SCIENCE
Solved Paper-3 (Biology), 2018
(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 organization which procures and supplies blood during an emergency
Ans. Red Cross

(ii) The blood vessel which supplies blood to the liver
Ans. Hepatic artery

(iii) The number of chromosomes present in a nerve cell of a human being .
Ans. 46 /23 pairs

(iv) The layer of the eyeball that forms the transparent Cornea
Ans. Sclera/Sclerotic layer.

(v) The wax like layer on the epidermis of leaves which reduces transpiration .
Ans. Cuticle

(b) Choose the correct answer from each of the four options given below : **[5]**

(i) The number of spinal nerves in a human being are
(a) 31 pairs (b) 10 pairs
(c) 21 pairs (d) 30 pairs
Ans. (a) 31 pairs

(ii) Which one of the following is non-biodegradable ?
(a) DDT (b) Vegetable peel
(c) Cardboard (d) Bark of trees
Ans. (a) DDT

(iii) Aqueous humour is present between the
(a) Lens and Retina (b) Iris and Lens
(c) Cornea and Iris (d) Cornea and Lens
Ans. (d) Cornea and Lens

(iv) A strong chemical substance which is used on objects and surfaces in our surroundings to kill germs
(a) Cresol (b) Carbolic acid
(c) Iodine (d) Mercurochrome
Ans. (a) Cresol

(v) Which one of the following is a Greenhouse gas ?
(a) Oxygen (b) Methane
(c) Sulphur dioxide (d) Nitrogen
Ans. (b) Methane

(c) Complete the following paragraph by filling in the blanks (i) to (v) with appropriate words ; **[5]**

To test a leaf for starch, the leaf is boiled in water to (i) ..... . It is then boiled in Methylated spirit to (ii) ..... . The leaf is dipped in warm water to soften it. It is placed in a petri dish, and (iii) ..... solution is added. The region of the leaf which contains starch , turns (iv) ..... and the region which does not contain starch, turns (v) ..... .

Ans. (i) Kill the cells, (ii) remove chlorophyll/decolorize the leaf /remove green pigment, (iii) Iodine, (iv) bluish black /deep blue / black, (v) brown /yellowish brown /golden brown.

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

Column A	**Column B**
(i) Cretinism	(a) Hyposecretion of adrenal cortex
(ii) Diabetes insipidus	(b) Hyposecretion of thyroxine
(iii) Exophthalmic goitre	(c) Hyposecretion of growth hormone
(iv) Adrenal virilism	(d) Hyposecretion of vasopressin
(v) Dwarfism	(e) Hyposecretion of growth hormone
	(f) Hyposecretion of thyroxine

Ans. (i) (b) Hyposecretion of thyroxine
(ii) (d) Hyposecretion of vasopressin
(iii) (f) Hyposecretion of thyroxine
(iv) (a) Hyposecretion of adrenal cortex
(v) (c) Hyposecretion of growth hormone

(e) Correct the following statements by changing the underlined words : **[5]**

(i) Normal pale colour of the urine is due to the presence of the pigment <u>Melanin</u>
Ans. Urochrome

(ii) The outermost layer of Meninges is <u>Pia mater</u>
Ans. Dura mater

(iii) The cell sap of root hair is <u>Hypotonic</u>
Ans. Hypertonic

(iv) <u>Xylem</u> transports starch from the leaves to all parts of the plant body
Ans. Phloem

(v) <u>Nitrogen</u> bonds are present between the complementary nitrogenous bases of DNA.
Ans. Hydrogen

(f) Choose between the two options to answer the question specified in the brackets for the following :
An example is illustrated below .
Example : Corolla or Calyx (Which is the outer whorl ?) **Answer** Calyx **[5]**

(i) Blood in the renal artery or renal vein (Which one has more urea?)
Ans. Renal artery

(ii) Perilymph or endolymph (Which one surrounds the organ of Corti ?)
Ans. Endolymph

(iii) Lenticels or Stomata (Which one remains open always ?)
Ans. Lenticels

(iv) Sclerotic layer or choroid layer (Which one forms the Iris?)
Ans. Choroid

(v) Blood in the pulmonary artery or pulmonary vein (Which one contains less oxyhaemoglobin ?)
Ans. Pulmonary artery

(g) Given alongside is a representation of a type of pollution. Study the picture and answer the questions : **[5]**

(i) Name the type of pollution shown in the picture .
Ans. Air pollution

(ii) Name one source of this pollution
Ans. Petrol/Diesel vehicles, Factories,
Burning of waste etc. ..... (*any one*)

