

ICSE Board Question Paper

Class X Biology (2016)

(Two hours)

General Instructions:

Total Marks: 80

1. Answers to this paper must be written on the paper provided separately.
2. You will **not** be allowed to write during the first **15** minutes.
This time is to be spent in reading the question paper.
3. The time given at the head of the paper is the time allowed for writing the answers.
4. Attempt **all** questions from **Section I** and **any four** questions from **Section II**.
5. The intended marks of questions or parts of questions are given in brackets [].

SECTION I (40 Marks)

Attempt **all** questions from this Section

Question 1

(a) Name the following:

- (i) The exchange of chromatid parts between the maternal and the paternal chromatids of a pair of homologous chromosomes during meiosis.
- (ii) The number of individuals inhabiting per unit area.
- (iii) The immunity acquired by providing readymade antibodies from outside for treating certain infectious diseases.
- (iv) The pollutants that cannot be broken down to simple and harmless products.
- (v) The part of the brain that carries impulses from one hemisphere of the cerebellum to the other.

[5]

(b) Choose the correct answer from each of the four options given below:

- (i) A plant cell may burst when:
 - A. Turgor pressure equalises wall pressure.
 - B. Turgor pressure exceeds wall pressure.
 - C. Wall pressure exceeds turgor pressure.
 - D. None of the above
- (ii) The individual flattened stacks of membranous structures inside the chloroplasts are known as :
 - A. Grana
 - B. Stroma
 - C. Thylakoids
 - D. Cristae

(iii) The nephrons discharge their urine at the :

- A. Urinary bladder
- B. Urethra
- C. Renal pelvis
- D. Renal pyramid

(iv) Gigantism and Acromegaly are due to :

- A. Hyposecretion of Thyroxine
- B. Hyposecretion of Growth hormone
- C. Hypersecretion of Thyroxine
- D. Hypersecretion of Growth hormone

(v) The mineral ion needed for the formation of blood clot is :

- A. Potassium
- B. Sodium
- C. Calcium
- D. Iron

(c) In each set of terms given below, there is an odd one and cannot be grouped in the same category to which the other three belong. Identify the odd one in each set and name the category to which the remaining three belong. [5]
Example : ovary, Fallopian tube, Ureter, Uterus.

Odd term : Ureter

Category : Parts of female reproductive system.

- (i) Sewage, newspaper, Styrofoam, Hay.
- (ii) Thymine, Cytosine, Adenine, Pepsin.
- (iii) Malleus, iris, Stapes, Incus.
- (iv) Cortisone, Somatotropin, Adrenocorticotrophic hormone, Vasopressin.
- (v) Typhoid, Haemophilia, Albinism, Colour blindness.

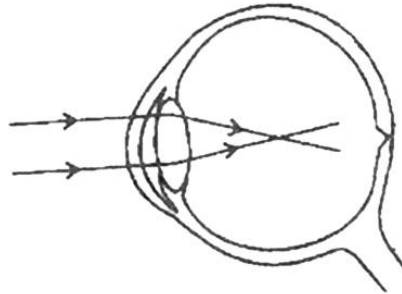
(d) Complete the following paragraph by filling in the blanks (i) to (v) with appropriate words: [5]

(i) _____ secreted by the (ii) _____ lobe of the pituitary gland. If this hormone secretion is reduced, there is an increased production of urine. This disorder is called (iii) _____. Sometimes excess glucose is passed with urine due to hyposecretion of another hormone called (iv) _____ leading to the cause of a disease called (v) _____.

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

- (i) Centromere
- (ii) Chordae tendinae
- (iii) Thyroid gland
- (iv) Ciliary body
- (v) Proximal convoluted tubule.

- (f)** Given below is a diagram depicting a defect of the human eye, study the same and then answer the questions that follow: [5]



- (i) Name the defect shown in the diagram.
- (ii) What are the two possible causes that cause this defect?
- (iii) Name the type of lens used to correct this defect.
- (iv) With the help of a diagram show how the defect shown above is rectified using a suitable lens.

