

SECTION A

Q. Nos. 1 - 5 are of one mark each

1. The role of FSH in the process of spermatogenesis in humans is to
- (A) stimulate the secretion of certain factors from Sertoli cells.
 - (B) inhibit the secretion of testosterone from the interstitial cells.
 - (C) stimulate the action of testosterone on Sertoli cells.
 - (D) stimulate the secretion of LH from pituitary cells.

Ans. (A) / Stimulate the secretion of certain factors from Sertoli cells

[1 mark]

2. Some cyanobacteria in aquatic and terrestrial environment that enrich the soil by fixing atmospheric nitrogen are

- (A) Rhizobium and Azotobacter
- (B) Azospirillum and Glomus
- (C) Anabaena and Nostoc
- (D) Azospirillum and Azotobacter

Ans. (C) / *Anabaena and Nostoc*

OR

Colostrum provides passive immunity to human infants as it contains antibody

- (A) IgA
- (B) IgM
- (C) IgE
- (D) IgG

Ans. (A) / IgA

[1 mark]

3. The specific site for fertilisation in human female is

- (A) Infundibulum
- (B) Uterus
- (C) Ampulla
- (D) Ampullary isthmic junction

Ans. (C) / Ampulla

// (D) / Ampullary isthmic junction

OR

The hormone that regulates the synthesis and secretion of androgens in human males is

- (A) GH
- (B) FSH
- (C) LH
- (D) Prolactin

Ans. (C) / LH

[1 mark]

4. In biotechnology experiments, 'molecular scissors' used are

- (A) Plasmid
- (B) Restriction enzymes
- (C) Vectors
- (D) Sigma factor

Ans. (B) / Restriction enzymes

[1 mark]

5. 'Cry genes' that code for insecticidal toxins are present in

- (A) Cotton bollworms
- (B) Nematodes
- (C) Corn borer
- (D) *Bacillus thuringiensis*

Ans. (D) / *Bacillus thuringiensis*

[1 mark]

SECTION B

Q. Nos. 6 - 12 are of two marks each

6. Why do some organisms enter into diapause while some others into aestivation? Give one example each of such organisms.

Ans. Diapause – To avoid unfavourable condition, eg.-Zooplankton = $\frac{1}{2} + \frac{1}{2}$

Aestivation – To avoid summer related problem / to avoid heat / desiccation, eg.- Snail / Fish = $\frac{1}{2} + \frac{1}{2}$

[1+ 1 = 2 marks]

7. Mendel did not explain the expression of incomplete dominance in plants. Give an example of flower exhibiting incomplete dominance.

Name and state the Law of Mendel the genes which exhibit incomplete dominance follow.

Ans. *Antirrhinum* / Snapdragon / Dog flower / Four o'clock plant / *Mirabilis jalapa* = 1



