

# ISC Solved Paper 2018

## Biology

### Class-XII

(Maximum Marks : 70)

(Time allowed : Three hours)

This paper comprises **TWO PARTS** – Part I and Part II.

Answer **all** questions.

Part I contains **one** question of 20 marks having four subparts.

Part II consists of Sections A, B and C.

Section A contains **seven** questions of **two** marks each

Section B contains **seven** questions of **three** marks each, and

Section C contains **three** questions of **five** marks each.

**Internal choices have been provided in two questions in Section A, two questions in Section B and in all three questions of Section C.**

#### PART- I

[20 Marks]

Answer **all** questions.

1. (a) Answer the following questions briefly and to the point: [8 × 1]
- \* (i) Give a significant point of difference between *Oestrous and Menstrual cycle*.
- (ii) Give the biological name of the organism causing typhoid.
- \* (iii) If the haploid number of chromosomes in a plant species is 20, how many chromosomes will be present in the cells of the shoot tip?
- \* (iv) Name a plant which flowers every twelve years.
- (v) Name the diagnostic test for AIDS.
- \* (vi) Name the terminal stage of ageing in the life cycle of plants.
- (vii) Which organisms constitute the last trophic level?
- \* (viii) What is *emasculation*?
- Ans. (ii) The organism causing typhoid is *Salmonella typhi*.
- (v) The diagnostic test for AIDS is ELISA – Enzyme-linked immunosorbent assay.
- (vii) Decomposers are the organisms which constitute the last trophic level.
- (b) Each of the following questions has four choices. Choose the best option in each case: [4 × 1]
- (i) Length of the DNA with 23 base pairs is:  
(1) 78.4  
78.2 Å  
(3) 78 Å  
(4) 74.8 Å
- (ii) Opium is obtained from:  
(1) *Papaver somniferum*  
(2) *Cannabis sativa*  
(3) *Erythroxylum coca*  
(4) *Datura metel*
- (iii) According to Abiogenesis, life originated from:  
(1) Non-living matter  
(2) Pre-existing life  
(3) Oxygen  
(4) Extra-terrestrial matter
- (iv) The largest unit in which gene flow is possible is:  
(1) Organism  
(2) Population  
(3) Species  
(4) Genes
- Ans. (i) (2) 78.2 Å  
(ii) (1) *Papaver somniferum*  
(iii) (1) Non-living matter  
(iv) (2) Population

(c) Give one significant contribution of each of the following scientists: [4 × 1]

(i) P. Maheshwari

(ii) E. Wilson

(iii) M. S. Swaminathan

(iv) H. Boyer

Ans. (i) **P. Maheshwari:** The originator of Indian Plant embryology.

(ii) **E. Wilson** is the Father of biodiversity.

(iii) **M.S. Swaminathan:** Father of green revolution in India.

(iv) **H. Boyer :** Constructed first recombinant DNA, thus gave birth to the science of recombinant technology.

(d) Define the following: [2 × 1]

(i) Biopatent

(ii) Parthenocarp

Ans. (i) **Biopatent :** A patent is the right granted by a government to an inventor to prevent others from commercial use of his invention. When patents are granted for biological entities and

for products derived from them, these patents are called biopatents.

(ii) Parthenocarp is the natural or artificially induced production of fruit without fertilization which leads to the development of seedless fruit.

(e) Give a reason for each of the following: [2 × 1]

(i) **Pollen grains of wind pollinated flowers are produced in large quantities.**

(ii) **Equilibrium of a forest ecosystem can be disturbed by uncontrolled hunting of big predators.**

Ans. (i) In wind pollinated plants, the chances of loss of pollen grains are more due to which most of the pollen grains fail to reach the appropriate stigma. So to compensate this loss and increase the chances of pollination, the wind pollinated flowers produce large number of pollen grains.

(ii) Equilibrium of a forest can be disturbed by uncontrolled hunting of big predators as it removes a check and balance in the food chain on the population of prey previously consumed by the predators.

PART- II

[50 Marks]

SECTION - A

[14 Marks]

(Answer all questions)

2. (a) A woman with blood group O married a man with blood group AB. Show the possible blood groups of the progeny. List the alleles involved in this inheritance.