- (g)** Given in the box below are a set of 14 biological terms. Of these, 12 can be paired into 6 matching pairs. Out of the six pairs, one has been done for you as an example. [5]

Example : endosmosis - Turgid cell.

Identify the remaining *five* matching pairs :

Cushing's syndrome, Turgid cell, Iris, Free of rod and cone cells, Colour of eyes, Hypoglycemia, Active transport, Acrosome, Addison's disease, Blind spot, Hyperglycemia, Spermatozoa, Endosmosis, Clotting of blood.
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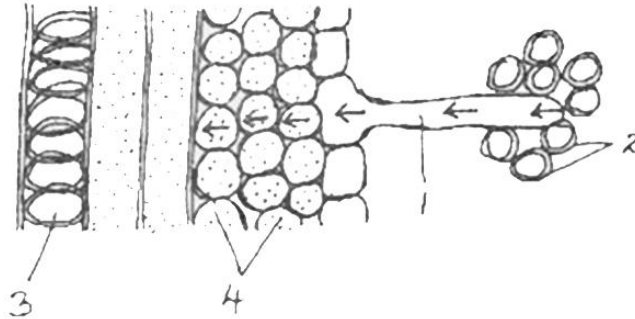
- (h)** State the main function of the following : [5]
- (i) Lymphocytes of blood
 - (ii) Leydig cells
 - (iii) Guard cells
 - (iv) Eustachian tube
 - (v) Corpus luteum

SECTION II (40 Marks)

Attempt any four questions from this Section

Question 2

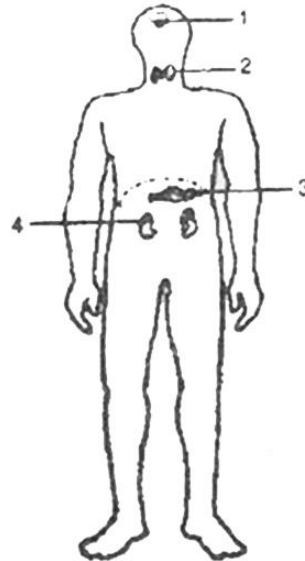
- (a) The figure given below is a diagrammatic representation of a part of the cross section of the root in the root hair zone. Study the same and then answer the questions that follow : [5]



- Name the parts indicated by the guidelines 1 to 4.
 - Which is the process that enables the passage of water from the soil into the root hair?
 - Name the pressure that is responsible for the movement of water in the direction indicated by the arrows. Define it.
 - Due to an excess of this pressure sometimes drops of water are found along the leaf margins of some plants especially in the early mornings. What is the phenomenon called?
 - Draw a well labelled diagram of the root hair cell as it would appear if an excess of fertiliser is added to the soil close to it.
- (b) Differentiate between the following pairs on the basis of what is mentioned within brackets : [5]
- Human skin cell and Human ovum (number of chromosomes).
 - Sperm duct and fallopian tube (function)
 - Red Cross and WHO (one activity)
 - Rod cells and cone cells (pigment)
 - LUBB and DUP (names of the valves whose closure produce the sound)

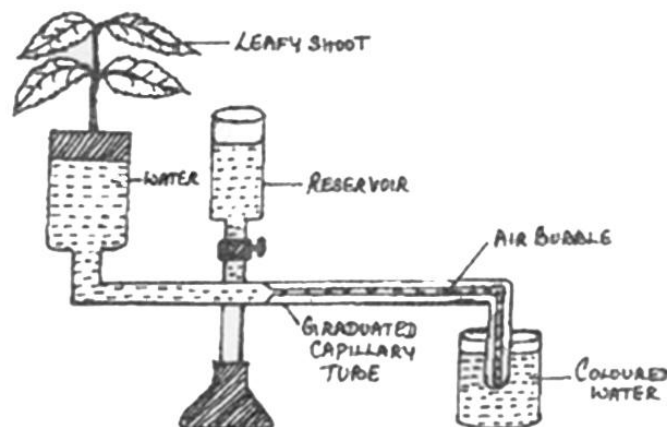
Question 3

(a) Given below is the outline of the human body showing the important glands : [5]



- (i) Name the glands marked 1 to 4.
- (ii) Name the hormone secreted by part 2. Give one important function of this hormone.
- (iii) Name the endocrine part of the numbered 3.
- (iv) Why is the part labelled I called the master gland? Which part of the forebrain controls the gland labelled I?
- (v) Name the gland that secretes the 'emergency hormone'.