(iii) How does this pollution affect human health ?
Ans. Respiratory problems, Nausea, etc. ..... (*any one*)

(iv) Write one measure to reduce this pollution
Ans. Use of CNG as fuel in vehicles, Factories to be out of city limits, huge chimneys in factories, etc. ..... (*any one*)

(v) State one gaseous compound that leads to the depletion of the ozone layer and creates 'Ozone holes'
Ans. Chloro fluoro carbon /CFC, aerosol sprays, Styrofoam ..... (*any one*)

(h) Choose the **ODD** one out from the following terms given and name the **CATEGORY** to which the others belong :

Example : Nose, Tongue, Arm, Eye

Answer : **Odd** Term — Arm, **Category** — Sense organs **[5]**

(i) Detergents, X-rays, sewage, oil spills.
Ans. Odd Term — X-rays **Category** — Water pollutants

(ii) Lumen, muscular tissue, connective tissue, pericardium.
Ans. Odd Term — Pericardium **Category** — parts of blood vessels

(iii) Dendrites, Medullary sheath, Axon, Spinal cord.
Ans. Odd Term — Spinal cord **Category** — Parts of neuron/erve cell

(iv) Centrosome, Cell wall, Cell membrane, Large vacuoles.
Ans. Odd Term — Centrosome **Category** — parts of plant cell

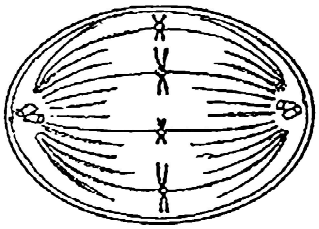
(v) Prostate gland, Cowper's gland, seminal vesicle, seminiferous tubules.
Ans. Odd Term — Seminiferous tubules **Category** — Accessory glands

SECTION II (40 Marks)

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

QUESTION 2

(a) The diagram given below represents a stage during cell division. Study the same and answer the questions that follow : **[5]**



(i) Identify whether it is a plant cell or an animal cell.
Give a reason to support your answer.
Ans. Plant cell, Cell wall present or animal cell, asters present.

(ii) Name the stage depicted in the digram. What is the unique feature observed in this stage ?
Ans. Metaphase, duplicated chromosomes lie on the equatorial plane of the spindle .

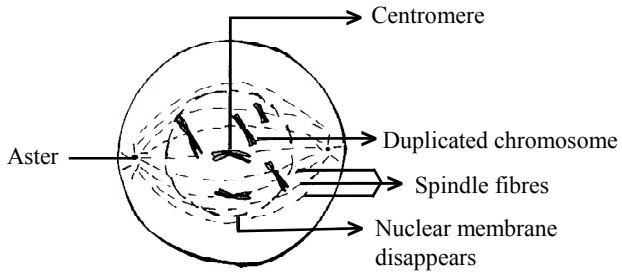
(iii) Name the type of cell division that occurs during:
1. Replacement of old leaves by new ones. 2. Formation of gametes.
Ans. 1. Mitosis 2. Meiosis

(iv) What is the stage that comes before the stage shown in the diagram ?

Ans. Prophase

(v) Draw a neat, labelled diagram of the stage mentioned in (iv) above keeping the chromosome number constant.

Ans.



(b) Mention the exact location of the following : **[5]**

(i) Epididymis.

Ans. On top of testis

(ii) Lacrimal gland.

Ans. Upper sideward portion of the orbit of the eye

(iii) Malleus.

Ans. In the middle ear in contact with/ touching tympanum /eardrum

(iv) Hydathodes.

Ans. Margin of leaves

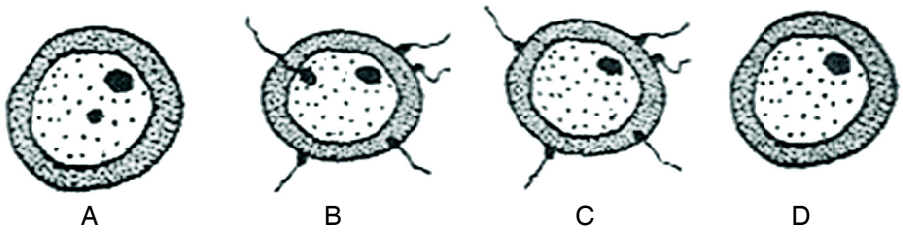
(v) Pulmonary semilunar valve.

Ans. Base of pulmonary artery

QUESTION 3

(a) Given below are diagrams showing the different stages in the process of fertilisation of an egg in the female reproductive tract :

Study the diagrams and answer the questions : **[5]**



(i) Arrange the letters given below each diagram in a logical sequenceto show the correct order in the process of fertilisation.

