

ICSE Solved Paper 2022 Semester-1

Biology

Class-X

(Maximum Marks : 40)

(Time allowed : One hour)

You will not be allowed to write during the first 10 minutes

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

ALL QUESTIONS ARE COMPULSORY.

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

Select the correct option for each of the following questions.

SECTION-I

(40 marks)

1. Name the following by choosing the correct option:

(i) The process of conversion of ADP to ATP during photosynthesis: [1]

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

(ii) Permanently open structures seen on the barks of old woody stems: [1]

- (a) Stomata
- (b) Hydathodes
- (c) Lenticels
- (d) Epidermal pores

(iii) The pressure developed in the roots due to continuous inward movement of water by cell to cell osmosis: [1]

- (a) Root pressure
- (b) Wall pressure
- (c) Turgor pressure
- (d) Air pressure

(iv) The type of gene, which in the presence of a contrasting allele is not expressed: [1]

- (a) Homozygous
- (b) Heterozygous
- (c) Dominant
- (d) Recessive

(v) After Mitosis, a female human cell will have: [1]

- (a) 44 + XX chromosomes
- (b) 22 + X chromosomes
- (c) 22 + Y chromosomes
- (d) 44 + XY chromosomes

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

Explanation: The process in which conversion of ADP to form ATP takes place by utilizing the energy of sunlight is termed as photophosphorylation. This takes place during the first phase of photosynthesis. There are two types of photophosphorylation: Cyclic photophosphorylation and non-cyclic photophosphorylation.

(ii) Option (c) is correct.

Explanation: Lenticels are permanently open structures seen on the barks of old woody stems. They make a porous tissue on the bark and help in the gaseous exchange of carbon dioxide and oxygen.

(iii) Option (a) is correct.

Explanation: The pressure developed in the roots due to continued inward movement of water through cell to cell osmosis is known as root pressure. It helps in the ascent of cell sap upward through the stem. It is caused by active transport of mineral nutrient ions into the root xylem.

(iv) Option (b) is correct.

Explanation: Recessive is the type of gene which in the presence of a contrasting allele is not expressed.

(v) Option (a) is correct.

Explanation: Mitosis is an equational division that produces daughter cells with same number of chromosomes as that of a parent cell. So, mitosis in a human female cell would produce progeny cells with 44 + XX chromosomes.

2. Complete the following statements by choosing the appropriate option for each blank:

(i) At the end of _____, Cytokinesis is completed. [1]

- (a) Metaphase
- (b) Prophase
- (c) Interphase
- (d) Telophase

(ii) The genotype of a person who cannot roll his tongue is _____. [1]

- (a) Rr
- (b) RR
- (c) rr
- (d) RRr

- (iii) When a cell is placed in a _____ solution, it becomes plasmolysed. [1]
 (a) Distilled water
 (b) Hypertonic
 (c) Isotonic
 (d) Hypotonic
- (iv) The nitrogenous base Adenine always pairs with _____. [1]
 (a) Thymine
 (b) Guanine
 (c) Cytosine
 (d) Thiamine
- (v) The basic units of heredity are _____. [1]
 (a) Chromosomes
 (b) Chromatids
 (c) Genes
 (d) Centrosome

Ans. (i) Option (d) is correct.

Explanation: Cytokinesis begins in anaphase and ends in telophase, reaching completion as the next interphase begins.

(ii) Option (c) is correct.

Explanation: In humans, tongue rolling is a dominant trait (R), those with the recessive condition cannot roll their tongues.

(iii) Option (b) is correct.

Explanation: If a plant cell is placed in a hypertonic solution, the plant cell loses water and hence, the cell will shrink i.e., get plasmolysed.

(iv) Option (a) is correct.

Explanation: In base pairing, adenine always pairs with thymine, and guanine always pairs with cytosine.

(v) Option (c) is correct.

Explanation: A gene is the basic physical and functional unit of heredity.