(b) The diagram of an given below demonstrates a particular process in plants. Study the same and answer the questions that follow : [5]



- (i) Name the apparatus.
- (ii) Which phenomenon is demonstrated by this apparatus?
- (iii) Explain the phenomenon mentioned in (ii) above.
- (iv) State two limitations of using this apparatus.
- (v) What is the importance of the air bubble in the experiment?
- (vi) Name the structures in a plant through which the above process takes place.

Question 4

(a)

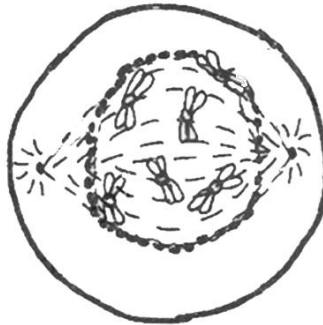
- (i) Draw a well labelled diagram of the membranous labyrinth found in the inner ear. [5]
- (ii) Based on the diagram drawn above in (i) give a suitable term for each of the following descriptions :
 1. The sensory cells that helps in hearing.
 2. The part that is responsible for static balance of the body.
 3. The membrane covered opening that connects the middle ear to the inner ear.
 4. The fluid present in the middle chamber of cochlea.
 5. The structure that maintains dynamic equilibrium of the body.

(b) Give the Biological/technical term for the following: [5]

- (i) Complete stoppage of menstrual cycle in females.
- (ii) Pigment providing colour to urine.
- (iii) The vein which drains the blood from the intestine to the liver.
- (iv) The canal through which the testes descend into the scrotum just before the birth of a male baby.
- (v) The process causing an undesirable change in the environment.
- (vi) The removal of nitrogenous wastes from the body.
- (vii) The repeating components of each DNA strand lengthwise.
- (viii) An alteration in the genetic material that can be inherited.
- (ix) The process of uptake of mineral ions against the concentration gradient using energy from the cell.
- (x) Blood vessels carrying blood to the left atrium.

Question 5

(a) The given diagram shows a stage during mitotic division in an animal cell : [5]



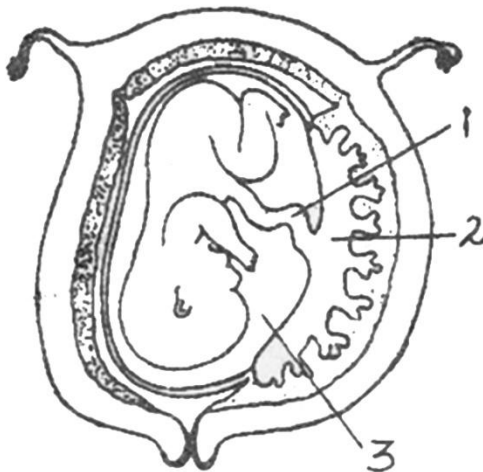
- (i) Identify the stage. Give a reason to support your answer.
- (ii) Draw a neat labelled diagram of the cell as it would appear in the next stage. Name the stage.
- (iii) In what two ways is mitotic division in an animal cell different from the mitotic division in a plant cell?
- (iv) Name the type of cell division that occurs during :
 - A. Growth of a shoot
 - B. Formation of pollen grains.

