SCIENCE
Solved Paper-3 (Biology) — 2014
(One hour and a half)

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.

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*Attempt **all** questions from **Section I** and any **four** questions from **Section II.**.*
The intended marks for 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: **[5]**

(i) The part of the brain associated with memory.
Ans. Cerebrum

(ii) The ear ossicle which is attached to the tympanum.
Ans. Malleus / Hammer

(iii) The type of gene, which in the presence of a contrasting allele is not expressed.
Ans. Recessive

(iv) The hormone secreted by islets of langerhans.
Ans. Insulin / Glucagon / Somatostatin (any one)

(v) The process of conversion of ADP into ATP during photosynthesis.
Ans. Photophosphorylation

(b) State the main function of the following: **[5]**

(i) Cerebrospinal fluid.
Ans. Protects the brain from shocks.

(ii) Eustachian tube.
Ans. Equalises air pressure on either side of the tympanum / ear drum.

(iii) Suspensory ligament of the eye.
Ans. Holds the eye lens in position.

(iv) Sperm duct.
Ans. Carries/ transfers sperms from testis to urethra in human male.

(v) Lenticels.
Ans. Help in respiration in plants / exchange of respiratory gases // Help in transpiration in young stems / herbaceous stems / old stems.

(c) Copy and complete the following by filling in the blanks 1 to 5 with appropriate words:

The human female gonads are ovaries. A maturing egg in the ovary is present in a sac of cells called _____(1). As the egg grows larger, the follicle enlarges and gets filled with a fluid and is now called the _____(2) follicle. The process of releasing the egg from the ovary is called _____(3). The ovum is picked up by the oviducal funnel and fertilization takes place in the _____(4). In about a weak the blastocyst gets fixed in the endometrium of the uterus and this process is called _____(5). **[5]**

Ans. (1) Follicle (2) Graafian follicle (3) Ovulation (4) Oviduct /fallopian tube (5) Implantation

(d) Given below are six sets with four terms each. In each set one term is odd 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. The first one has been done as an example. **[5]**

Example: Calyx, Corolla, Stamens, Midrib

Odd term: midrib

Category: Parts of a flower.

(i) Haemoglobin, Glucagon, Iodopsin, Rhodopsin.

Ans. *Odd* — Glucagon *Rest* — Pigments

(ii) Urethra, Uterus, Urinary bladder, Ureter.

Ans. *Odd* — Uterus *Rest* — Parts / Organs of Excretory System

(iii) Transpiration, Photosynthesis, Phagocytosis, Guttation.

Ans. *Odd* — Phagocytosis *Rest* — Life processes in plants / Physiological processes in plants

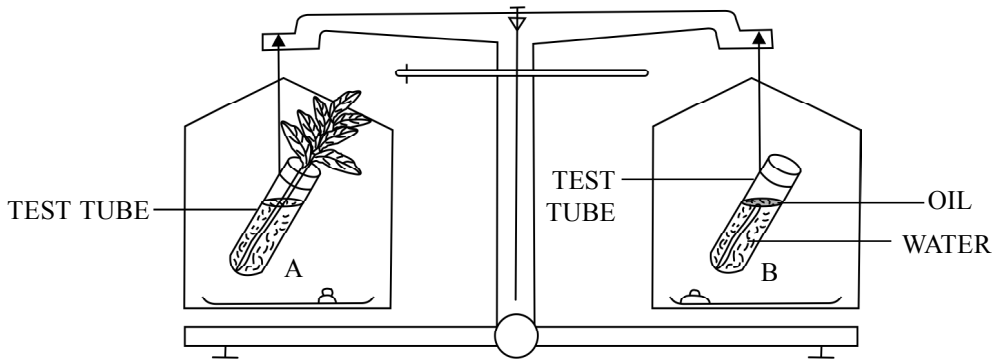
(iv) Cyton, Photon, Axon, Dendron.

Ans. *Odd* — Photon *Rest* — Parts of Neuron / Nerve cell.

(v) Oxytocin, Insulin, Prolactin, Progesterone.