3. Choose the correct answer from each of the four options given below:

- (i) NADP is expanded as: [1]
 (a) Nicotinamide Adenosine Dinucleotide Phosphate.
 (b) Nicotinamide Adenine Dinucleotide Phosphate.
 (c) Nicotinamide Adenine Dinucleolus Phosphate.
 (d) Nicotinamide Adenosine Dinucleolus Phosphate.
- (ii) Transpiration is useful to the plant because it: [1]
 (a) Creates a suction force for absorption of water from the soil.
 (b) Helps in photophosphorylation.
 (c) Synthesises glucose.
 (d) Splits water molecules.
- (iii) A homozygous pea plant having purple flowers is crossed with a homozygous pea plant bearing

white flowers. The phenotypic ratio of the offspring obtained in F₂ generation is: [1]

- (a) 2 : 1
 (b) 1 : 1
 (c) 1 : 2 : 1
 (d) 3 : 1
- (iv) A shoot from a balsam plant is kept in a beaker containing eosin solution (pink). The pink colour will be distinctly seen in the: [1]
 (a) Xylem
 (b) Phloem
 (c) Epidermis
 (d) Cortex
- (v) Replication of DNA in the cell cycle occurs during the: [1]
 (a) G₁- phase
 (b) Anaphase
 (c) S- phase
 (d) G₂-phase

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

Explanation: NADP stands for Nicotinamide Adenine Dinucleotide Phosphate (NADP), a major role of NADP is as co-enzyme in cellular electron transfer reactions.

(ii) Option (a) is correct.

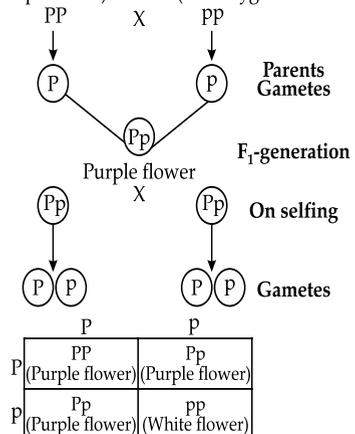
Explanation: Transpiration process in plants creates a suction pressure which pulls up water from the xylem of the roots to the stem and then to the leaves.

(iii) Option (d) is correct.

Explanation: When a homozygous pea plant having purple flowers is crossed with a homozygous pea plant bearing white flowers, the phenotypic ratio of the offspring obtained in F₂ generation is 3:1 (i.e., 3 Purple flowers and 1 White flower).

Cross:

(Homozygous Purple flower) × (Homozygous White flower)



Phenotypic ratio Purple : White

3 : 1

Genotypic ratio PP : Pp : pp

1 : 2 : 1

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

Explanation: Eosin is a water-soluble stain. When the cut end of the plant is immersed in an eosin solution, the colored solution enters the xylem vessels, which appear red indicating that water uptake in plants is through xylem only.

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

Explanation: S-phase is the period during which DNA replication occurs.

4. Explain the following terms:

(i) **Karyokinesis:** [1]

- (a) It is the division of nucleus during cell division.
- (b) It is the division of cytoplasm during cell division.
- (c) It is the division of centrosome.
- (d) It is the division of nucleolus.

(ii) **Law of Dominance:** [1]

- (a) Out of a pair of contrasting alleles present together, only the recessive allele is able to express itself while the dominant remains suppressed.
- (b) Out of a pair of contrasting alleles present together, only the dominant allele is able to express itself while the recessive remains suppressed.
- (c) Out of a pair of contrasting alleles present together, both the dominant and recessive cannot express themselves.
- (d) Out of a pair of contrasting alleles present together, both the dominant and recessive can express themselves.

(iii) **Mutation:** [1]

- (a) It is a sudden change in one or more genes in an organism's cells which is heritable.
- (b) It is a change in the number of centrosomes in an organism's cells which is heritable.
- (c) It is a change in the structure of cell membrane in an organism's cell which is heritable.
- (d) It is a change in the shape of cells which is heritable.

(iv) **Photosynthesis:** [1]

- (a) It is the synthesis of glucose from carbon dioxide by non-green plants using light energy.
- (b) It is the synthesis of glucose by green plants from carbon dioxide using light energy.
- (c) It is the synthesis of glucose from carbon dioxide and water by non-green plants using light energy.
- (d) It is the synthesis of glucose from carbon dioxide and water by green plants using light energy.