(b) Give scientific reasons for the following statements : [5]

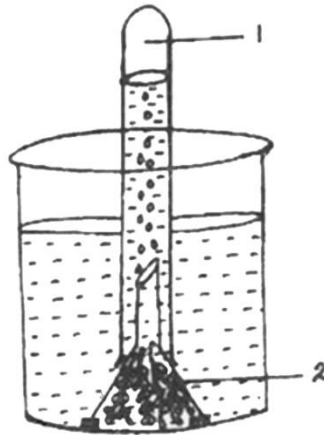
- (i) Colour blindness is more common in men than in women.
- (ii) Injury to medulla oblongata leads to death.
- (iii) When an ovum gets fertilized, menstrual cycle stops temporarily in a woman.
- (iv) Mature erythrocytes in humans lack nucleus and mitochondria.
- (v) Blood flows in arteries in spurts and is under pressure.

Question 6

(a) The diagram given below is that of a developing human foetus. Study the diagram and then answer the questions that follow: [5]



- (i) Label the parts numbered 1 to 3 in the diagram.
 - (ii) Mention any two functions of the part labelled 2 in the diagram.
 - (iii) Explain the significance of the part numbered 3 in the diagram.
 - (iv) Define the term 'Gestation'. What is the normal gestational period of the developing human embryo?
 - (v) Mention the sex chromosomes in a male and female embryo.
- (b)** The following diagram demonstrates a physiological process taking place in green plants. The whole set up was placed in bright sunlight for several hours. Study the diagram and answer the questions that follow : [5]



- (i) What aspect of the physiological process is being examined?
- (ii) Explain the physiological process mentioned in (i) above.
- (iii) Label the parts numbered 1 and 2 in the diagram.
- (iv) Write a well-balanced chemical equation for the physiological process explained in (ii) above.
- (v) What would happen to the rate of bubbling of the gas if a pinch of sodium bicarbonate is added to the water in the beaker? Explain your answer.

Question 7

- (a)** A homozygous tall plant (T) bearing red coloured (R) flowers is crossed with a homozygous dwarf (t) plant bearing white (r) flowers :-
- (i) Give the genotype and phenotype of the plants of F_1 generation.
 - (ii) Mention the possible combinations of the gametes that can be obtained from the F_1 hybrid plant.
 - (iii) State the Mendel's law of Independent Assortment.
 - (iv) Mention the phenotypes of the off springs obtained in F_2 generation.
 - (v) What is the phenotypic ratio obtained in F_2 generation?
- (b)** Briefly explain the following terms:
- (i) Reflex action
 - (ii) Power of accommodation
 - (iii) Photophosphorylation
 - (iv) Hormone
 - (v) Synapse

ICSE QUESTION PAPER

Class X Biology

(2016) Solution

SECTION I

Answer 1

(a)

- (i) Crossing over
- (ii) Population
- (iii) Passive acquired immunity
- (iv) Non-biodegradable wastes
- (v) Ponds

(b)

- (i) C. Wall pressure exceeds turgor pressure
(The cell wall is unable to bear the turgor pressure after a certain time; it ruptures and the cell contents burst out.)
- (ii) C. Thylakoids
(The individual flattened stacks of membrane material inside the chloroplast are known as thylakoids.)
- (iii) C. Renal pelvis
(From the renal pelvis, urine is transported out of the kidneys through the ureters, tubes which carry the urine out of each kidney, to be stored in the urinary bladder.)
- (iv) D. Hypersecretion of growth hormone
(Oversecretion or hypersecretion in childhood results in gigantism. Hypersecretion in adults causes acromegaly.)
- (v) C. Calcium
(Calcium is necessary for blood clotting.)

Please note that the information provided in brackets is to help you in your learning. It does not have to be included in your answer.

