ICSE Biology Grade X
Solution for 2022-23 Examination

BIOLOGY

(SCIENCE PAPER - 3)

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 the 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 (40 Marks)
(Attempt all questions from this section)

Question 1. Select the correct answers to the questions from the given options.
(Do not copy the questions, write the correct answer only).

(i) The sex chromosome in a human ovum is:
(a) X chromosome
(b) Y chromosome
(c) Both X and Y chromosomes
(d) Either X or Y chromosome

Answer - (a) X chromosome

Ovum contains one single X chromosome while sperm can have either X or Y chromosome.

(ii) Which one of the following is a biodegradable waste?
(a) Metal cans
(b) E-waste
(c) Plastic
(d) Flowers

Answer - (d) Flowers

Flowers are biodegradable as they can be degrade by the microbes present in the soil.

(iii) The heart sound 'Dup' is produced when
(a) Semilunar valves open
(b) Atrioventricular valves close
(c) Semilunar valves close
(d) Atrioventricular valves open

Answer - (c) Semilunar valves close

The first heart sound is produced by the closure of the AV valves while the second heart sound is produced by the closure of the semilunar valves.

(iv) Deplasmolysis occurs when a plasmolysed cell is placed in
(a) Concentrated salt solution
(b) Tap water
(c) Crated agar solution
(d) Hypertonic salt solution

Answer - (b) Tap water

When a deplasmolysed cell is placed in tap water which is a hypotonic solution the water will move inside the cell. This is also known as endosmosis.

(v) Alpha cells of Pancreas secrete
(a) Glycogen
(b) Glucose
(c) Glucagon
(d) Insulin

Answer - (c) Glucagon

Alpha cells secretes glucagon hormone which converts glycogen back to glucose.

(vi) Haploid number of chromosomes are found in
(a) Nephrons
(b) Neurons
(c) Skin cells
(d) Sperms

Answer -(d) Sperms

Sperms have half of the chromosome hence called haploid (22+X or 22+Y).

(vii) The lifespan of an RBC is
(a) 120 days
(b) 220 days
(c) 20 days
(d) 2 weeks

Answer - (a) 120 days

The RBC gets destroyed after 120 days.

(viii)The statistical study of human population is called
(a) Mortality
(b) Demography
(c) Natality
(d) Equality

Answer - (b) Demography

The study of the human population is called demography.

(ix) The pale yellow colour of normal human urine is due to the pigment:
(a) Melanin
(b) Anthocyanin
(c) Urochrome
(d) Hemoglobin

Answer - (c) Urochrome
Urine has a yellow tint due to the presence of urochrome. It is formed through the breakdown of bile pigments in the liver, preceded by the breakdown of hemoglobin.

(x) Stimulation of the nerves of the sympathetic nervous system
(a) Accelerates heartbeat
(b) Constricts pupil of eyes
(c) Increases peristalsis
(d) Retards heartbeat

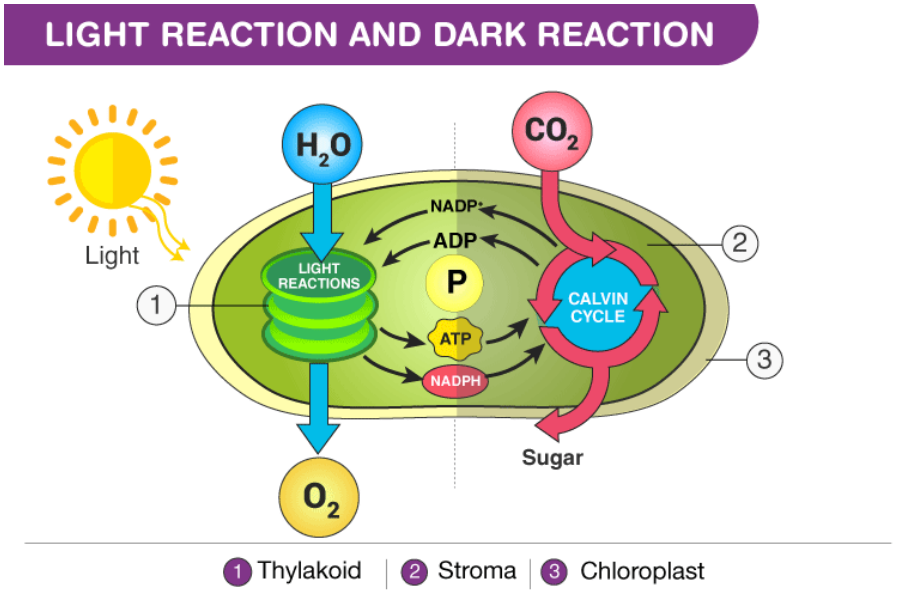
Answer - (a) Accelerates heartbeat

Sympathetic nervous system is a component of the autonomic nervous system which Accelerates heartbeat.