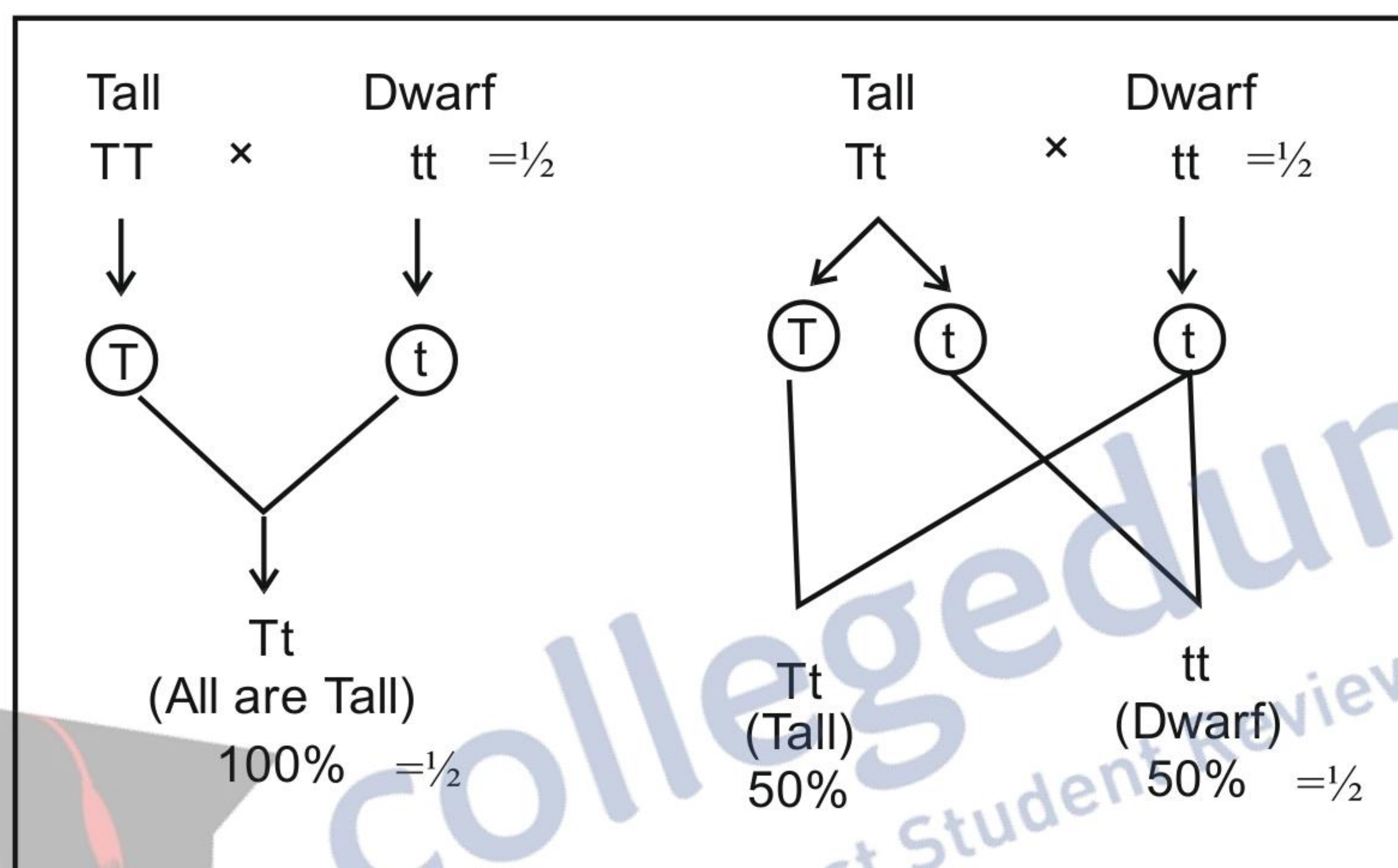
Law of segregation = $\frac{1}{2}$, Allele/factors of a pair segregate from each other such that a gamete receives only one of the two factors = $\frac{1}{2}$

[1 + $\frac{1}{2}$ + $\frac{1}{2}$ = 2 marks]

OR

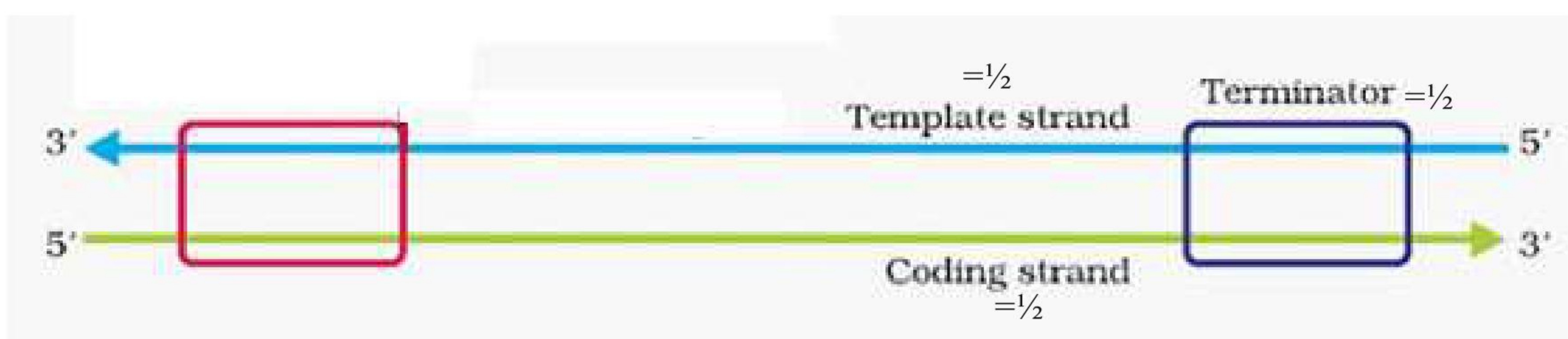
Your teacher gave you a tall pea plant and asked you to find whether the plant is homozygous tall or heterozygous tall. How will you proceed to find the genotype of the given plant ?

