism
- 5. Diabetes mellitus
- 6. Exophthalmic goitre
- 7. Cretinism

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

- (a) Used bandages, Pesticides, Face masks, Syringes.
- (b) Dust, Smoke, Carbon monoxide, Effluents
- (c) Uterus, Urethra, Urinary bladder, Ureter
- (d) Menstrual phase, Telophase, Follicular phase, Luteal phase
- (e) Malleus, Incus, Cochlea, Stapes

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

- (a) Thyroid gland
- (b) Dura mater
- (c) Amniotic fluid
- (d) Papillary muscles
- (e) Islets of Langerhans

| | | | |
|-------------|-----|-----------------|-----|
| Sol. | (i) | (a) Centriole | [1] |
| | | (b) Haemophilia | [1] |
| | | (c) Menopause | [1] |
| | | (d) Lenticels | [1] |
| | | (e) Ethylene | [1] |

- | | | |
|-------|--|------------------------|
| (ii) | (a) Cabbage → Rabbit → Snake → Hawk | [1] |
| | (b) Soil water → Root hair → Cortical cells → Xylem | [1] |
| | (c) Receptor → Spinal cord → Effector → Response | [1] |
| | (d) Conjunctiva → Cornea → Lens → Fovea | [1] |
| | (e) Testis → Epididymis → Sperm duct → Urethra | [1] |
| (iii) | Column - I | Column - II |
| | (a) Hyposecretion of thyroxine in adults | 2. Myxedema |
| | (b) Hyposecretion of Insulin | 5. Diabetes mellitus |
| | (c) Hypersecretion of Growth hormone in childhood | 4. Gigantism |
| | (d) Hyposecretion of ADH | 1. Diabetes insipidus |
| | (e) Hypersecretion of Thyroxine | 6. Exophthalmic goitre |
| (iv) | (a) Odd term: Pesticides | [½] |
| | Category: Biomedical wastes | [½] |
| | (b) Odd term: Effluents | [½] |
| | Category: Air pollutants | [½] |
| | (c) Odd term: Uterus | [½] |
| | Category: Parts of human excretory system | [½] |
| | (d) Odd term: Telophase | [½] |
| | Category: Phases of menstrual cycle | [½] |
| | (e) Odd term: Cochlea | [½] |
| | Category: Parts of middle ear | [½] |
| (v) | (a) The two lobes of thyroid gland are located on the either side of the trachea. | [1] |
| | (b) Dura mater is located underneath the skull and vertebral column. | [1] |
| | (c) Amniotic fluid is present in the amniotic cavity which is the space between embryo and a thin membrane covering of embryo called amnion. | [1] |
| | (d) Papillary muscles are present in the ventricular walls of the heart. | [1] |
| | (e) Islets of Langerhans are present in the pancreas. | [1] |

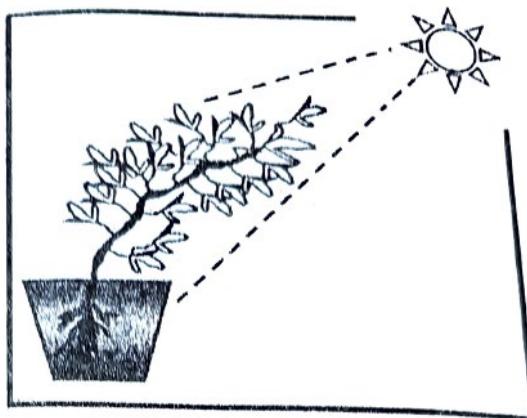
SECTION-B (40 Marks)

(Attempt any four questions from this Section.)

3. (i) Write the overall chemical equation for photosynthesis. [1]
- (ii) Mention *any two* functions of blood. [2]
- (iii) Differentiate between Karyokinesis and Cytokinesis. [2]
- (iv) *Excessive use of fertilizers in agricultural fields reduces the yield of crops.* Justify the statement. [2]

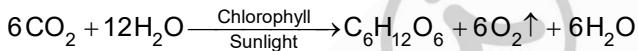
- (v) Study the diagram given below and answer the questions that follow:

[3]



- (a) Name the phenomenon depicted by the shoot in the above diagram.
(b) Which plant hormone plays an important role in the above movement?
(c) Complete and rewrite the given statement by filling in the correct terms:
 Shoots show positive _____ whereas, roots show positive _____.