(c)

- (i) Odd term: Styrofoam
Category: Biodegradable materials
- (ii) Odd term: Pepsin
Category: Nitrogenous bases of DNA
- (iii) Odd term: Iris
Category: Parts of human ear (middle ear)
- (iv) Odd term: Cortisone
Category: Hormones of the pituitary gland
- (v) Odd term: Typhoid
Category: Genetic disorders

(d)

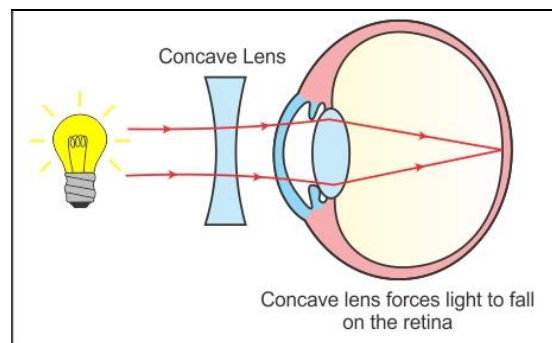
- (i) Anti-diuretic hormone (ADH)
- (ii) Posterior
- (iii) Diabetes insipidus
- (iv) Vasopressin
- (v) Blood pressure

(e)

- (i) At the centre of the chromosome joining the sister chromatids
- (ii) Between tricuspid/bicuspid valves and papillary muscles of the heart
- (iii) Base of the neck (below larynx)
- (iv) Between iris and choroid (composed of ciliary muscles)
- (v) Convoluted region near the Bowman's capsule

(f)

- (i) Myopia
- (ii) Two possible reasons are
 - Eye ball is lengthened from front to back.
 - Lens is too curved.
- (iii) Concave lens
- (iv)



(g)

- (i) Blind spot: Free of rods and cones
- (ii) Acrosome: Spermatozoa
- (iii) Iris: Colour of eyes
- (iv) Addison's disease: Hypoglycemia
- (v) Cushing's syndrome: Hyperglycemia

(h)

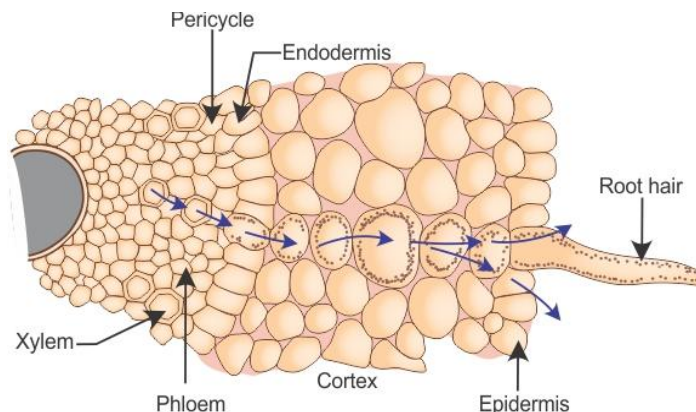
- (i) Defend the body against cancerous cells, pathogens and foreign matter
- (ii) Produce male sex hormone called testosterone
- (iii) Help to regulate the rate of transpiration by opening and closing of stomata
- (iv) Equalises air pressure on either sides of the eardrum allowing it to vibrate freely
- (v) Responsible for the secretion of the hormones oestrogen and progesterone in females

SECTION II

Answer 2

(a)

- (i) 1: Root hair, 2: Soil particle, 3: Xylem vessel, 4: Vacuoles
- (ii) Osmosis is the process which enables the passage of water from the soil into root hair.
- (iii) Root pressure is responsible for the movement of water. It is the pressure developed in the roots because of the inflow of water.
- (iv) Guttation
- (v)



(b)

- (i) Human skin cell contains 46 chromosomes, whereas human ovum contains 23 chromosomes.
- (ii) Sperm duct transports the sperms into the urethra, whereas the fallopian tube transports the egg from the ovary to the uterus.
- (iii) Red Cross looks after maternal and child welfare centres, whereas WHO promotes and supports projects for research on diseases.
- (iv) Rods contain the pigment rhodopsin, whereas cones contain the pigment iodopsin.
- (v) LUBB is produced by atrioventricular valves, whereas DUBB is produced by semilunar valves.