Ans. *Odd* — Insulin *Rest* — Female hormones.

(e) The figure given below represents an experimental set up with a weighing machine to demonstrate a particular process in plants. The experimental set up was placed in bright sunlight. Study the diagram and answer the following questions: **[5]**



(i) Name the process intended for study.

Ans. Transpiration (in Plants)

(ii) Define the above mentioned process.

Ans. Process by which plants lose water in the form of water vapour from the aerial parts of the plant / leaves of the plant

(iii) When the weight of the test tube (A and B) is taken before and after the experiment, what is observed? Give reasons to justify your observation in A and B.

Ans. *Before* — Weights of A and B are the same .

After — 'A' becomes lighter as it loses water due to transpiration , no change in 'B' as there is no loss of water due to evaporation as the surface of water is covered with oil.

(iv) What is the purpose of keeping the test tube B in the experimental set up?

Ans. 'B' acts as a control to prove that water is lost in the form of water vapour due to transpiration from the aerial parts / leaves of the plant.

(f) Match the items given in Column A with the most appropriate ones in Column B and rewrite the correct matching pairs from Column A and Column B: **[5]**

Sl. No.	Column A		Column B
1.	Pituitary gland	a.	Testosterone
2.	Sulphur dioxide	b.	Calcium
3.	Seminiferous tubules	c.	Growth hormone
4.	Clotting of blood	d.	Acid rain
5.	Guttation	e.	Sperms
		f.	Global warming
		g.	Magnesium
		h.	Hydathodes

Ans. (1) Pituitary gland (c) Growth hormone
(2) Sulphur dioxide (d) Acid rain
(3) Seminiferous tubules (e) Sperms
(4) Clotting of blood (b) Calcium
(5) Guttation (h) Hydathodes

(g) Choose the correct answer from the options given below: **[5]**

(i) Cretinism and Myxoedema are due to:
(a) Hyper secretion of thyroxin (b) Hyper secretion of growth hormone
(c) Hyposecretion of thyroxin (d) Hyposecretion of growth hormone.
Ans. (c) Hyposecretion of thyroxine

(ii) Which of the following is not a natural reflex action ?
(a) Knee-jerk (b) Blinking of eyes due to strong light
(c) Salivation at the sight of food. (d) Sneezing when any irritant enters the nose.
Ans. (c) Salivation at the sight of food

(iii) After mitotic cell division, a female human cell will have:
(a) 44 + xx chromosome (b) 44 + xy chromosome
(c) 22 + x chromosome (d) 22 + y chromosome.
Ans. (c) 44 + XX chromosome

(iv) The antibiotic penicillin is obtained from:
(a) Protozoan (b) Bacteria (c) Virus (d) Fungus
Ans. (d) Fungus

(v) The site of maturation of human sperms is the:
(a) Seminiferous tubule (b) Interstitial cells (c) Epididymus (d) Prostate gland
Ans. (c) Epididymus

(h) State the exact location of the following: **[5]**

(i) Tricuspid valve.
Ans. Between the right auricle and the right ventricle.

(ii) Amnion.

Ans. Around the developing foetus in the uterus.

(iii) Yellow spot.

Ans. On the retina diametrically opposite the lens.

(iv) Seminal vesicle.

Ans. Just below the urinary bladder in human male.

(v) Adrenal gland.

Ans. Lies on the anterior / top of the kidney / cap like structure on the anterior part of the kidney.

SECTION II (40 Marks)

*Attempt any **four** questions from this Section*

QUESTION 2

(a) Differentiate between the following pairs on the basis of what is mentioned within brackets: **[5]**

(i) Spinal nerves and Cranial nerves (Number of nerves).

Ans. Spinal nerves — 31 pairs Cranial nerves — 12 pairs

(ii) Near vision and Distant Vision (Shape of the eye lens).

Ans. Near vision — Eye lens is too curved

Distant vision — Eye lens is too flat.

(iii) Corpus callosum and Corpus luteum (Function.)

Ans. Corpus callosum — Joins the two cerebral hemispheres.