Ans. DCBA

(ii) Where does fertilisation normally take place ? What is 'implantation' that follows fertilisation?

Ans. Oviduct/Fallopian tube

The fixing of the blastocyst / zygote to the uterine wall.

(iii) Mention the chromosome number of the egg and zygote in humans

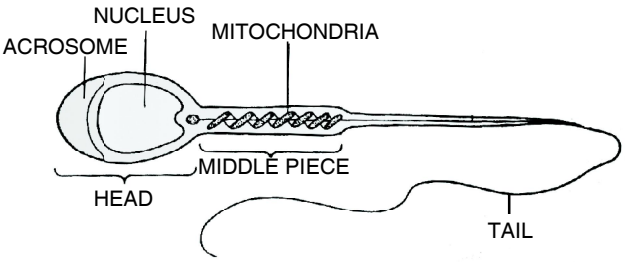
Ans. Egg — 23 Zygote — 46/23 pairs

(iv) Explain the term 'Gestation'. How long does gestation last in humans ?

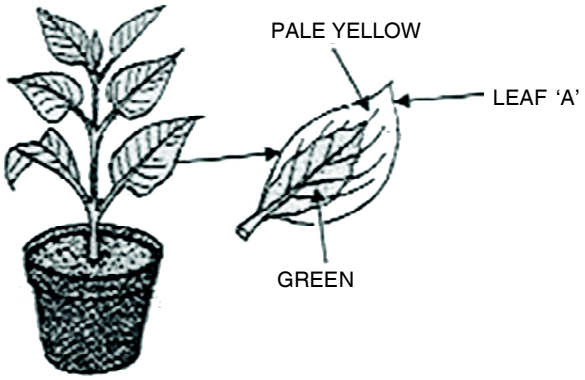
Ans. The period of full term development of the embryo/foetus in the uterus, 280 days

(v) Draw a neat labelled diagram of a mature human sperm

Ans.



(b) A potted plant with variegated leaves was taken in order to prove a factor necessary for photosynthesis. The potted plant was kept in the dark for 24 hours and then placed in bright sunlight for a few hours. Observe the diagrams and answer the questions **[5]**



(i) What aspect of photosynthesis is being tested in the above diagram ?

Ans. Chlorophyll is necessary for photosynthesis

(ii) Represent the process of photosynthesis in the form of a balanced equation

Ans. $6CO_2 + 12H_2O \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} C_6H_{12}O_6 + 6H_2O + 6O_2$

(iii) Why was the plant kept in the dark before beginning the experiment ?

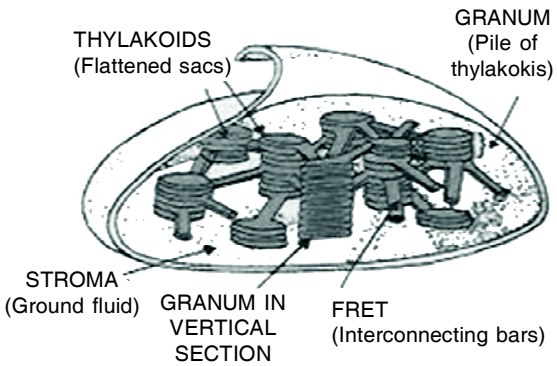
Ans. To ensure that the leaves are free from starch. (Plant is free from starch = 0)

(iv) What will be the result of the test performed on leaf 'A' shown in the diagram ? Give an example of a plant with variegated leaves.

Ans. Pale yellow region turns golden brown,
Green region turns bluish black/black/deep blue
Egs Croton, Geranium etc. (*any one*).

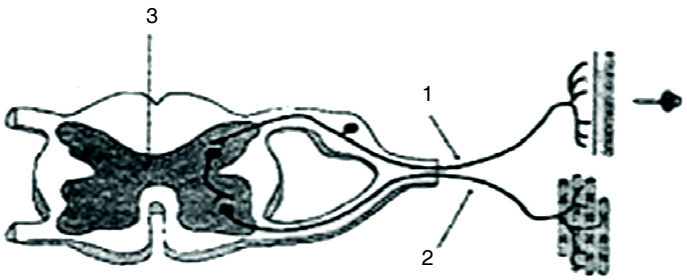
(v) Draw a neat labelled diagram of a chloroplast.

Ans.