Test Cross



[$\frac{1}{2} \times 4 = 2$ marks]

8. Draw a schematic diagram of a transcription unit with the polarity of the DNA strands and label coding strand, template strand and terminator.



Correct polarity = $\frac{1}{2}$

[$\frac{1}{2} \times 4 = 2$ marks]

9. Causative organisms of some diseases gain entry into human body through mosquito bites and make humans suffer from the disease.

Name one such :

- (i) protozoan disease along with the scientific name of the causative organism.

(ii) **helminthes disease along with the scientific name of the causative organism.**

Ans. (i) Malaria , *Plasmodium vivax* / *Plasmodium malaria* / *Plasmodium falciparum* = $\frac{1}{2}$ + $\frac{1}{2}$

(ii) Elephantiasis / Filariasis , *Wuchereria bancrofti* / *Wuchereria malayi* = $\frac{1}{2}$ + $\frac{1}{2}$

[1 + 1 = 2 marks]

10. What is 'bagging'? State its importance in artificial hybridization of flowering plants.

Ans. Bagging - Process of covering of emasculated / female / artificially pollinated flowers with a bag of suitable size generally made up of butter paper (to prevent contamination of stigma with unwanted pollen) = 1

Importance – The desired pollen grains are used for pollination / the stigma is protected from contamination from unwanted pollen / It combines desirable characters to produce commercially superior varieties = 1

[1 + 1 = 2 marks]

11. (a) Mention the difference in the level of BOD before and after the secondary treatment of sewage water.

(b) **Write the importance of 'flocs' during the secondary treatment of sewage.**

Ans. (a) Before - High = $\frac{1}{2}$, After – Low = $\frac{1}{2}$

(b) Reduces BOD / Biochemical Oxygen Demand = 1

[1 + 1 = 2 marks]

12. Name any two cereal crops that have been fortified. Mention how.

Ans. - Maize (hybrids) = $\frac{1}{2}$, that had twice the amount of the amino acids - lysine and tryptophan = $\frac{1}{2}$

- Wheat (variety) Atlas 66 = $\frac{1}{2}$, for a high protein content = $\frac{1}{2}$

- Iron - fortified rice variety = $\frac{1}{2}$, with over five times iron (as in commonly consumed varieties) = $\frac{1}{2}$

(Any two) = 1 + 1

[1 + 1 = 2 marks]

SECTION C

Q. Nos. 13 - 21 are of three marks each

13. Why does an organic farmer intentionally not use toxic chemicals to kill the pests which damage his crops ? Explain giving three reasons.

Ans. - Toxic chemicals can have adverse side effects / causes biomagnification ,

- It kills both useful and harmful life forms indiscriminately,

- It eradicates pests not control pests ,

- Beneficiary predatory and parasitic insects which depend upon them as food or hosts would not able to survive ,

- It disturbs food chain / food webs / vibrant ecosystem (Any Three) = 1 × 3

[3 marks]



14. Name the three different parts of a human sperm and write their involvement in the process of fertilisation.

Ans. Acrosome = $\frac{1}{2}$, filled with enzyme which helps the sperm to enter into the ovum (through zona pellucida) = $\frac{1}{2}$

Nucleus = $\frac{1}{2}$, containing chromosomal material / genetic material = $\frac{1}{2}$

Mitochondria / Middle piece = $\frac{1}{2}$, energy source for swimming = $\frac{1}{2}$

Tail = $\frac{1}{2}$, it helps in movement / motility = $\frac{1}{2}$

Plasma membrane = $\frac{1}{2}$, sperm is enveloped by it = $\frac{1}{2}$ (Any Three) = 1×3

[3 marks]