Answer 3

(a)

- (i) 1: Pituitary gland, 2: Thyroid gland, 3: Pancreas, 4: Adrenal gland
- (ii) Thyroid glands secrete the hormone thyroxine.
Function: Regulates basal metabolism
- (iii) The endocrine part is the islets of Langerhans.
- (iv) The pituitary gland is called the master gland because it controls several other hormone-releasing glands.
The hypothalamus of the forebrain controls the pituitary gland.
- (v) The adrenal gland secretes the emergency hormone adrenaline.

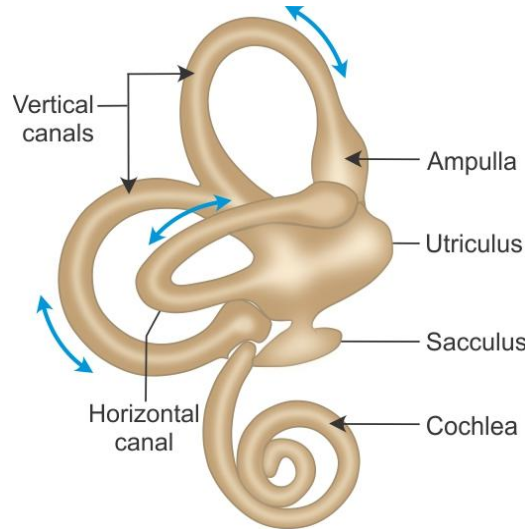
(b)

- (i) The apparatus is called Ganong's Potometer.
- (ii) The phenomenon is called transpiration.
- (iii) The evaporative loss of water in the form of water vapour from the aerial parts of plants is known as transpiration.
- (iv) Two limitations are
 - It is not easy to introduce the air bubble into the capillary.
 - The twig may not remain fully alive for a long time.
- (v) The air bubble helps measure the rate of transpiration.
- (vi) Transpiration occurs through roots.

Answer 4

(a)

(i)



- (ii) 1: Cochlear duct
- 2: Semicircular canal
- 3: Oval window
- 4: Endolymph
- 5: Sensory cells in semicircular canals

(b)

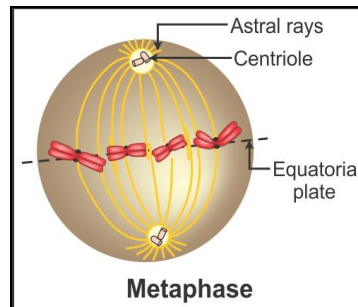
- (i) Menopause
- (ii) Bilirubin
- (iii) Hepatic portal vein
- (iv) Inguinal canal
- (v) Pollution
- (vi) Excretion
- (vii) Nucleotides
- (viii) Mutation
- (ix) Active transport
- (x) Pulmonary vein

Answer 5

(a)

(i) Late prophase. The nuclear membrane and nucleolus disappear.

(ii)



The next stage is metaphase.

(iii)

Mitosis in Plant Cell	Mitosis in Animal Cell
1. Asters are not formed.	1. Asters are formed.
2. Occurs at the growing tips.	2. Occurs throughout the body.

(iv)

- A. Mitosis
- B: Meiosis

(b)

- (i) Colour blindness is an X-linked disorder caused by a recessive gene. Males have only one 'X' chromosome and thus have only one copy of the gene which if recessive may lead to colour blindness. However, females have two 'X' chromosomes and both should possess the recessive gene for her to become colourblind, which occurs rarely.
- (ii) The medulla oblongata is responsible for the control of various life processes such as breathing, heartbeat and blood pressure. Injury to the medulla oblongata may hamper any of the processes thus leading to death.
- (iii) In case of fertilisation of the ovum by a sperm, the corpus luteum persists and continues to secrete progesterone in the body thus maintaining its high levels. The presence of progesterone prevents the maturation of another ovum, thus temporally stopping the menstrual cycle.
- (iv) Mature RBCs lack a nucleus as it increases the surface area to volume ratio, making the absorption of oxygen more efficient. Also, the lack of mitochondria in these cells prevents the use of oxygen for themselves in cellular respiration, thus transporting all the oxygen absorbed and further increasing the efficiency of oxygen transport.