(v) **Transpiration:** [1]

- (a) It is the loss of water in the form of droplets from the aerial parts of the plant.

(b) It is the loss of water in the form of water vapour from the underground parts of the plant.

(c) It is the loss of water in the form of water vapour from the aerial parts of the plant.

(d) It is the loss of water in the form of water vapour from all parts of the plant.

Ans. (i) Option (a) is correct.

Explanation: Karyokinesis is the process of the division of a cell's nucleus during mitosis or meiosis. It is followed by the division of the cytoplasm, which is known as cytokinesis.

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

Explanation: Law of dominance is known as the first law of inheritance. It states that in a given cross between two organisms with pure contrasting alleles or characters, only one allele is expressed in F_1 generation; the character which is expressed is called dominant and the other which is not expressed is called recessive.

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

Explanation: A mutation is a change in a DNA sequence. Mutations can result from DNA copying mistakes made during cell division, exposure to ionizing radiation, exposure to chemicals called mutagens, or infection by viruses.

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

Explanation: Photosynthesis is the process by which green plants and certain other organisms transform light energy into chemical energy. During the process, the plants take in carbon dioxide from the air and water from the soil. This water is oxidized (loses electrons) while the carbon dioxide is reduced (gains electrons). Hence, the water is transformed into oxygen and the carbon dioxide is transformed into glucose. After this, the plants release oxygen into the air and stores the energy in the form of glucose molecules.

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

Explanation: The biological process in which the water from various aerial parts (like leaves, stems and flowers) of the plant evaporate in the form of water vapour, is called transpiration. This happens mainly through the stomata of the leaves.

5. Mention the exact location of the following:

(i) **Aster:** [1]

- (a) Around the centrioles in plant cells.
- (b) Around the centrioles in animal cells.
- (c) Around the chromatids in animal cells.
- (d) Around the chromatids in plant cells.

(ii) **Guard cells:** [1]

- (a) Around the root hairs.
- (b) Around the lenticels.
- (c) Around the thylakoids.
- (d) Around the stoma.

(iii) Xylem tissue: [1]

- (a) Conducts water and minerals in leaves.
- (b) Does not conduct water and minerals in stems.
- (c) Conducts food and nutrients to roots.
- (d) Conducts food and nutrients to all parts of the plant.

(iv) Centrioles: [1]

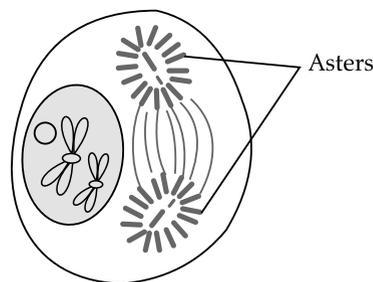
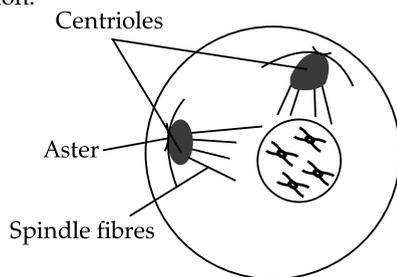
- (a) Found only in plant cells.
- (b) Found inside nucleus.
- (c) Found only in animal cells.
- (d) Found in animal and plant cells.

(v) Genes: [1]

- (a) Present on cell wall.
- (b) Present on chloroplast.
- (c) Present on chromosomes.
- (d) Present on centrosomes.

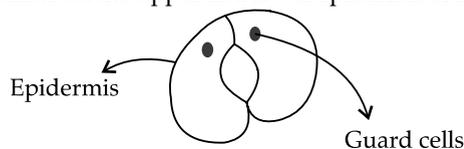
Ans. (i) Option (b) is correct.

Explanation: An aster is a star-shaped cellular structure. It is located around the centrioles in animal cells. Its main function is to hold the two centrioles at the two opposite poles and help the spindle apparatus to position during nuclear division.