(xi)The site of light reaction in the cells of a green leaf is
(a) Nucleus
(b) Grana of chloroplast
(c) Cytoplasm
(d) Stroma of chloroplast

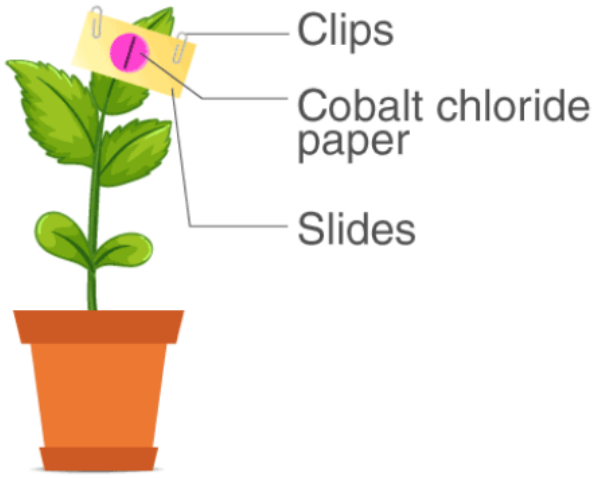
Answer - (b) Grana of chloroplast

Stacks of lamellae in plastids is known as grana. These are the sites of conversion of light energy into chemical energy.



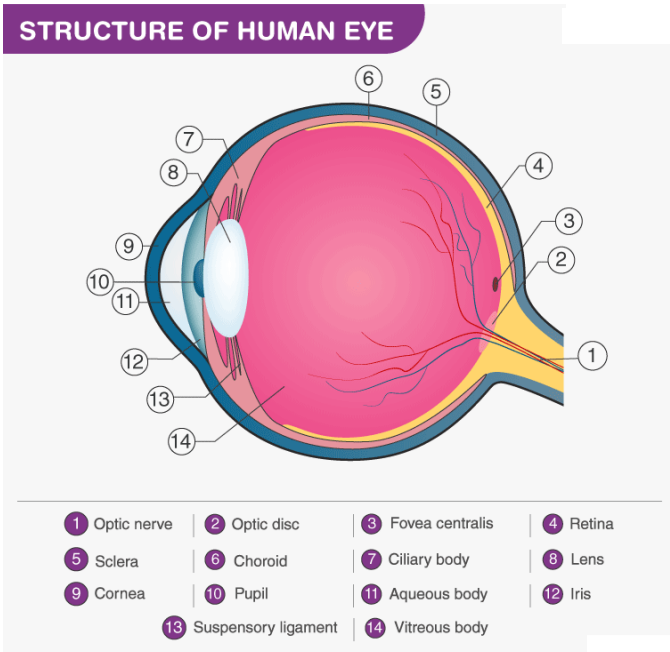
(xii) The paper used to demonstrate unequal transpiration in a dicot leaf is
(a) Filter paper
(b) Litmus paper
(c) Starch paper
(d) Cobalt chloride paper

Answer - (d) Cobalt chloride paper



(xiii) Vitreous humour is present between:
(a) Cornea and Iris
(b) Lens and Retina
(c) Iris and Lens
(d) Cornea and Lens