OR

(b) If the mother is a carrier of colour blindness and the father is normal, show the possible genotype and phenotype of the offspring of the next generation, with the help of a punnet square.

Ans. (a) Woman with blood group O married a man with blood group AB, hence the genotype of parents are:

Mother –  $I^O I^O$

Father –  $I^A I^B$

Using the Punnet square, the possible blood groups in the progeny are

	$I^O$	$I^O$
$I^A$	$I^A I^O$	$I^A I^O$
$I^B$	$I^B I^O$	$I^B I^O$

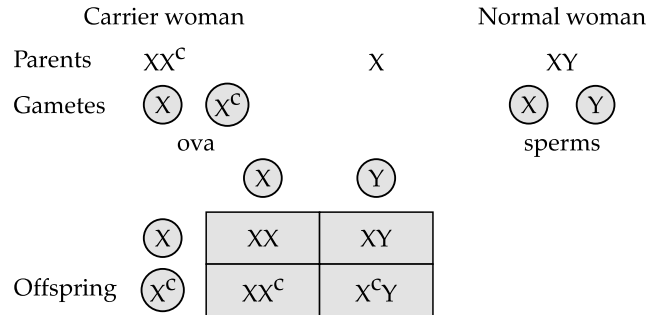
Hence, the possible genotypes are  $I^A I^O$  and  $I^B I^O$  and the possible phenotype  $I^O$  the progeny are blood group A and blood group B.

The three alleles involved in this inheritance are  $I^A$ ,  $I^B$  and  $I^O$ .

OR

(b) Colour blindness is a recessive sex-linked trait As the mother is carrier for colour blindness, the genotype must be  $XX^C$ .

The Father being normal, hence the genotype must be XY. By using Punnet square, the possible genotypes and phenotypes can be determined in the next generation.



Possible Genotypes – XX,  $XX^C$ , XY and  $X^CY$   
 Possible Phenotypes : XX – Normal daughter  
 $XX^C$  – Carrier daughter  
 XY – Normal son  
 $X^CY$  – Colour blind son

\*3. Define life span. Give the life span of an elephant. [2]

They were about 180 cm in height with large skull, broad and arched forehead, distinct chin and had elevated nose.

4. Give two characteristic features of each of the following: [2]

Their cranial capacity was about 1650 CC. It could walk and run faster and lived in families in caves.

- (a) *Ramapithecus*
- (b) Cro-Magnon man

\*5. (a) List any four effects of global warming. [2]

Ans. (a) *Ramapithecus*: It was more man-like and lived on the tree tops but also lived on the ground. Its jaws and teeth were like these of humans. They walked erect on their wind Feet.

OR

(b) State any four measures to control noise pollution. [2]

(b) Cro-Magnon Man:

\*6. Define BOD. What is its significance in an aquatic ecosystem?

7. Give one significant difference between each of the following pairs:

- (a) Humoral immunity and cell mediated immunity.
- (b) Benign tumour and malignant tumour.

Humoral Immunity	Cell Mediated Immunity
(i) It consists of B-lymphocytes which produce the antibodies that circulate in the body fluids.	(i) It consists of T-lymphocytes which produce normally four types of T-Cells
(ii) It defends the body against viruses and bacteria.	(ii) It defends the body against all pathogens including fungi and protozoa

(Any one)

(b)

Benign Tumor	Malignant Tumor
(i) It remains confined to the affected organ.	(i) It spreads to the regions of the body.
(ii) The rate of growth is usually slow.	(ii) The rate of growth is usually rapid.

(Any one)

8. Give four causes of infertility in males.

(ii) **Oligospermia** – Low sperm count.

Ans. The causes of infertility in males are :

(iii) **Impotency** – Failure of erection.

- (i) **Cryptorchidism** – it is a condition in which the testes are unable to descend from the abdomen in the scrotum.

(iv) **Asthenospermia** – Decreased motility of sperm.