Sol. (i) Chemical equation of photosynthesis:



[1]

- (ii) **Functions of blood:**

- (a) It helps in transport of food materials and respiratory gases.
(b) It helps in transport of hormones, excretory matter and salts.
(c) It helps in maintaining body temperature.
(d) It helps in defence against infection.

[Any two] [2×1]

- (iii) **Difference between karyokinesis and cytokinesis:**

| Karyokinesis | Cytokinesis |
|--|---|
| <ul style="list-style-type: none"> It is the division of the nucleus of a cell. | <ul style="list-style-type: none"> It is the division of the cytoplasm of a cell. |
| <ul style="list-style-type: none"> It occurs during M-phase of cell cycle before the cytokinesis begins to proceed. | <ul style="list-style-type: none"> It occurs at the end of M-phase after the nuclear division is over. |

[2×1]

- (iv) Excessive use of fertilizers in agricultural fields reduces the yield of crops because their long term use in an area reduces soil fertility as the organic matter in the soil is not replenished and it also affects the nature of soil, making it either too alkaline or too acidic.

[2]

- (v) (a) Phototropism

[1]

- (b) Auxin

[1]

- (c) Shoots show positive phototropism whereas, roots show positive geotropism.

[1]

4. (i) Expand the abbreviation – DNA.

[1]

- (ii) What is Active transport?

[2]

- (iii) Mention the two pairs of nitrogenous bases which pair with each other with hydrogen bonds.

[2]

(iv) State Mendel's 'Law of Segregation'. [2]

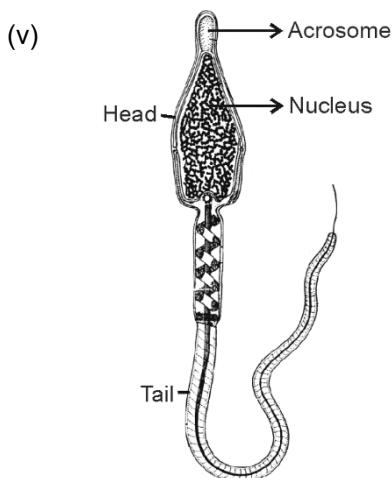
(v) Draw a neat, labelled diagram of a human sperm. [3]

Sol. (i) DNA – Deoxyribonucleic acid [1]

(ii) The transport in which materials are transported against the concentration gradient across a membrane with the help of a mobile carrier protein or ATP is called active transport. It is an uphill transport and an energy driven process. [2]

(iii) Adenine pairs with thymine and guanine pairs with cytosine. [2x1]

(iv) Law of Segregation: The paired alleles of a unit factor separate or segregate randomly during gamete formation, so that each gamete can receive either of the two alleles of a unit factor controlling one character. [2]



Structure of human sperm

[Diagram-1, Labellings- 4x1/2]

5. (i) Explain the term 'Population density'. [1]

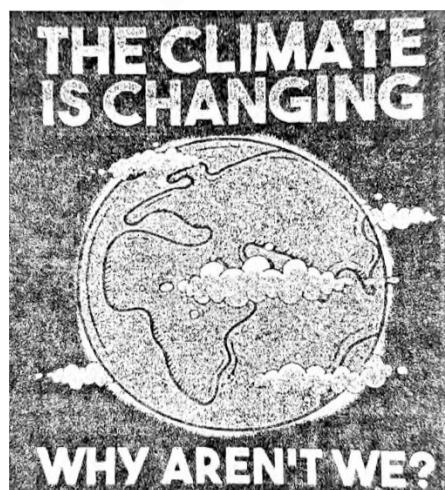
(ii) Name the *two* surgical methods of population control. [2]

(iii) Mention *two* factors responsible for population explosion in India. [2]

(iv) Name *any two* resources which come under pressure due to rising population. [2]

(v) The diagram given below depicts the climate change on planet Earth. [3]

Answer the following questions:



- Name the climatic phenomenon for the increase in Earth's temperature.
- Mention *one* reason for this warming.
- What measure can be taken to prevent this climate change?