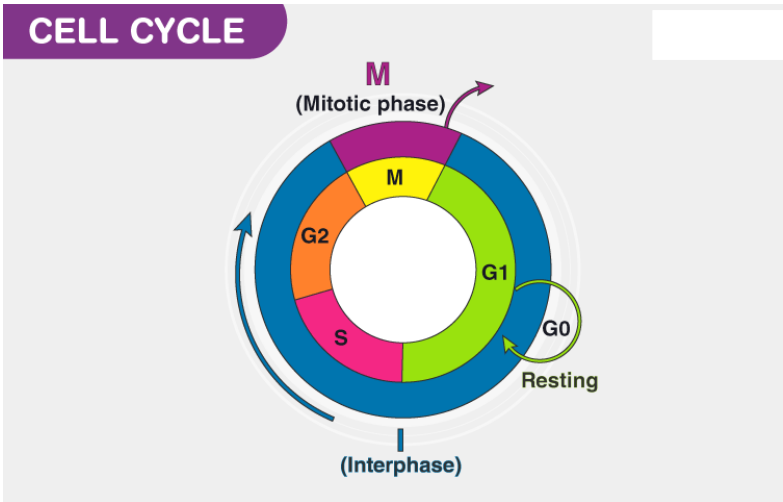
Answer - (b) Lens and Retina



(xiv) Oxygenated blood to liver is supplied by
(a) Hepatic artery
(b) Hepatic vein
(c) Inferior vena cava
(d) Hepatic portal vein

Answer - (a) Hepatic artery
Hepatic artery is the major blood vessel that carries blood to the liver.

(xv) During the synthesis phase of the cell cycle, more of
(a) RNA is synthesised
(b) RNA and proteins are synthesised
(c) DNA is synthesised
(d) Glucose is synthesized
Answer - (c) DNA is synthesised
S phase (Synthesis) – DNA replication takes place during this phase. If the initial quantity of DNA in the cell is denoted as 2N, then after replication it becomes 4N. However the number of chromosomes does not vary, viz., if the number of chromosomes during G1 phase was 2n, it will remain 2n at the end of S phase. The centriole also divides into two centriole pairs in the cells which contain centriole.



Question 2
(i) Name the following:
(a) The organelle that forms the aster during cell division.
(b) A genetic disorder in which the blood does not clot.
(c) The permanent stoppage of menstruation in human females around the age of 45
(d) The openings on the barks of trees through which transpiration occurs.

(e) A gaseous plant hormone which promotes ripening of fruits.

Answer -

(a) Centrosome
(b) Hemophilia
(c) Menopause
(d) Lenticels
(e) Ethylene Hormone

(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

(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

Answer -

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

(iii) Match the items given in Column I with most appropriate ones in Column II and rewrite the correct matching pairs:

Column I	**Column II**
(a) Hyposecretion of Thyroxine in adults	1. Diabetes insipidus
(b) Hyposecretion of Insulin	2. Myxedema
(c) Hypersecretion of Growth hormone in childhood	3. Dwarfism
(d) Hyposecretion of ADH	4. Gigantism
(e) Hypersecretion of Thyroxine	5. Diabetes mellitus
	6. Exophthalmic gore
	7. Cretinism

Answer -

Column I	**Column II**
(a) Hyposecretion of Thyroxine in adults	1. Cretinism, Myxedema

(b) Hyposecretion of Insulin — 2. Diabetes mellitus
(c) Hypersecretion of Growth hormone in childhood — 3.Gigantism

(d) Hyposecretion of ADH — 4. Diabetes insipidus
(e) Hypersecretion of Thyroxine — 5. Exophthalmic goitre

(iv) Choose the **odd** one out from the following terms and name the **category to which the others belong**.
(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

Answer -

(a) Pesticides - Pesticides are chemicals which are used for killing pests.
(b) Effluents - liquid waste that is sent out from factories or places where sewage is dealt with, usually flowing into rivers, lakes, or the sea.
(c) Uterus - It is a part of the female reproductive system where the embryo develops.
(d) Telophase - It is one of the stages of cell division.
(e) Cochlea - It is the innermost part of the ear.

(v) State the exact location of the following structures
(a) Thyroid gland
(b) Dura mater
(c) Amniotic fluid
(d) Papillary muscles
(e) Islets of Langerhans

Answer -

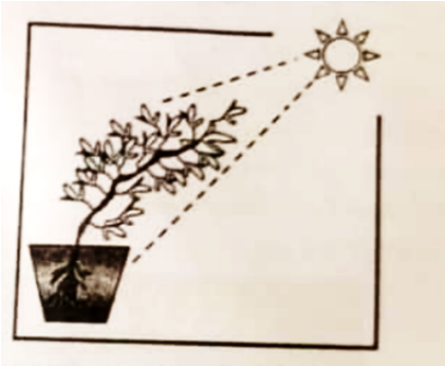
(a) Thyroid gland-Thyroid Gland is situated in the anterior portion of the neck.
(b) Dura mater - located directly under your skull and vertebral column.
(c) Amniotic fluid - Amniotic fluid is located in the cavity between amnion and embryo in the uterus.
(d) Papillary muscles - papillary muscles of the heart are pillar-like muscles seen within the cavity of the ventricles, attached to their walls.
(e) Islets of Langerhans - These are endocrine cells found in the pancreas that secrete hormones.