SECTION - B

[21 Marks]

(Answer all questions)

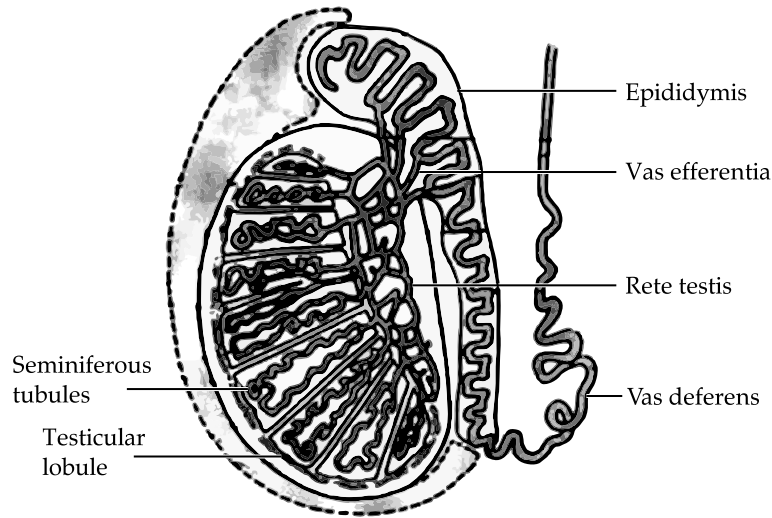
9. (a) Draw a labelled diagram of L.S. of human testis. [3]

OR

(b) Draw a labelled diagram of the mature embryo sac of angiosperms. [3]

Ans.

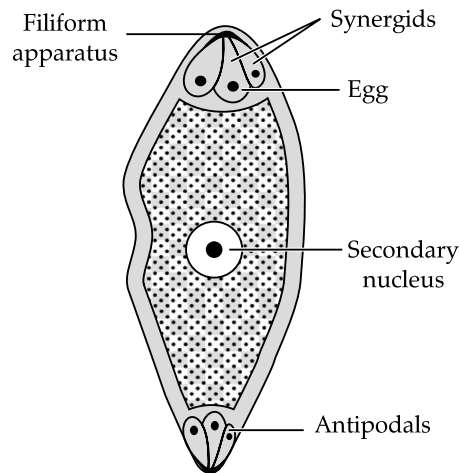
(a)



L.S. of Testis

OR

(b)



Mature Embryo Sac Angiosperm

10. Explain gene therapy, with reference to treatment of SCID. [3]

Ans. Gene therapy is the technique of genetic engineering to replace a faulty gene by a normal functional gene to treat genetic diseases SCID is severe com-

bined immune deficiency caused due to defect in the gene for the enzyme adenosine deaminase (ADA). This disorders is caused due to the deletion of gene for ADA. The enzyme is crucial for immune system to work properly.

As a first step to wards gene therapy, lymphocytes are extracted from the bone marrow of the patient and are grown in a culture outside the body.

A functional ADA cDNA (using a retroviral vector) is then introduced into these lymphocytes, which are re-injected into the patients bone marrow. But,

as these cells are not immortal, the patient requires periodic infusion of such genetically engineered lymphocytes.

However, if the isolated gene from bone marrow cells producing ADA is introduced into cells at early embryonic stages, it could be a permanent cure

11. Study the table given below. Do not copy the table, but write the answers in the correct order.

Scientific Name	Commercial Product	Use
(a) _____	Streptokinase	(b) _____
<i>Monascus purpureus</i>	(c) _____	(d) _____
(e) _____	Lactic acid	(f) _____

Ans. (a) *Streptococcus* (b) Clot buster.  
 (c) Statins (d) Lowering blood cholesterol.  
 (e) *Lactobacillus sps* (f) Lactic acid is used as a food preservative, curing agent, and flavouring agent.

12. Explain industrial melanism. [3]

Ans. Industrial melanism is an adaptation where the moths living in the industrial areas developed melanism pigments to match their body to the tree trunks. The occurrence of industrial melanism is closely associated with the progress of the industrial revolution in Great Britain, during the nineteenth century.

Before the industrial revolution, peppered moth (*Biston betularia*) existed in two strains : light coloured (white) and melanic (black). The bark of trees was covered by which lichens, so white moths escaped unnoticed from predatory birds, on the contrary, the black coloured were conspicuous and were easy victims for the predatory birds, hence they were rare.