15. Why do doctors suggest some married couples to go for 'IVF' ? Explain the steps carried out in the process of 'IVF'.

Ans. - (Childless) couples could be assisted to have children through IVF = 1

- Ova from the wife / donor (female) and sperm from the husband / donor (male) are collected, and are induced to form zygote under simulated conditions in the laboratory, the zygote or early embryos (with upto 8 blastomeres) could then be transferred into fallopian tube (ZIFT), and embryos with more than 8 blastomeres transferred into uterus (IUT) = $\frac{1}{2} \times 4$

[1 + 2 = 3 marks]

16. Explain the events occurring in a 'Replicating Fork' during replication of DNA.

Ans. - DNA dependent DNA polymerase catalyse polymerisation,

- of deoxynucleotides / deoxyribonucleoside triphosphates,

- only in one direction $5' \rightarrow 3'$,

- on one strand (the template with polarity $3' \rightarrow 5'$) the replication is continuous,

- while on the other (the template with polarity $5' \rightarrow 3'$) it is discontinuous,

- the discontinuously synthesised fragments are later joined by the enzyme DNA ligase = $\frac{1}{2} \times 6$

[$\frac{1}{2} \times 6 = 3$ marks]

OR

Name the different types of RNA polymerases in a eukaryotic cell. Write their roles in transcription.

Ans. - RNA polymerase I = $\frac{1}{2}$, transcribes rRNAs (28S/18S/5.8S) = $\frac{1}{2}$

- RNA polymerase II = $\frac{1}{2}$, transcribes precursor of mRNA/hnRNA/heterogenous nuclear RNA = $\frac{1}{2}$

- RNA polymerase III = $\frac{1}{2}$, transcribes tRNA/5srRNA/snRNAs/small nuclear RNAs = $\frac{1}{2}$

[$\frac{1}{2} \times 6 = 3$ marks]

17. Why are poultry farms set up ? Write the different components to be kept in mind in poultry farm management.

Ans. Used for food / meat / eggs = 1

- Selection of disease free and suitable breeds,

- proper and safe farm conditions ,
- proper feed and water ,
- and hygiene and health care = $\frac{1}{2} \times 4$

[1 + 2 = 3 marks]

18. Describe the technique that is very effectively used to get a large amount of desired DNA for research and detailed investigation.

- Ans. - By using PCR (polymerase chain reaction) denaturation of desired DNA ,
- separate into 2 strands where each acting as template ,
 - for each strand a separate set of primer used (two primers) ,
 - with the help of deoxy(ribo) nucleotides and Taq polymearse (DNA polymearase isolated from *Thermus aquaticus*) ,
 - results in extension of DNA primer = $\frac{1}{2} \times 6$

[$\frac{1}{2} \times 6 = 3$ marks]

19. What are transgenic animals ? How are they being used for vaccine safety and chemical safety testing ? Explain.

- Ans. Transgenic animals – : Animals that have had their DNA manipulated to possess and express an extra/foreign/trans gene = 1
- Transgenic mice are being developed for use in testing the safety of vaccine before they are used in humans / transgenic mice are being used to test the safety of polio vaccine , if successful and found reliable they could replace the use of monkeys to test the safety of batches of the vaccine = $\frac{1}{2} \times 2$
 - Transgenic animals are made that carry genes which make them more sensitive to toxic substances than non-transgenic animals , they are exposed to the toxic substances and the effects are studied (that allows to obtain results in less time) = $\frac{1}{2} \times 2$

[1 + 1 + 1 = 3 marks]

20. Differentiate between pleiotropy and polygenic inheritance by taking one example of each.

Ans.

Pleiotropy	Polygenic Inheritance
a single gene can exhibit multiple phenotypic expression = 1	Inheritance which are generally controlled by three or more genes = 1
eg.- Phenylketonuria / mutation of a gene coding for phenylalanine hydroxylase can manifests multiple phenotypic expression(mental retardation and a reduction in hair and skin pigmentation) / a single gene in garden pea control the size of starch grain and seed shape = $\frac{1}{2}$	eg.-Human skin colour controlled by three genes (A,B,C) = $\frac{1}{2}$

[1 + 1 + $\frac{1}{2}$ + $\frac{1}{2}$ = 3 marks]

OR

State Oparin and Haldane hypothesis. How did S.L. Miller experimentally prove it? Explain.