Sol. (i) Population density is defined as the number of individuals present per unit area or volume at a given time. [1]

(ii) The two surgical methods of population control are vasectomy and tubectomy. [2×1]

(iii) The factors responsible for population explosion in India are:

- Illiteracy
- Religious and social customs
- Desire for a male child
- Lack of recreation
- Reduced death rate
- Traditional beliefs
- Economics reasons

(Any two) [2×1]

(iv) The resources which come under pressure due to rising population are:

- Food
- Water
- Land
- Forests
- Energy
- Minerals

(Any two) [2×1]

(v) (a) Global warming [1]

(b) Increase in the concentration of greenhouse gases in the earth's atmosphere leads to global warming. [1]

(c) The following measures can be taken to prevent this climate change:

- By promoting afforestation.
- By reducing deforestation.
- By limiting use of fossil fuels by developing alternate source of energy.
- By adopting policy of 5 R's.
- There should be a control on the emission of greenhouse gases.

(Any one) [1]

6. (i) Define the term Transpiration. [1]

(ii) State *any two* adaptations in plants to reduce transpiration. [2]

(iii) Mention *any two* functions of the human foetal placenta. [2]

(iv) What is the significance of the human testes being located in scrotal sacs outside the abdomen? [2]

(v) Draw a neat, labelled diagram of a Malpighian Capsule. [3]

Sol. (i) Transpiration involves the loss of water in the form of water vapours through aerial surface of plant. [1]

(ii) **Adaptations in plants to reduce transpiration are:**

- (a) The stomata may be sunken or covered by hair as in *Oleander*.
- (b) The number of stomata may be reduced as in xerophytes, e.g., *Cactus*.
- (c) The leaves may become narrow to reduce leaf surface area, e.g., *Nerium*, Pine, etc.
- (d) The leaves may roll over or fold to reduce exposed surface and maintain moisture around stomata, e.g., desert grass.
- (e) There may be very few leaves on a plant to reduce transpiration, e.g., *Acacia*.
- (f) The leaves may have thick cuticle as in mango and most evergreen trees to prevent transpiration, e.g., Banyan.

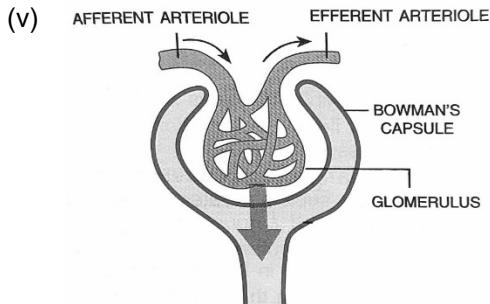
(Any two) [2×1]

(iii) **Functions of human foetal placenta are:**

- (i) **Nutrition** : Food materials pass from maternal blood to foetal blood via placenta.
- (ii) **Respiration** : Oxygen and carbon dioxide also diffuses via placenta.
- (iii) **Excretion** : Waste products (urea) also pass from foetal blood to maternal blood via placenta.
- (iv) **Hormones** : hCG (human chorionic gonadotropin), estrogens and progesterone are released from the placenta during pregnancy. [2]

(Any two) [2×1]

(iv) Testes are found hanging in a pouch-like structure called scrotum. The scrotum provides an optimal temperature for the formation of sperms, which is 2.5°C lower than the normal temperature of the body. [2]

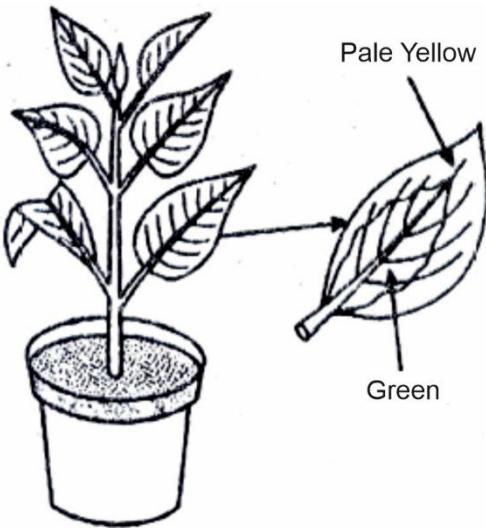


Diagrammatic sketch of a Malpighian capsule
(Bowman's capsule + glomerulus)

[Diagram-1, Labellings- 4×1/2]

7. (i) What is a Reflex action? [1]
- (ii) Renal cortex has a dotted appearance and Renal medulla has a striped appearance. Explain [2]
- (iii) What are the two functions of cerebellum. [2]
- (iv) Distinguish between Semicircular canals and Utriculus based on their function. [2]

- (v) A potted plant with variegated leaves was kept in dark for 24 hours and then placed in bright sunlight.
Answer the following questions. [3]



- (a) Which aspect of photosynthesis is being tested in the above diagram?
- (b) Why was the plant kept in dark for 24 hours?
- (c) After the starch test what will be the colour of the yellow and green parts of the leaf? Give reasons to support your answer.