(ii) Option (d) is correct.

Explanation: A pair of guard cells surround the stomata on the upper and lower epidermis of leaf.



(iii) Option (a) is correct.

Explanation: Xylem is a plant vascular tissue. This tissue transports water and other dissolved minerals from the roots to aerial parts of the plants. It is generally located at the center of the vascular bundle, deep inside the plant.

(iv) Option (c) is correct.

Explanation: Centrioles are minute microscopic cylindrical structures located in the cytoplasm of animal cells, near the nuclear envelope.

(v) Option (c) is correct.

Explanation: Genes are present on the chromosomes, which are in the cell's nucleus. A chromosome contains hundreds to thousands of genes.

6. State the functions of the following:

(i) Cell wall: [1]

- (a) Regulates entry of solutes in plant cells.
- (b) Regulates entry of solutes in animal cells.
- (c) Gives rigidity and shape to plant cells.
- (d) Gives rigidity and shape to animal cells.

(ii) Centromere: [1]

- (a) It is the point of attachment of two sister chromatids.
- (b) It is the point of attachment of two centrioles.
- (c) It is the point of attachment of two centrosomes.
- (d) It is the point of attachment between two daughter nuclei.

(iii) Cuticle on leaves: [1]

- (a) Prevents photosynthesis.
- (b) Reduces transpiration.
- (c) Protects leaves from grazing animals.
- (d) Gives colour to leaves.

(iv) Hydathodes: [1]

- (a) Transpiration
- (b) Absorption of water
- (c) Photosynthesis
- (d) Guttation

(v) Grana of chloroplast is not the: [1]

- (a) Site of Light Independent Phase
- (b) Site of Light Dependent Phase
- (c) Site of Photolysis
- (d) Site of Photon absorption

Ans. (i) Option (c) is correct.

Explanation: Plant cells have a rigid cell wall that surrounds the cell membrane and gives rigidity and shape to plant cell.

(ii) Option (a) is correct.

Explanation: The centromere links a pair of sister chromatids together during cell division.

(iii) Option (b) is correct.

Explanation: Plant cuticle is a water impervious protective layer covering the epidermal cells of leaves and other parts. It protects plants against drought, extreme temperature, etc., by reducing the transpiration rate.

(iv) Option (d) is correct.

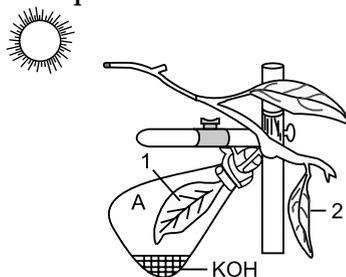
Explanation: Hydathodes are the structures that discharge water from the interior of the leaf to its surface in a process called guttation.

(v) Option (a) is correct.

Explanation: Grana of chloroplast is site of light dependent reaction and not light independent reaction.

7. The diagram given below represents an experiment to demonstrate a particular aspect of photosynthesis. The letter 'A' indicates a certain condition inside the flask.

Answer the questions:



(i) What is the aim of the experiment? [1]

- To show that oxygen is released during Photosynthesis.
- To show that Photosynthesis occurs in the presence of KOH.
- To show that chlorophyll is necessary for Photosynthesis.
- To show that carbon dioxide is necessary for Photosynthesis.

(ii) What is the special condition inside the flask? [1]

- Air inside the flask is free of oxygen.
- Air inside the flask is free of carbon dioxide.
- Air inside the flask is free of nitrogen.
- KOH purifies the air inside the flask.

(iii) An alternative chemical that can be used instead of KOH is: [1]

- Sodium hydroxide.
- Sodium chloride.
- Potassium chloride.
- Potassium permanganate.

(iv) In what manner do the leaves 1 and 2 differ at the end of the starch test? [1]

- Leaf 1 turns brown, Leaf 2 turns blue black.
- Leaf 1 turns blue black, Leaf 2 turns brown.
- Leaf 1 turns purple, Leaf 2 remains green.
- There is no change in the colour of the leaves.