Ans. First form of life could have come from pre-existing non-living molecules (DNA/protein), and that formation of life was preceded by chemical evolution (formation of diverse organic molecules from inorganic constituents) = $\frac{1}{2} + \frac{1}{2}$

He created reducing / early atmospheric condition by taking a closed flask, containing CH_4 (Methane) H_2 (Hydrogen) NH_3 (Ammonia) and water vapour, at 800°C , subjecting them to electric discharge and observed formation of aminoacids / organic compounds = $\frac{1}{2} \times 4$

[1 + 2 = 3 marks]

21. How are the two Assisted Reproductive Technologies (ART), intracytoplasmic sperm injection and intrauterine insemination different? Explain.

Intra cytoplasmic sperm injection (ICSI)	IUI – intra-uterine insemination
Ovum is collected from donor female	No need of donor female
Sperm directly injected into the ovum	Sperm is introduced into vagina / uterus
Embryo formation occurs in the laboratory	Embryo formation occurs in the mother's body

[1 × 3 = 3 marks]

SECTION D

Q. Nos. 22 - 24 are of three marks each

22. Tigers inhabit forests. Over the past many decades the tiger population was on the decline in our country. A project 'Save Tiger' was launched in 1973 to conserve this precious species. It is heartening to see in the last couple of decades that there has been a gradual increase in the tiger population in our country.

Answer the questions :

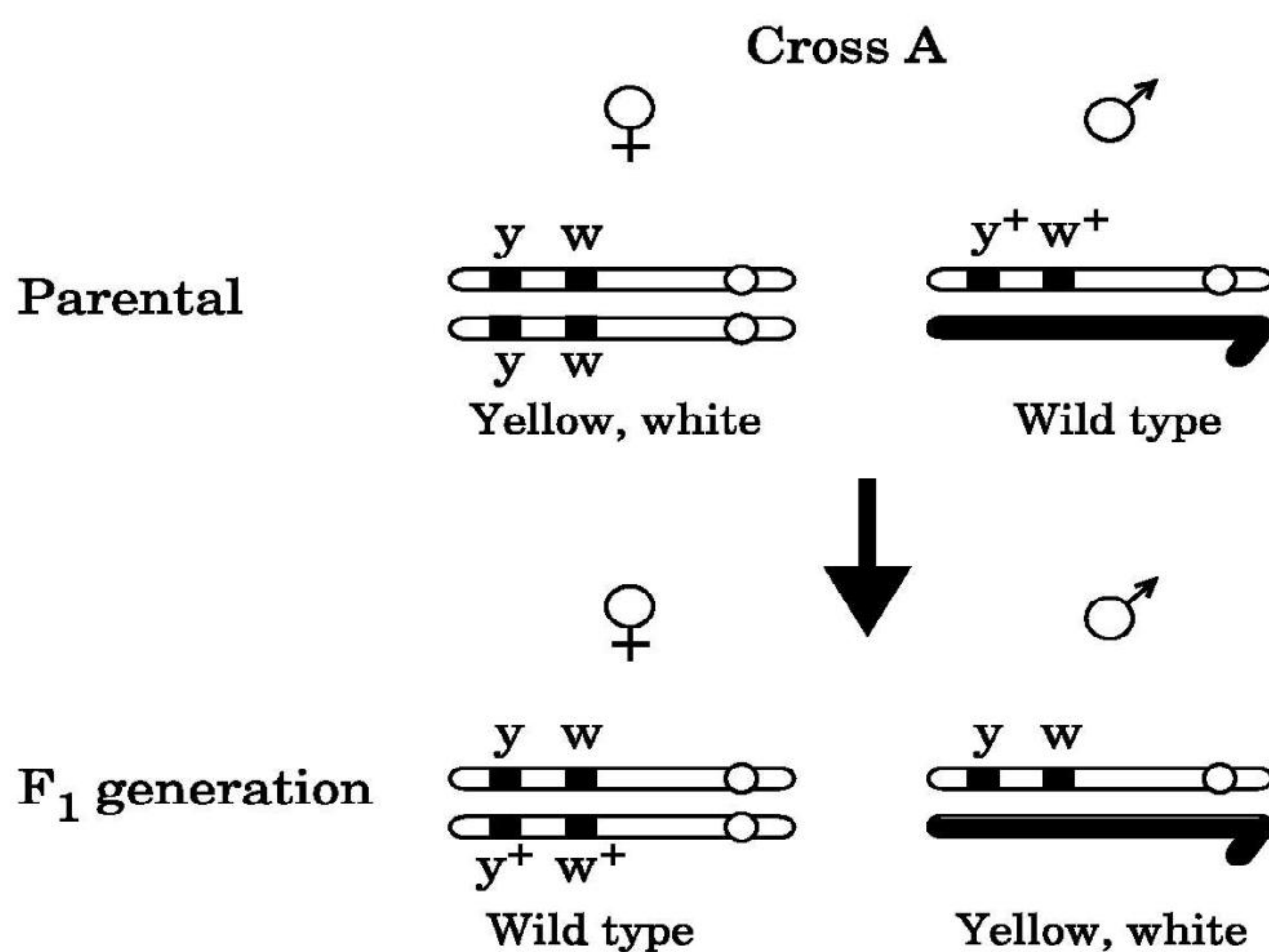
- Mention one major cause responsible for the decline in tiger population.
- Write one main effort of the biodiversity conservationists that must have helped in the increase in tiger population.
- State how it is possible to count the number of tigers in a forest area.