After industrialisation, the bark got covered by smoke, so the white moths were selectively picked up by birds. But black moths escaped unnoticed so they managed to survive resulting in more population of black moths and less population of white moths.

Thus, industrial melanism supports evolution by natural selection.

13. Describe the tissue culture technique in plants. [3]

Ans. Following are the steps involved in tissue culture techniques in plants:

- (i) Proper explants is excised from the plant which may be a cell, tissue or a piece of plant organ. After surface sterilization of the explants by disinfectants it is transferred (inoculated) into a suitable nutrient medium.
- (ii) The culture is grown in tissue culture room having appropriate physical condition, temperature and humidity.
- (iii) Callus, an organized mass of cells is produced due to growth of the explants. It develops due to proliferation of cells from explants because of mitosis.
- (iv) Growth hormones like auxins and cytokinins in proper proportion are provided to the callus to induce formation of organs (organogenesis). Usually, an excess of auxin promotes root culture where as that of cytokinin promotes shoot culture. The tissue or cell multiplies and then form plantlets.
- (v) Next step is hardening by which the plantlets are gradually exposed to environmental conditions. After hardening the plantlets are transferred to field conditions.

14. Define the following: [3]

(a) Spermiogenesis

(b) **Reproductive health**

(c) **Amenorrhea**

**Ans. (a) Spermiogenesis:** The transformation of immature spermatids into mature spermatozoa is called spermiogenesis.

(b) **Reproductive health** means a total well-being in physical, emotional, social and behavioural aspects in reproduction.

(c) **Amenorrhea** is the absence of menstrual cycle in a female of a reproductive age.

15. (a) **Define the following:** [3]

(i) **Hotspots**

(ii) **Ramsar Sites**

(iii) **Red data book**

OR

(b) **Define the following:** [3]

(i) **Biodiversity**

\***(ii) Eutrophication**

**(iii) PAR**

**Ans. (a) (i)** A hotspot is a geographic region that is both a significant reservoir of biodiversity and is threatened with destruction. It is an area of high endemism and high level of species richness.

**(ii) Ramsar Sites :** It is a wetland site designated of international importance under the Ramsar Convention, an inter-governmental environmental treaty established in 1971 by UNESCO and came into Force in 1975.

**(iii) The Red Data book** maintained by IUCN is created for the recordings of endangered and rare species of plants, animals, fungi as well as some local sub-species that exist within the territory of the state or country.

OR

**(b) (i)** Biodiversity is the occurrence of different types of ecosystems, different species of organisms with the whole range of their variant and genes adapted to different climates, environments along with their interactions and processes.

OR

Biodiversity refers to the sum total of diversity that exists at all levels of biological organization.

**(iii)** PAR is photosynthetically active radiation. The part of visible spectrum of light that contributes most to the process of photosynthesis is PAR.

<b>SECTION - C</b>	<b>[15 Marks]</b>
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*(Answer all questions)*

16. (a) **Describe post transcriptional processing of RNA in eukaryotes.** [5]

OR

(b) **Describe Avery, McLeod and McCarty's experiment. State its significance.** [5]

**Ans. (a)** Primary transcript is often larger than the functional RNA. This primary transcript is called heterogeneous nuclear RNA or hn RNA and is converted into functional mRNA after post-transcriptional processing which involves 3 steps.

**(i) Modification of 5' end by capping:** Capping at 5' end occurs rapidly after the start of transcription. An unusual nucleotide i.e. methyl guanosine triphosphate is added to the 5'-end of hnRNA. It is catalysed by guanyl transferase. Cap is essential for formation mRNA-ribosome complex. Translation is not possible if cap is lacking because cap is identified by 18S-rRNA of ribosome unit.

**(ii) Tailing and Splicing:** Tailing is the addition a poly(A) tail is added to an RNA at the end of transcription. The poly(A) tail consists of multiple adenosine monophosphates; on newly formed hn RNA with the help of poly (A) polymerase. Splicing is the process of removal of introns and joining of exons in a defined order. Introns are removed by small nuclear RNA (SnRNA) and protein complex called small nuclear ribonucleo proteins or snRNP (Snurps).