(v) What is the important step that should be taken before performing this experiment? [1]

- The plant should be placed in dark for 24 hours to destarch the entire plant.
- The plant should be placed in dark for 24 hours to remove chlorophyll from the leaves.
- The plant should be placed in dark for 24 hours to destarch the leaves.
- The plant should be placed in dark for 24 hours for the roots to absorb water.

Ans. (i) Option (d) is correct.

Explanation: In the given experimental set up, potassium hydroxide in the flask absorbs carbon dioxide. Thus, due to the absence of CO_2 , the leaf fails to produce starch, which proves that carbon dioxide is necessary for photosynthesis.

(ii) Option (b) is correct.

Explanation: The leaf inside the flask does not get atmospheric carbon dioxide because KOH absorbs all of it.

(iii) Option (a) is correct.

Explanation: An alternative chemical that can be used instead of KOH is NaOH as it can also absorb CO_2 from the flask.

(iv) Option (a) is correct.

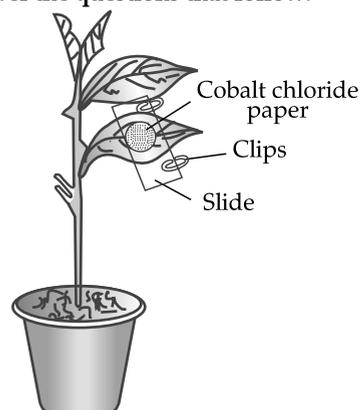
Explanation: In leaf 1, there is no change in colour, confirmed with starch test whereas leaf 2, will turn blue black at the end of starch test.

(v) Option (c) is correct.

Explanation: Before starting an experiment on photosynthesis, the plant should be placed in the dark for 24-48 hours to destarch the leaves. During this period, all the starch from the leaves is used up and the leaves will not show the presence of starch.

8. Given below is the diagram of an experimental setup to study the process of Transpiration. Cobalt chloride papers are fixed on the upper as well as lower surface of the leaf.

Answer the questions that follow:



(i) What is the aim of the experiment? [1]

- To prove that more transpiration occurs from the lower surface of a dicot leaf.
- To prove that more transpiration occurs from the upper surface of a dicot leaf.
- To prove that transpiration is equal on both sides of the leaf.
- To prove that transpiration does not take place in a dicot leaf.

(ii) What is the colour of dry cobalt chloride paper? [1]

- Pink
- Blue
- Brown
- White

(iii) After about an hour, what change if any, would you expect to find in the cobalt chloride paper placed on the upper and lower surface of the leaf? [1]

- (a) Upper surface – Pink, Lower Surface – Blue.
- (b) Upper surface – White, Lower surface – Blue.
- (c) Upper surface – less pink, Lower surface – more pink.
- (d) Upper surface – more pink, Lower surface – less pink.

(iv) Two adaptations in plants to reduce Transpiration are: [1]

- (a) Narrow leaves, Thin cuticle.
- (b) Fewer stomata, Broad lamina of leaves.
- (c) Thin cuticle, Sunken stomata.
- (d) Narrow leaves, Fewer stomata.

(v) The rate of transpiration is less when there is: [1]

- (a) High humidity in the air and low temperature.
- (b) Less humidity in the air and decrease in atmospheric pressure.

- (c) Bright sunlight and high temperature.
- (d) More wind and low intensity of sunlight.

Ans. (i) Option (a) is correct.

Explanation: The given experimental set-up proves that more transpiration occurs from the lower surface of a dicot leaf due to the presence of more stomatal openings.

(ii) Option (b) is correct.

Explanation: The color of cobalt chloride paper is blue.

(iii) Option (c) is correct.

Explanation: The cobalt chloride paper placed on the lower surface of the leaf will be more pink as there are more **stomatal** openings. The upper surface has less stomata than the lower surface, so it will be less pink.

(iv) Option (d) is correct.

Explanation: Rate of transpiration will be less if leaf is narrow and has fewer stomata.

(v) Option (a) is correct.

Explanation: Rate of transpiration is less when relative humidity is high and temperature is low.