SECTION B (40 Marks)

(Attempt any four questions from this Section)

Question 3

(i) Write the overall chemical equation for photosynthesis.
(ii) Mention any two functions of blood.
(iii) Differentiate between Karyokinesis and Cytokinesis
(iv) Excessive use of fertilizers in agricultural fields reduces the yield of crops Justify the statement.
(v) Study the diagram given below and answer the questions that follow



(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_____.

Answer -

(i) $6CO_2 + 12H_2O$ -----> $C_6H_{12}O_6 + 6O_2 + 6H_2O$

- For each molecule of glucose (C6H12O6) produced during photosynthesis, six molecules of carbon dioxide (CO2) and twelve molecules of water (H2O) are required.
- The molecules of water get oxidized and the electrons so released are then utilised for the reduction of carbon dioxide to form glucose.

(ii) Functions of blood:

1. Transportation of oxygen from the lungs to the tissues.
2. Transportation of digested food from the small intestine to the tissues and cells around the body.

(iii) Karyokinesis vs Cytokinesis

Karyokinesis	Cytokinesis

(a) Karyokinesis means the process of division of the nucleus.	(a) Cytokinesis means the process of division of cytoplasm.
(b) The nucleus gets divided into two daughter nuclei.	(b) The cytoplasm, cell organelles and the nuclei divide and are passed onto daughter cells equally.
(c) It can occur with or without cytokinesis.	(c) It is dependent on karyokinesis.

(iv) The excessive use of fertilizers in agricultural fields can actually have a negative impact on crop yields in the long run. This is because excessive fertilizer use can lead to a number of problems, including:

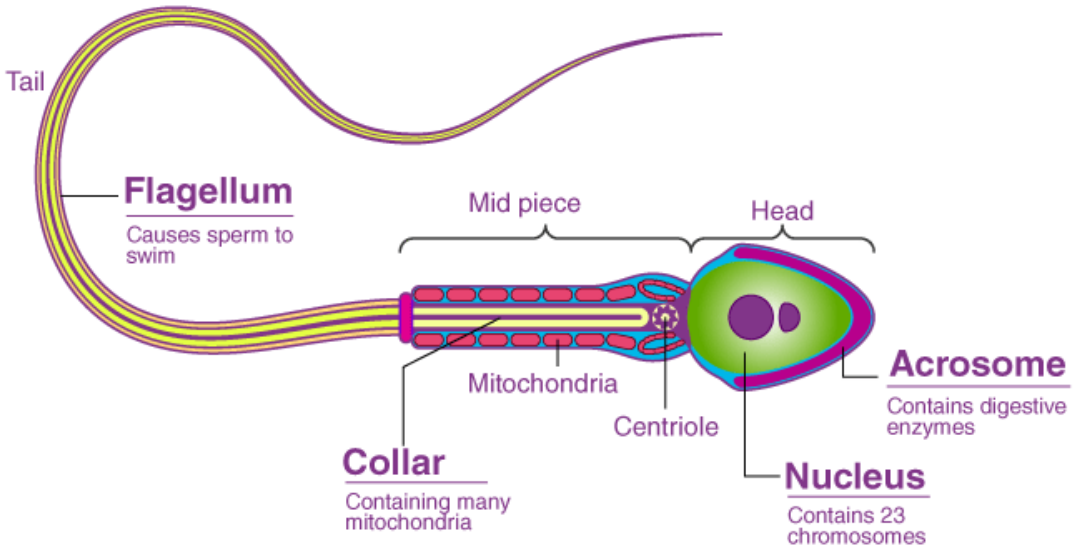
Soil acidification: Overuse of nitrogen-based fertilizers can cause the soil to become more acidic, which can ultimately reduce the soil's ability to support healthy plant growth.
Nutrient imbalances: Overuse of a particular type of fertilizer can lead to imbalances in soil nutrients, which can cause some nutrients to become unavailable to the plant, while others are present in excess. This can lead to stunted growth and reduced yields.

(v) (a) The phenomenon depicted by the shoot in the above diagram is phototropism.
(b) Auxin plays an important role in phototropism.
(c) Shoots show positive **phototropism** whereas, roots show positive **geotropism**.