QUESTION 4

(a) The diagram given alongside shows the internal structure of a spinal cord depicting a phenomena. Study the diagram and answer the questions : **[5]**



(i) Name the phenomenon that is depicted in the diagram. Define the phenomenon.
Ans. Reflex Action. It is a involuntary, Spontaneous/immediate /quick response to a stimulus.

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

(iii) Name the parts numbered 1, 2 and 3
Ans. 1. Sensory nerve 2. Motor nerve 3. Neural canal/Gray matter

(iv) How does the arrangement of neurons in the spinal cord differ from that of the brain ?
Ans. Spinal cord — Gray matter/Cytons inside, white matter/axons outside
Brain — Gray matter/Cytons outside, white matter/axons inside

(v) Mention two ways by which the spinal cord is protected inour body.
Ans. Meninges cover it, lies in the vertebral column.

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

(i) Process of maintaining water and salt balance in the body .
Ans. Homeostasis

(ii) Hormones which regulate the secretion of other endocrine glands.
Ans. Tropic hormones

(iii) Movement of molecules of a substance from their higher concentration to lower concentration when they are in direct contact.
Ans. Diffusion

(iv) The condition in which a pair of chromosomes carry similar alleles of a particular character.
Ans. Homozygous chromosomes

(v) The complex consisting of a DNA strand and a core of histones.
Ans. Nucleosome

(vi) The onset of menstruation in a young girl.
Ans. Menarche

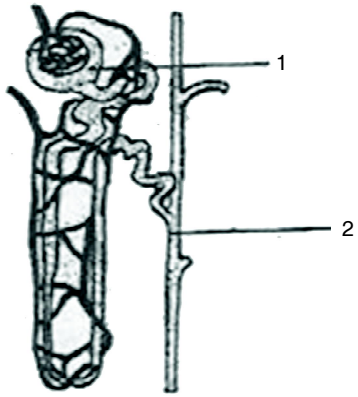
(vii) Squeezing out of white blood cells from the capillaries into the surrounding tissues .
Ans. Diapedesis.

(viii) The fluid which surrounds the foetus .
Ans. Amniotic fluid .

(ix) The relaxation phase of the heart .
Ans. Diastole

(x) The difference between the birth rate and the death rate.
Ans. Growth rate

QUESTION 5



(a) The diagram given below is that of a structure present in a human kidney. Study the same and answer the questions that follow : **[5]**

(i) Name the structure represented in the diagram.

Ans. Nephron/Uriniferous tubule /renal tubule /kidney tubule.

(ii) What is the liquid entering part '1' called ? Name two substances present in this liquid that are reabsorbed in the tubule.

Ans. Glomerular filtrate, Glucose, water, salts, sodium ions, chloride ions (*any two*)

(iii) What is the fluid that comes to part '2' called ? Name the main nitrogenous waste in it.

Ans. Urine, Urea

(iv) Mention the three main steps involved in the formation of the fluid mentioned in (iii) above.

Ans. Glomerular filtration, Reabsortion and Tubular secretion.

(v) Name the substance which may be present in the fluid in part '2' if a person suffers from Diabetes mellitus.

Ans. Glucose/Sugar.

(b) Differentiate between the following pairs on the basis of what is indicated in the brackets : **[5]**

(i) Leaf and Liver (form in which glucose is stored)

Ans. Leaf — Starch Liver — Glycogen

(ii) ATP and AIDS (expand the abbreviation)

Ans. ATP — Adenosine tri phosphate AIDS — Acquired immuno deficiency syndrome

(iii) Testosterone and Oestrogen (organ which secretes)

Ans. Testosterone — Testes Oestrogen — Ovary

(iv) Ureter and Urethra (Functions)

Ans. Ureter — Transfers urine from Kidney to Urinary bladder.

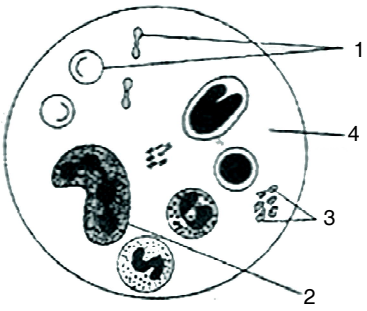
Urethra — Transfers urine from urinary bladder to outside of the body.

(v) Hypotonic solution and Hypertonic solution (condition of a plant cell when placed in them)

Ans. Hypotonic — Deplasmolysed Hypertonic — Plasmolysed
Turgid Flaccid

QUESTION 6

(a) Given below is a diagram of a human blood smear. Study the diagram and answer the questions that follow : **[5]**



(i) Name the components numbered '1' to '4'

Ans. 1. Red blood corpuscles/erythrocytes. 2. WBC (Neutrophil) 3. Platelets 4. Plasma

(ii) Mention two structural differences between the parts '1' and '2'.