Ans. (a) Habitat loss and fragmentation / prey depletion = 1
(b) Through *in situ* conservation like national parks / wild life sanctuaries / protect biodiversity hot spots / biosphere reserves / *ex situ* conservation like zoological parks / zoo / wild life safari parks / cryopreservation = 1
(c) Based on pug marks / faecal pellets / sites with scratches on trees are chosen for installing camera / since each tiger has a very unique stripe pattern hence this is used to differentiate one tiger from the other = 1

[1 + 1 + 1 = 3 marks]

23. T.H. Morgan carried out a cross on *Drosophila Melanogaster*, involving genes for body colour (y^+/y) and genes for eye colour (w^+/w). Study the schematic representation of the cross upto F_1 generation and answer the questions that follow :





- (a) Name the kind of cross it represents.
- (b) Identify and write the dominant phenotype with respect to eye colour.
- (c) What are these genes located on the chromosome shown referred to as ?

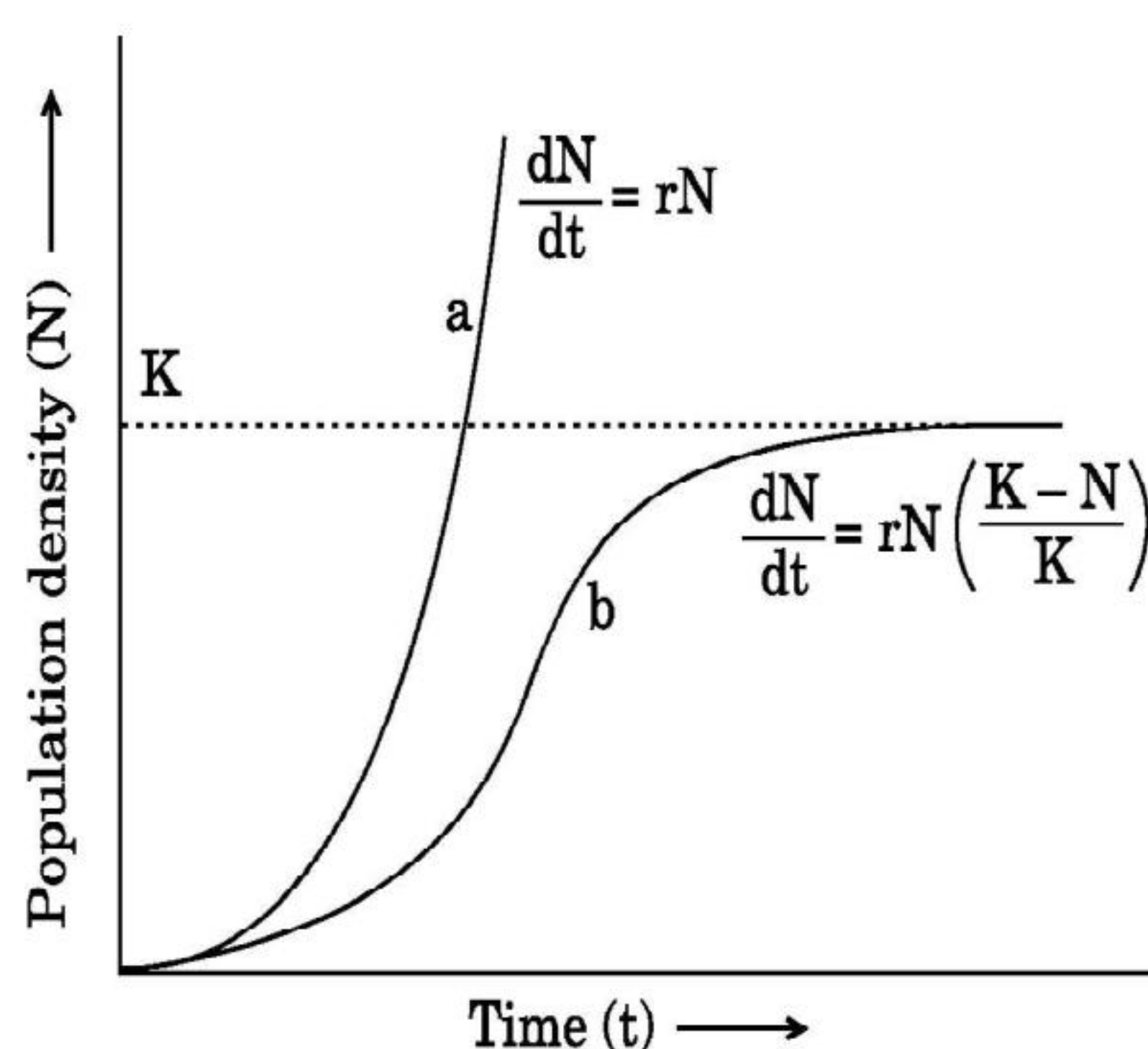
- Ans. (a) Dihybrid cross = 1
- (b) Red eye / phenotype of w^+ = 1
- (c) Linked genes / sex linked genes = 1

[1 + 1 + 1 = 3 marks]

24. Study the graph given below showing the different types of growth curves of different species.

Answer the questions :

- (a) Name the type of growth curve 'a' shown in the graph.
- (b) State one reason why the growth curve 'b' is said to be logistic.
- (c) What is 'K' representing in the equation $\frac{dN}{dt} = rN \left[\frac{K - N}{K} \right]$ given along the logistic curve.



- Ans. (a) Exponential / geometric / 'J' shaped = 1

- (b) Resources for growth of most animals populations are finite and become limiting sooner or later = 1
- (c) Carrying capacity = 1