Question 4
(i) Expand the abbreviation - DNA
(ii) What is Active transport?
(iii) Mention the two pairs of nitrogenous bases which pair with each other with hydrogen bonds.
(iv) State Mendel's 'Law of Segregation"
(v) Draw a neat, labelled diagram of a human sperm

Answer -

(i) Deoxyribonucleic acid.
(ii) Active Transport is defined as a process that involves the movement of molecules from a region of lower concentration to a region of higher concentration against a gradient or an obstacle with the use of external energy.
(iii) Adenine pairs with Thymine, and Cytosine pairs with Guanine.
(iv) Mendel’s law of segregation states that: During the formation of gamete, each gene separates from each other so that each gamete carries only one allele for each gene
(v)



Question 5

(i) Explain the term "Population density".

(ii) Name the two surgical methods of population control.

(iii) Mention two factors responsible for population explosion in India.

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

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

Answer the following questions:

(a) Name the climatic phenomenon for the increase in Earth's temperature.
(b) Mention one reason for this warming
(c) What measures can be taken to prevent this climate change?

Answer -

(i) Population density means the number of people living per unit area.
It is normally written as per square km.
(ii) Vasectomy and Tubectomy.
(iii) (a) Illiteracy (b) Desire for Male children.
(iv) (a) Food (b) Land
(v) (a) Global warming
(b) Due to the increase in concentration of greenhouse gases such

- Carbon dioxide.
- Methane.
- Ozone.
- Nitrous oxide.
- Water vapor

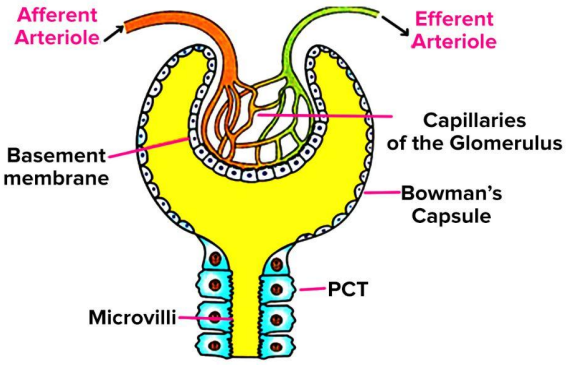
(c) measures to prevent this climate change are
(i) Stop deforestation and promote afforestation.
(ii) Reduce air pollution caused due to vehicles and various industries.

Question 6
(i) Define the term Transpiration.
(ii) State any two adaptations in plants to reduce transpiration.
(iii) Mention any two functions of the human foetal placenta.
(iv) What is the significance of the human testes being located in scrotal sacs outside the abdomen?
(v) Draw a neat, labelled diagram of a Malpighian Capsule.

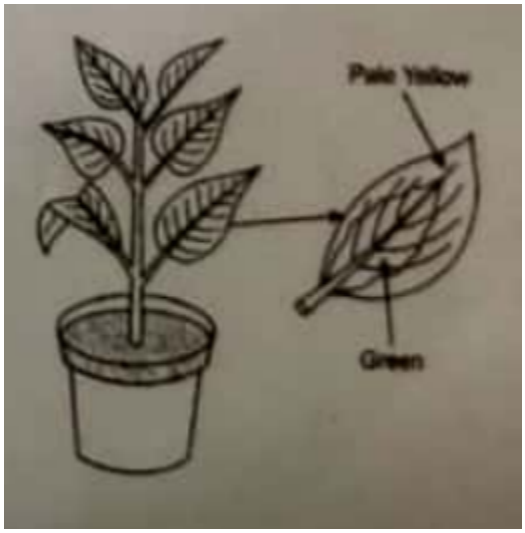
Answer -

(i) Transpiration is the process in which water is lost as water vapor from the aerial parts of the plants through stomata. Transpiration is essentially evaporation of water from the leaves of the plant.