Corpus luteum — Secretes the female hormones Oestrogen , Progesterone.

(iv) Turgor pressure and wall pressure (Explain).

Ans. Turgor pressure — Pressure exerted by the contents of a turgid cell on the cell wall of the cell.

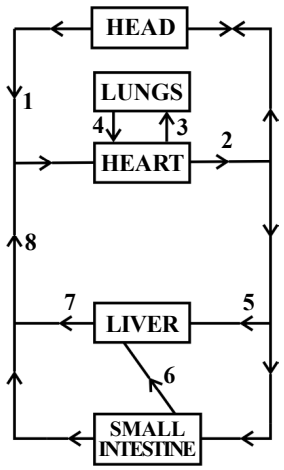
Wall Pressure — Pressure exerted by the cell wall on the contents of a cell.

(v) Disinfectant and Antiseptic (Definition).

Ans. Disinfectant — Chemical substances applied to the surroundings to destroy /kill harmful microorganisms

Antiseptic — Chemical substances applied on the surface of the body to destroy /kill harmful microorganisms

(b) The diagram below represents the simplifed pathway of the circulation of blood. Study the same and answer the questions that follow: **[5]**



(i) Name the blood vessels labelled 1 and 2.

Ans. 1. Superior / Anterior Vena Cava 2. Aorta

(ii) State the function of blood vessels labelled 5 and 8.

Ans. 5. Transports oxygenated blood to the liver.

8. Transports deoxygenated blood from the posterior regions of the body to the right auricle.

(iii) What is the importance of the blood vessel labelled 6 ?

Ans. 6. Transports the glucose (digested carbohydrates) and amino acids (digested Proteins) to the liver from the small intestine.

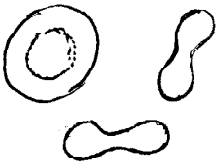
(iv) Which blood vessel will contain a high amount of glucose and amino acids after a meal ?

Ans. Hepatic Portal vein (6).

(v) Draw a diagram of the different blood cells as seen in a smear of human blood.

Ans.

White blood corpuscles

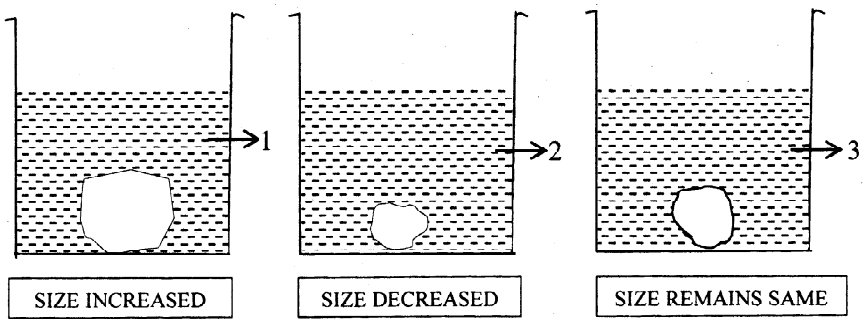


Red blood corpuscles

Thrombocytes / platelets

QUESTION 3

(a) A candidate in order to study the process of osmosis has taken 3 potato cubes and put them in 3 different beakers contaning 3 different solutions. After 24 hours, in the first beaker the potato cube increased in size, in the second beaker the potato cube decreased in size and in the third beaker there was no change in the size of the potato cube. The following diagram shows the result of the same experiment: **[5]**



(i) Give the technical terms of the solutions used in beakers, 1, 2 and 3.

Ans. 1. Hypotonic 2. Hypertonic 3. Isotonic

(ii) In beaker 3 the size of the potato cube remains the same. Explain the reason in brief.

Ans. The size of the potato remains the same as the concentration of the solution outside and inside the cells of the potato cube is the same and hence there is no movement of water molecules into or out of the cells.

(iii) Write the specific feature of the cell sap of root hairs which helps in absorption of water.

Ans. Cell sap is hypertonic

(iv) What is osmosis ?