**(iii)** The fully processed hn RNA is now called mRNA and it is transported out of the nucleus for translation.

OR

**(b)** The transformation experiments, conducted by Griffith in 1928 helped in establishing the nature of genetic material. He performed series of experiments by selecting two strains of

bacterium *Streptococcus pneumonia* namely S and R.

- (i) S- strain/smooth or capsulated type have a mucous (polysaccharide) coat and produce smooth colonies, these are virulent and cause pneumonia.
- (ii) R strain/rough or non-capsulated type have no mucous coat and produce rough colonies. These are non-virulent and do not cause pneumonia.

**The experiment can be described in following 4 steps:**

- (a) S strain → injected into mice → Mice die
- (b) R strain → injected into mice → Mice live
- (c) S strain (heat killed) injected into mice → Mice live
- (d) S strain (heat killed) + R –strain (live) → injected into mice → Mice die

Griffith concluded that the R- strain had somehow been transformed by the heat – killed S – strain bacteria this occurred perhaps due to absorption of same transforming principle by rough type bacteria from heat – killed smooth bacteria. It had enabled the R – strain to synthesize a smooth polysaccharide coat and become virulent. However, the biochemical nature of genetic material was not defined.

A very, Macleod and McCarty repeated the experiment *in-vitro* to identify the biochemical nature of the transforming substances. They proved that this substance is DNA.

They purified biochemical i.e., proteins, DNA and RNA from the heat killed S – cell to see which ones could transform live R – cells into S – cells. They discovered that DNA alone from S – bacteria caused R – bacteria to become transformed. They also discovered that protein – digesting enzymes i.e., protease and RNA – digesting enzymes i.e., RNase did not affect transformation, so the transforming substance was not a protein or RNA. Digestion with DNase did inhibit transformation, suggesting that DNA caused the transformation.

**Significance:** DNA and not protein is the genetic material.

- \*17. (a) **Write a short note on Chipko Movement.** [5]

OR

- (b) **Write a short note on Joint forest management.** [5]

18. (a) **What does PCR stand for? Describe the different steps of PCR.**

OR

- (b) **Give an account of the Blue-White Method of selection of recombinants.**

- Ans. (a) PCR stands for polymerase Chain Reaction. The basic requirements of a PCR reaction are the following:

- (i) DNA template: Any source that contains one or more target DNA molecules to be amplified can be taken as template.
- (ii) Two nucleotide primers which are oligonucleotides, that hybridizes to the target DNA region.
- (iii) Enzyme DNA polymerase which is thermo stable like tag polymerase.
- (iv) Four types of dioxynucleotides called dNTPs.

**The three essential steps for PCR technique are:**

- (i) **Denaturation:** The target DNA is heated to a high temperature (usually 94° to 96° C), resulting in the separation of the two strands each of which then acts as a template for DNA synthesis.
- (ii) **Annealing:** In this step, the two oligonucleotide primers anneal to each of the single – stranded template DNA. This step is carried out at a lower temperature.
- (iii) **Extension (polymerisation):** The final step is extension, where in taq DNA polymerase synthesizes the DNA region between the primers, using dNTPs and Mg<sup>2+</sup>. By this the primers are extended towards each other so that the DNA segment lying between the two primers is copied. The optimum temperature for this step is 72°C.

These three steps constitute one cycle of the reaction. The process is carried out for about 28 – 30 cycles beyond which its reliability decreases.

OR

- (b) **Blue – white** method of selection of Recombinants: The blue – white screen is a screening technique that allows for the rapid and convenient detection of recombinant bacteria in vector based molecular cloning experiments.

This method is based upon the inspectional inactivation of the lac-z gene present on the vector. This gene expresses the enzyme  $\beta$  - galactosidase substrate called X – gal into blue colours product.

If the lac –z gene is inactivated due to the presence of the insert, then enzymes is not expressed. Cells transformed with vectors containing recombinant DNA will produce white colonies; cells transformed with non-recombinant plasmids (i.e. only the vector) grow into blue colonies.



**Don't Stop Reading !**  
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