(ii) (1) Spines instead of leaves: The leaves in the desert plants are modified into spines to decrease the surface area for transpiration.
(2) Thick cuticle on leaves: A waxy layer called cuticle on the surface of the leaves lowers the transpiration rate.
(3) Sunken stomata: The stomatal pores are not directly exposed to the leaves, reducing transpiration.
(iii) (1) The placenta provides nutrients and oxygen to the embryo while also eliminating carbon dioxide and waste materials produced by the embryo.
(2) The placenta produces hormones such as estrogens, human chorionic gonadotropin (hCG), and progesterone.
(iv) The presence of testes outside the abdominal cavity in the scrotum keeps the temperature of testes 2-3 degrees Celsius below the temperature of the body which is important for the production of sperm.
(v)



Question 7
(i) What is a Reflex action?
(ii) Renal cortex has a dotted appearance and Renal medulla has a striped appearance. Explain.
(iii) What are the two functions of cerebellum?
(iv) Distinguish between Semicircular canals and Utriculus based on their function.
(v) A potted plant with variegated leaves was kept in dark for 24 hours and then placed in bright sunlight. Answer the following questions



(a) Which aspect of photosynthesis is being tested in the above diagram?
(b) Why was the plant kept in the 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.

Answer -

(i) Reflex is an involuntary and sudden response to stimuli. It happens to be an integral component of the famed survival instinct.
(ii) The nephron has two parts- a cup shaped body called malpighian corpuscle or renal corpuscle and a tubular part called renal tubule. The cortex has a dotted appearance because of the presence of these malpighian corpuscles. The striated appearance of the medulla is due to the renal tubule.
(iii) The cerebellum maintains the balance of the body.
It also coordinates various muscular activities of the body.
(iv) The semicircular canals, which respond to rotational movements (angular acceleration); and the utricle and saccule within the vestibule, which respond to changes in the position of the head with respect to gravity (linear acceleration).
(v)
(a) Sunlight is the important aspect of photosynthesis which is tested here in this experiment.
(b) The plant was kept in dark to eliminate the starch in the leaves.
(c) After the starch test the green parts of the leaf will become blue black while the yellow parts lacking chlorophyll will show negative starch test.
The green part which contains chlorophyll will be able to synthesize starch while the yellow part lacking chlorophyll will not be able to synthesize starch hence will show negative starch test.

Question 8

(i) Define the term Mutation.

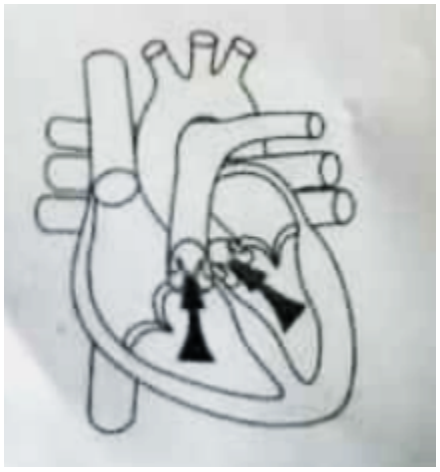
(ii) A pure breeding red flower variety of pea plant (RR) is crossed with a pure breeding white flower variety of pea plant (rr). Draw a Punnett square to find out the Phenotypic and Genotypic ratios of the progeny belonging to the F2 generation.

(iii) Leaves of certain plants roll up on a hot sunny day. Explain by giving suitable reasons.

(iv) What is a semi permeable membrane? Name the semi permeable membrane present in a plant cell.

(v) The diagram below depicts the human heart in one of its phases.

Answer the questions that follow:



(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

Ans

(i) Mutation is the change in our DNA base pair sequence due to various environmental factors such as UV light, or mistakes during DNA replication

(ii)

F1 generation

	R	R
r	Rr	Rr
r	Rr	Rr

F2 generation

	R	r
R	RR	Rr
r	Rr	rr

Phenotypic ratio is 3:1
Genotypic ratio is 1:2:1

(iii) Leaves of some plants roll up on a bright sunny day to reduce the effective surface area for transpiration. The reduced surface area ultimately reduces the rate of transpiration.
(iv) Semi-permeable membrane - A membrane through which only smaller molecules like water can pass but not the bigger molecules like solutes is known as semi-permeable membranes (SPM).Cell membrane or Plasma membrane is a living, thin, delicate, elastic, selectively permeable membrane made up of proteins and lipids, present in both plant and animal cell.
(v)

(a) Here in this diagram ventricles are the contracting part of the heart.
(b) The blood is moving into the respective arteries (Pulmonary artery and dorsal aorta) because the ventricles are contracting.

(c)

Systole	Diastole
It happens when the heart muscle contracts and the blood moves to the aorta and pulmonary artery.	It happens when the heart muscle relaxes between two contractions and the heart is filled with blood.
Systole reduces the volume of the heart as all the blood gets pumped out.	Diastole increases the heart volume and makes it normal as the blood comes back in.