Ans. Osmosis is the movement of water molecules from their region of higher concentration to a region of lower concentration through a semipermeable membrane . // Osmosis is the movement of water molecules from a solution of low concentration to a solution of high concentratiom through a semipermeable membrane.

(v) How does a cell wall and a cell membrane differ in their permeability ?

Ans. Cell Wall — Permeable

Cell Membrane — Semipermeable

(b) A potted plant was taken in order to prove a factor necessary for photosynthesis. The potted plant was kept in the dark for 24 hours. One of the leaves was covered with black paper in the centre. The potted plant was then placed in sunlight for a few hours. **[5]**

(i) What aspect of photosynthesis was being tested ?

Ans. To prove that sunlight is necessary for Photosynthesis.

(ii) Why was the plant placed in the dark before beginning the experiment ?

Ans. The plant was placed in the dark in order to destarch the leaves of the plant // to ensure that the leaves of the plant are free from starch.

(iii) During the starch test why was the leaf —

(1) boiled in water (2) boiled in methylated spirit.

Ans. (1) to kill the protoplasm // to release the starch grains.

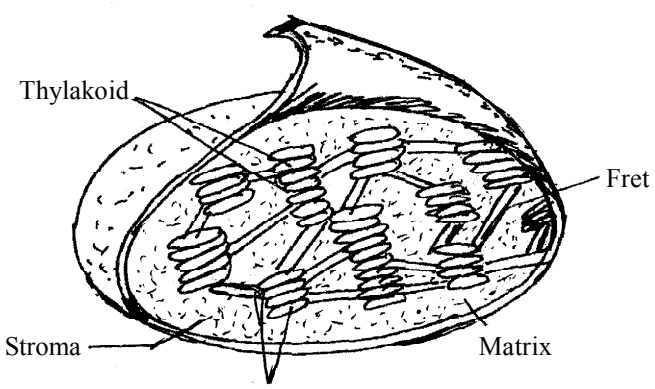
(2) to remove the chlorophyll.

(iv) Write a balanced chemical equation to represent the process of photosynthesis.

Ans. $6CO_2 + 12H_2O \xrightarrow[\text{chlorophyll}]{\text{sunlight}} C_6H_{12}O_6 + 6CO_2 + 6H_2O$

(v) Draw a neat diagram of a chloroplast and label its parts.

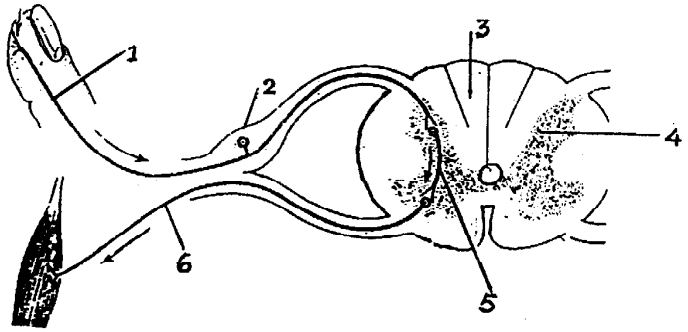
Ans.



Granum (pile of thylakoids)

QUESTION 4

(a) The diagram given below is a representation of a certain phenomenon pertaining to the nervous system. Study the diagram and answer the following questions: **[5]**



(i) Name the phenomenon that is being depicted.

Ans. Reflex action

(ii) Give the technical term for the point of contact between the two nerve cells.

Ans. Synapse

(iii) Name the parts 1, 2, 3 and 4.

Ans. 1. Axon of sensory neuron / Afferent / Sensory nerve fibre
2. Dorsal root ganglion
3. White matter
4. Gray matter

(iv) Write the functions of the parts 5 and 6.

Ans. 5. Transmits the message from the sensory neuron to the motor neuron.
6. Sends the message to the effector organ to respond to the stimulus.

(v) How does the arrangement of neurons in the spinal cord differ from that of the brain ?

Ans. Spinal cord — Gray matter (cyton portion) inside white matter (axon portion) outside.
Brain — Gray matter (cyton portion) outside white matter (axon portion) inside.

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

(i) Use of C.F.C. is banned in many countries.