[1 + 1 + 1 = 3 marks]

SECTION E

Q. Nos. 25- 27 are of five marks each

25. State what is disturbance in Hardy-Weinberg equilibrium indicative of. Write any four factors that affect this equilibrium. Explain how.

Ans. (Disturbance in Hardy- Weinberg equilibrium would be interpreted as resulting in) Evolution = 1

Factors :

- Gene migration / gene flow = $\frac{1}{2}$, when migration of a section of population to another place occurs then gene frequencies change in the original as well as in the new population / and it is a gene flow if this gene migration happens multiple times = $\frac{1}{2}$
- Genetic drift = $\frac{1}{2}$, if the change in gene frequencies occurs by chance = $\frac{1}{2}$
- Mutation = $\frac{1}{2}$, alteration of DNA sequence = $\frac{1}{2}$
- Genetic recombination = $\frac{1}{2}$, non-parental gene combination / variation in the genes due to recombination during gametogenesis = $\frac{1}{2}$
- Natural selection = $\frac{1}{2}$, a process in which heritable variations enabling better survival are enabled to reproduce and leave greater number of progeny = $\frac{1}{2}$

(Any four) = 1×4

[1 + 4 = 5 marks]

OR

Explain with the help of one suitable example that “Evolution is a random process based on chance events in nature and chance mutation in the organisms”

Ans. - Post industrialisation period the tree trunks became dark due to industrial smoke and soots and under this condition the white-winged moth did not survive due to predators, dark-winged or melanised moth survived, before industrialisation thick growth of almost white-coloured lichen covered the trees and in that background the white winged moth survived but the dark-coloured moth were picked out by predators = 1+1+1