Ans. RBC — Biconcave discs WBC — Amoeboid/Irregular in shape
Non nucleated Nucleated

(iii) Name the soluble protein found in part '4' which forms insoluble threads during clotting of blood

Ans. Fibrinogen

(iv) What is the average life span of the component numbered '1'?

Ans. 120 days.

(v) Component numbered '1' do not have certain organelles but are very efficient in their function. Explain.

Ans. RBCs transport oxygen to the cells of the body, hence they do not have mitochondria making them more efficient. They lack a nucleus which enables them to squeeze through and move easily through narrow vessels like capillaries.

(b) Give **biological** explanations for the following : **[5]**

(i) Education is very important for population control.

Ans. If people are literate they will understand the benefits of having a small family, the superstitious and traditional beliefs that a son is essential can be overcome through education, they will be able to realize the importance of spacing and limiting the number of children in the family, they will be more aware and adopt family planning measures.

(ii) The placenta is an important structure for the development of a foetus.

Ans. The placenta connects the mother and the growing foetus, it is through the placenta that the foetus receives its nutrition, and sends out the nitrogenous wastes, exchange of respiratory gases is enabled because of the placenta.

(iii) All the food chains begin with green plants.

Ans. Green plants form the base of the food chain, as animals depend on plants for food which is possible because of photosynthesis, primary consumers (herbivores) are directly dependent on plants, these in turn are fed on by secondary consumers (carnivores) which in turn are fed on by tertiary consumers.

(iv) Plants growing in fertilised soil are often found to wilt if the soil is not adequately watered.

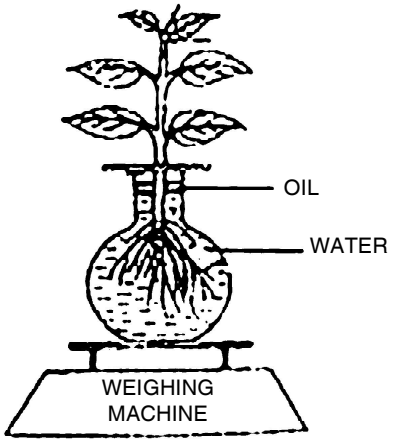
Ans. Fertilisers lead to the soil becoming hypertonic leading to exosmosis taking place and the cells losing their water content , as a result the cells become flaccid and the plant wilts.

(v) We should not put sharp objects into our ears.

Ans. Sharp objects can damage the tympanum / eardrum, which will lead to hearing being affected

QUESTION 7

(a) The diagram below represents a process in plants.The set up was placed in bright sunlight. Answer the following questions : **[5]**



(i) Name the physiological process depicted in the diagram. Why was oil added to the water ?

Ans. Transpiration. Oil was added to the water to ensure that water is not lost by evaporation from the surface of water.

(ii) When placed in bright sunlight for four hours, what do you observe with regard to the initial and final weight of the plant ? Give a suitable reason for your answer.

Ans. The weight will decrease, this is because the plant loses water due to transpiration.

(iii) What happens to the level of water when this setup is placed in :

1. Humid conditions ? 2. Windy conditions ?

Ans. 1. Slight or no drop in level 2. Drop in level of water in the jar as rate of transpiration increases.

(iv) Mention any three adaptations found in plants to overcome the process mentioned in '1'

Ans. Leaves reduced in size, Leaves modified to spines, Thickened cuticle, Reduced number of stomata, Sunken stomata (*any three*).

(v) Explain the term 'Guttation'.

Ans. Loss of water in the form of droplets from the margin of leaves / or through hydathodes.

(b) A pea plant which is homozygous for green pods which are inflated (GGII) is crossed with a homozygous plant for yellow pod which are constricted (ggii). Answer the following questions : **[5]**

(i) Give the phenotype and genotype of the F_1 generation.

Ans. Phenotype — All plants with pods that are green and inflated; Genotype — GgIi.

(ii) Write the phenotypic ratio of the F_2 generation.

Ans. 9 : 3 : 3 : 1

(iii) Write the possible combinations of the gametes that can be obtained if two F_1 hybrid plants are crossed .

Ans. GI, Gi, gI, gi

(iv) State Mendel's law of Segretation of Gametes'.

Ans. During a cross the two members of a pair of factors separate during the formation of gametes.

(v) What is the scientific name of the plant which Mendel used for his experiments on inheritance ?

Ans. *Pisum sativum*