Ans. Use of C.F.C is banned in many countries as it breaks down to Chlorine atoms which in turn breaks down or thins the ozone layer, thereby permitting the entry of harmful UV rays into the earth, causing sunburn/genetic disorders/skin cancer/affecting the productivity of forests and sea.

(ii) We cannot distinguish colours in moonlight.

Ans. Colours cannot be distinguished in moonlight because only the rods function in moonlight and not the cones.

(iii) Balsam plants wilt during midday even if the soil is well watered.

Ans. Balsam plants wilt during midday even if the soil is well watered as the rate of transpiration is greater than the rate of absorption , by wilting they try to reduce the surface area and thereby the rate of transpiration.

(iv) Carbon monoxide is highly dangerous when inhaled.

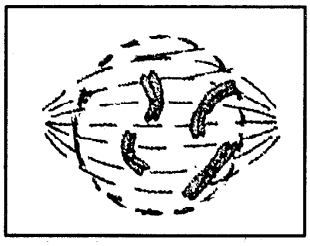
Ans. Carbon monoxide is highly dangerous when inhaled as haemoglobin has a great affinity for Carbon monoxide which is poisonous forming a stable compound carboxyhaemoglobin, which reduces the Oxygen carrying capacity of blood resulting in death.

(v) A person after consuming alcohol walks clumsily.

Ans. Alcohol affects the cerebellum and the person is unable to control and coordinate muscular activities resulting in the person walking clumsily.

QUESTION 5

(a) Given below is a diagram representing a stage during mitotic cell division. Study it carefully and answer the questions that follow : **[5]**



(i) Is it a plant cell or an animal cell ? Give a reason to support your answer.

Ans. A plant cell , as the asters are absent.

(ii) Identify the stage shown.

Ans. Late Prophase.

(iii) Name the stage that follows the one shown here. How is that stage identified ?

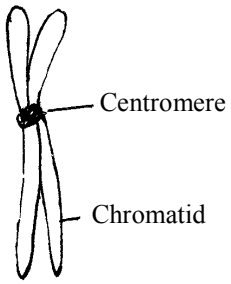
Ans. Metaphase. The duplicated chromosomes align/line themselves on the equatorial plane of the spindle.

(iv) How will you differentiate between mitosis and meiosis on the basis of the chromosome number in the daughter cells ?

Ans. Mitosis — The daughter cells will have 46 chromosomes (23 pairs) — Diploid.
Meiosis — The daughter cells will have 23 chromosomes — Haploid.

(v) Draw a duplicated chromosome and label its parts.

Ans.



(b) (i) Name the disease for which the following types of vaccines are given:

(1) Salk's Vaccine.

(2) B.C.G.

Ans. (1) Salk's vaccine — Poliomyelitis.
(2) B.C.G — Tuberculosis.

(ii) Given one example of each of the following:

(1) A water pollutant

(2) An aquatic plant used in the lab to demonstrate O_2 liberation during photosynthesis.

(3) An antibiotic.

(4) A nitrogenous base in DNA.

Ans. (1) Household detergents / Industrial waste/ Sewage / Oil spills …….
(2) Elodea/Hydrilla.
(3) Pencillin/Streptomycin/Amoxilline ……
(4) Adenine/Cytosine/Thymine/Guanine.

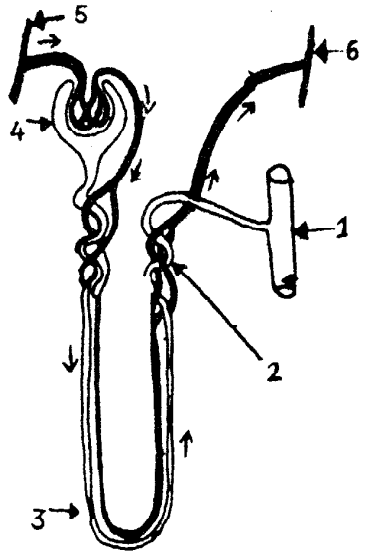
(iii) Expand the following biological abbreviations:

(1) ATP (2) TSH (3) DPT (4) DNA

Ans. (1) ATP — Adenosine Triphosphate.
(2) TSH — Thyroid Stimulating Hormone .
(3) DPT — Diphtheria, Pertussis and Tetanus .
(4) DNA — Deoxyribonucleic acid .