- (v) As the ventricles of the heart contracts, they push the blood into the small lumen of the arteries with a great force, thus making the blood in the arteries flow in spurts and under pressure.

Answer 6

(a)

- (i) 1: Umbilical cord
2: Placenta
3: Amniotic fluid
- (ii) Functions of placenta:
- It allows the diffusion of oxygen, nutrients and immune products from the mother to the foetus.
 - It allows the diffusion of waste material generated by the foetus to the mother to be excreted.
- (iii)
- The amniotic fluid prevents the foetus from injury and shocks.
 - It allows the foetus some amount of movement.
 - It prevents the amnion from sticking to the foetus.
 - It maintains an even pressure all around the foetus.
- (iv) The time period required for the development of the foetus inside the uterus is called gestation. The normal gestation period in humans is 280 days (9 months).
- (v) Male sex chromosomes: One 'X' chromosome and one 'Y' chromosome (XY)
Female sex chromosomes: Two 'X' chromosomes (XX)

(b)

- (i) Release of oxygen during photosynthesis
- (ii) The physiological process in question is photosynthesis. Photosynthesis occurs in green plants (autotrophs). It is the process by which plants prepare carbohydrates and oxygen in the presence of sunlight, carbon dioxide and chlorophyll.
- (iii) 1: Gas/Oxygen
2: Hydrilla
- (iv)
$$6CO_2 + 12H_2O \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} C_6H_{12}O_6 + 6H_2O + 6O_2 \uparrow$$
- (v) The rate of bubbling will increase.

When sodium bicarbonate is added to water, it leads to the release of CO₂. An increase in the levels of CO₂ promotes photosynthesis and increases the rate of photosynthesis, thus in turn increasing the amount of oxygen released.

Answer 7

(a)

- (i) Genotype of F₁ generation plants: TtRr
 Phenotype of F₁ generation plants: Tall and red-coloured flowers
- (ii) Possible combination of gametes obtained by the F₁ hybrids:

F ₂ generation	TR	Tr	tR	tr
TR	TTRR	TTRr	TtRR	TtRr
Tr	TTRr	Ttrr	TtRr	Ttrr
tR	TtRR	TtRr	ttRR	ttRr
tr	TtRr	Ttrr	ttRr	ttrr

- (iii) In case of two or more contrasting characters, the distribution of each member of one pair of characters in the gametes is independent of the distribution of the other pair.
- (iv) Phenotypes of offspring obtained in the F₂ generation:
- Tall plants with red flowers
 - Tall plants with white flowers
 - Dwarf plants with red flowers
 - Dwarf plant with white flowers
- (v) The phenotypic ratio obtained in the F₂ generation is 9:3:3:1.

(b)

- (i) Reflex action:
 A reflex action is an involuntary and quick response of the body initiated because of a stimulus. The commands for a reflex action originate from the spinal cord.
- (ii) Power of accommodation:
 The ability of the eye to adjust itself and to focus objects at different distances is known as the power of accommodation. The ciliary muscles

contract and make the lens thicker to view nearby objects clearly, whereas they relax and make the lens thinner to focus on distant objects.

(iii) Photophosphorylation:

The process by which a phosphate moiety is added to an ADP molecule using light energy to form an energy-rich ATP molecule is known as photophosphorylation. In photosynthetic plants, photophosphorylation occurs by two pathways—cyclic and non-cyclic.

(iv) Hormones:

Hormones are chemical regulators of the body which are synthesised by specific cells or glands of the body and poured directly into the blood, and they show their effects on their respective target cells or organs. Most of the hormones are produced by the endocrine glands; however, certain other glands may also produce hormones as a secondary function.

(v) Synapse:

A synapse is the point of contact between the terminal branches of the axon of one neuron with the dendrites of another neuron separated by a fine gap. The synapse allows the transmission of the nerve impulse from one neuron to the other through a chemical process.