- Sol.** (i) The simplest form of response in the nervous system is reflex action. This is a rapid automatic response to a stimulus which is not under the voluntary control of the brain. [1]
- (ii) Renal cortex has both the Bowman's capsule and the Proximal Convoluted Tubule (PCT) giving it a dotted appearance. [1]

Renal medulla has the middle U-shaped part (Loop of Henle) which is shaped like a hair pin giving the renal medulla striped appearance. [1]

(iii) **Functions of cerebellum are:**

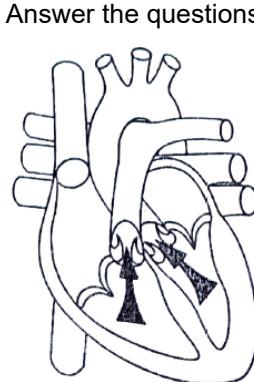
- (a) It is responsible for the precision of the voluntary actions.
- (b) It is responsible for maintenance of the equilibrium and posture of the body.
- (c) It modulates or modifies the voluntary movements initiated by cerebral hemisphere.

(Any two) [2 × 1]

| (iv) | Semicircular canal | Utriculus |
|------|---|--|
| | The semicircular canals maintain the dynamic balance of the body. | The utriculus alongwith sacculus maintains static balance of the body. |

- (v) (a) Chlorophyll is essential for photosynthesis is being tested in the given diagram. [1]
- (b) The plant was kept in the dark for 24 hours to make its leaves starch-free. [1]
- (c) After the starch test, the portion which was green earlier will turn blue-black, whereas the yellow part will not turn blue-black. This demonstrates the presence of starch in the green region and proves that chlorophyll is essential for photosynthesis. [1]

8. (i) Define the term Mutation. [1]
- (ii) A pure breeding red flower variety of pea plant (RR) is crossed with a pure breeding white flower variety of pea plant (rr). [2]
- Draw a Punnett square to find out the Phenotypic and Genotypic ratios of the progeny belonging to the F₂ generation.
- (iii) Leaves of certain plants roll up on a hot sunny day. [2]
- Explain by giving suitable reasons.
- (iv) What is a semi permeable membrane? [2]
- Name the semi permeable membrane present in a plant cell.
- (v) The diagram below depicts the human heart in one of its phases. [3]

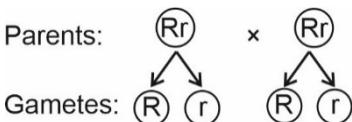


- (a) Which part of the heart is in the contraction phase?
(b) Give a suitable reason to justify your answer in (a).
(c) Distinguish between Systole and Diastole.

Sol. (i) Mutation is an alteration in the nucleic acid sequence of the genome of an organism. [1]



Self crossing of F₁ generation



Setting up Punnett square.

F₂ generation:

| $\frac{\text{♀}}{\text{♂}}$ | R | r |
|-----------------------------|----|----|
| R | RR | Rr |
| r | Rr | rr |

Genotypic ratio of F₂ generation – 1 (RR) : 2 (Rr) : 1 (rr)

Phenotypic ratio of F₂ generation – 3 (Red flowered) : 1 (White flowered)

- (iii) On a bright sunny day, the rate of transpiration is much higher than other days. The leaves of certain plants roll up on a hot sunny day to reduce the exposed surface and thus reduce the rate of transpiration.

[2]

- (iv) A semi-permeable membrane is the membrane which allows the passage of molecules selectively. [1]

- Plasma membrane is the semi-permeable membrane present in plant cell. [1]

- (v) (a) Left ventricle and right ventricle of the heart are in the contraction phase. [1]

(b) During ventricular contraction, left ventricle pours the oxygenated blood into aorta which distributes blood to all parts of the body. From right ventricle, deoxygenated blood flows to the lungs through pulmonary artery for oxygenation. [1]

(c) Systole means repeated contraction whereas diastole means repeated relaxation of the cardiac muscles. [1]