QUESTION 6

(a) The given diagram represents a nephron and its blood supply. Study the diagram and answer the following questions: **[5]**



(i) Label parts 1, 2, 3 and 4.

Ans. 1. Collecting duct 2. Distal convulated tubule 3. Loop of Henle 4. Bowman's capsule

(ii) State the reason for the high hydrostatic pressure in the glomerulus.

Ans. Due to the difference in the diameter of the afferent and efferent arteriole.

(iii) Name the blood vessel which contains the least amount of urea in this diagrams.

Ans. Renal vein — Part 6.

(iv) Name the two main stages of urine formation.

Ans. Ultrafiltration and Reabsorption.

(v) Name the part of the nephron which lies in the renal medulla.

Ans. Loop of Henle.

(b) Briefly explain the following terms: **[5]**

(i) Monohybrid cross.

Ans. *Monohybrid cross* — A cross between two plants taking into consideration only. One feature /characteristic at a time.

(ii) Biomedical waste.

Ans. *Biomedical waste* — Medical waste like needles, syringes, stained dressings, discarded medical tablets, Powders, biological research material thrown in the municipal garbage — which are harmful.

(iii) Innate immunity.

Ans. *Innate immunity* — Also called natural immunity is the inborn resistance to disease/due to genetic constitutional make up, without external stimulation or due to a previous infection.

(iv) Diapedesis.

Ans. *Diapedesis* — Movement of WBC's (Monocytes or neutrophils) through the walls of the capillaries to fight against harmful microorganisms in the body.

(v) Hormones.

Ans. *Hormones* — Hormones are chemical substances produced by specific cells or glands in the body, poured directly into the blood stream and carried to target organs or cells, specific in function, bringing about coordinatiom between the distant parts of the body.

QUESTION 7

(a) (i) State any two harmful effects of noise pollution on human health. **[5]**

Ans. Interrupts concentration of thought // Damages ear drum leading to deafness at times // Lowers efficiency of work // Disturbs sleep // Affects patients // Interferes in communication …….

(ii) Categorize the following activities as per the functions of the Red Cross Society and the WHO:

(1) To suggest quarantine measures to prevent spread of disease.

(2) Humanitarian services to victims of war.

(3) To educate people in accident prevention.

(4) To promote projects for research on disease.

Ans. (1) WHO (2) Red Cross Society (3) Red Cross Society (4) WHO

(iii) Write any two major reasons for the population explosion in India.

Ans. Illiteracy — ignorance and superstition, poor knowledge of the working of the reproductive system // Traditional belief that children are a gift from GOD// Economic reasons, more hands more income // Desire for a male child to continue the name of the family // Lack of recreation due to low standard of living. As a result physical sex is the only form of recreation // Most people do not believe in family planning due to religious and social customs ……. (Any two).

(iv) State Mendel's Law of segregation.

Ans. During the formation of gametes , the two members of a pair of factors separate independent of the other .

(b) Give technical terms for the following: **[5]**

(i) A method of contraception in which the sperm duct is cut and ligated.

Ans. Vasectomy

(ii) Statistical study of human population.

Ans. Demography

(iii) The protective covering of the heart.

Ans. Pericardium

(iv) A sudden heritable change in the gene.

Ans. Mutation

(v) Repeated units of DNA molecule.

Ans. Gene

(vi) The fluid portion of blood.

Ans. Plasma

(vii) The nerve that transmits impulses from the ear to the brain.

Ans. Auditory nerve

(viii) Group of hormones which influence other endocrine glands to produce hormones.

Ans. Tropic hormones

(ix) Thin walled sac of skin that covers the testes.

Ans. Scrotum

(x) The permanent stoppage of the menstrual cycle in a woman aged 50 years.

Ans. Menopause