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- Excess use of herbicides/ pesticides etc, has only resulted in selection of resistant varieties, in a much lesser time scale of months or years and not centuries = 1+1+1

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- Microbes against which we employ antibiotics or drugs against eukaryotic organisms /cell , and so resistant organisms/cells are appearing , in a time scale of months or years and not centuries = 1+1+1

Evolution is not a direct process in the sense of determinism , it is a stochastic process (based on chance events in nature and chance mutation in the organisms) = 1 + 1

[3 + 2 = 5 marks]



26. (a) How many episodes of mass extinction since the origin and biodiversification of life on the Earth have occurred and which one is presently in progress ?
- (b) How is the present one in progress different from the ones that occurred previously ?
- (c) Write the concerns of the ecologists in this respect.
- (d) Explain coextinction with the help of an example.

- Ans. a) 'Five episodes' of mass extinction of species, the 'Sixth Extinction' presently in progress =1+1
- b) It is 100 to 1,000 times faster than in the pre-human times / Human activities only responsible for it / It is anthropogenic =1
- c) If the present trends continue nearly half of all the species on earth might be wiped out within the next 100 years =1
- d) When a host fish species becomes extinct its unique assemblage of parasites also meets the same fate / the case of a coevolved plant-pollinator mutualism where extinction of one invariably leads to the extinction of the other =1

[2+1+1+1 = 5 marks]

OR

Explain the steps carried out in purifying the wastewater by the citizens of Arcata in the State of Northern California.

- Ans. Towns people created an integrated waste water treatment process with in a natural system, cleaning occurs in two steps, (in first step) conventional sedimentation - filtering and chlorine treatment are given, still a lot of dangerous pollutant like dissolved heavy metal still remain, the biologists developed a series of six connected marshes, over 60 hectares of marshland, with appropriate plants algae, fungi, and bacteria were seeded into this, which neutralise / absorb / assimilate the pollutants, and hence as the water flows through the marshes it gets purified naturally = $\frac{1}{2} \times 10$

[5 marks]

27. Trace the events that occur in an angiosperm during

- (a) Pollen-pistil interaction until pollen tube enters the ovule.
- (b) Double fertilisation.

- Ans. a) When pollen grain lands on the pistil a chemical components of the pollen interact with those of the pistil, the pollen grain germinates on the stigma to produce a pollen tube through one of the germ pores, the contents of the pollen grain move into the pollen tube, pollen tube grows through the tissues of the stigma and style and reaches the ovary, pollen tube after reaching the ovary enters the ovule through the micropyle = $\frac{1}{2} \times 5$
- b) After entering one of the synergids the pollen tube releases the two male gametes into the cytoplasm of the synergid, one of the male gametes moves towards the egg cell and fuses with its nucleus thus completing the syngamy, this results in the formation of a diploid cell the zygote, the other male gamete moves towards the two polar nuclei (secondary nucleus) located in the central cell and fuses with them, to produce a triploid primary endosperm nucleus (PEN) = $\frac{1}{2} \times 5$

[2 $\frac{1}{2}$ + 2 $\frac{1}{2}$ = 5 marks]

24



OR

Answer the following questions based on the process of oogenesis in human female :

- (a) When and where does the process begin ?
- (b) Explain the steps that occur in the process of oogenesis up to ovulation on the onset of puberty.

- Ans. a) Embryonic stage , fetal ovary = $\frac{1}{2} + \frac{1}{2}$
- b) The primary follicles get surrounded by more layers of granulosa cells and a new theca and are called secondary follicles , the secondary follicle soon transforms into a tertiary follicle , which is characterised by a fluid filled cavity called antrum , at this stage that the primary oocyte within the tertiary follicle grows in size and completes its first meiotic division , (it is an unequal division) resulting in the formation of a large haploid secondary oocyte and a tiny first polar body , tertiary follicle further changes into the mature follicle or Graafian follicle, the secondary oocyte forms a new membrane called zona pellucida surrounding it , the Graafian follicle now ruptures to release the secondary oocyte (ovum) from the ovary by the process called ovulation = $\frac{1}{2} \times 8$

[1+4 = 5 marks]



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