

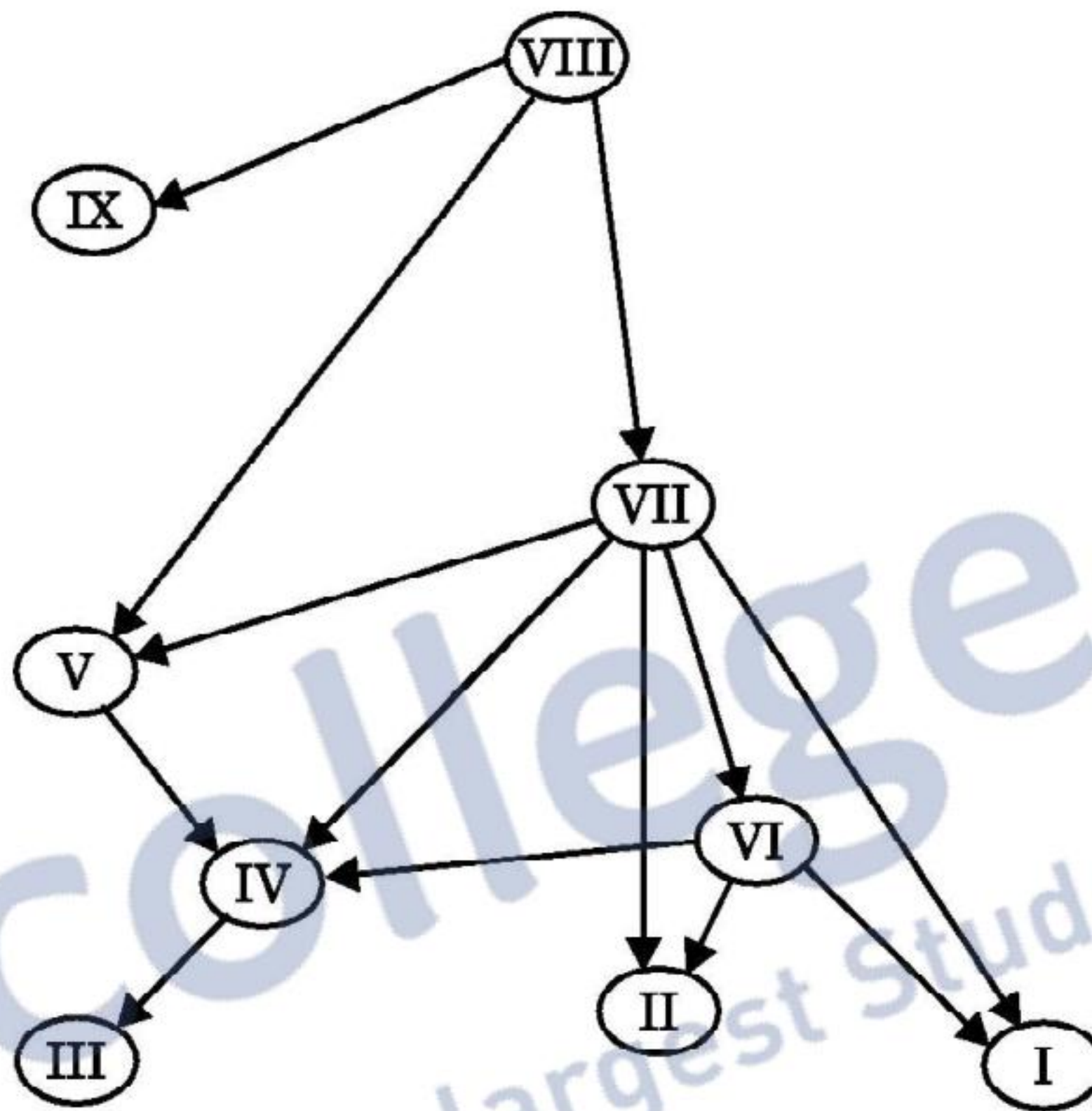
SECTION – A

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

1. In the illustration given below of a simplified food web on an island, the arrows indicate the direction of energy flow and the Roman numbers indicate species within the food web.

At which trophic level or levels does the species VIII function ?

- (A) 2nd and 3rd consumer
- (B) 1st consumer
- (C) Producer
- (D) 3rd and 4th consumer



Ans. (C) / Producer

[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

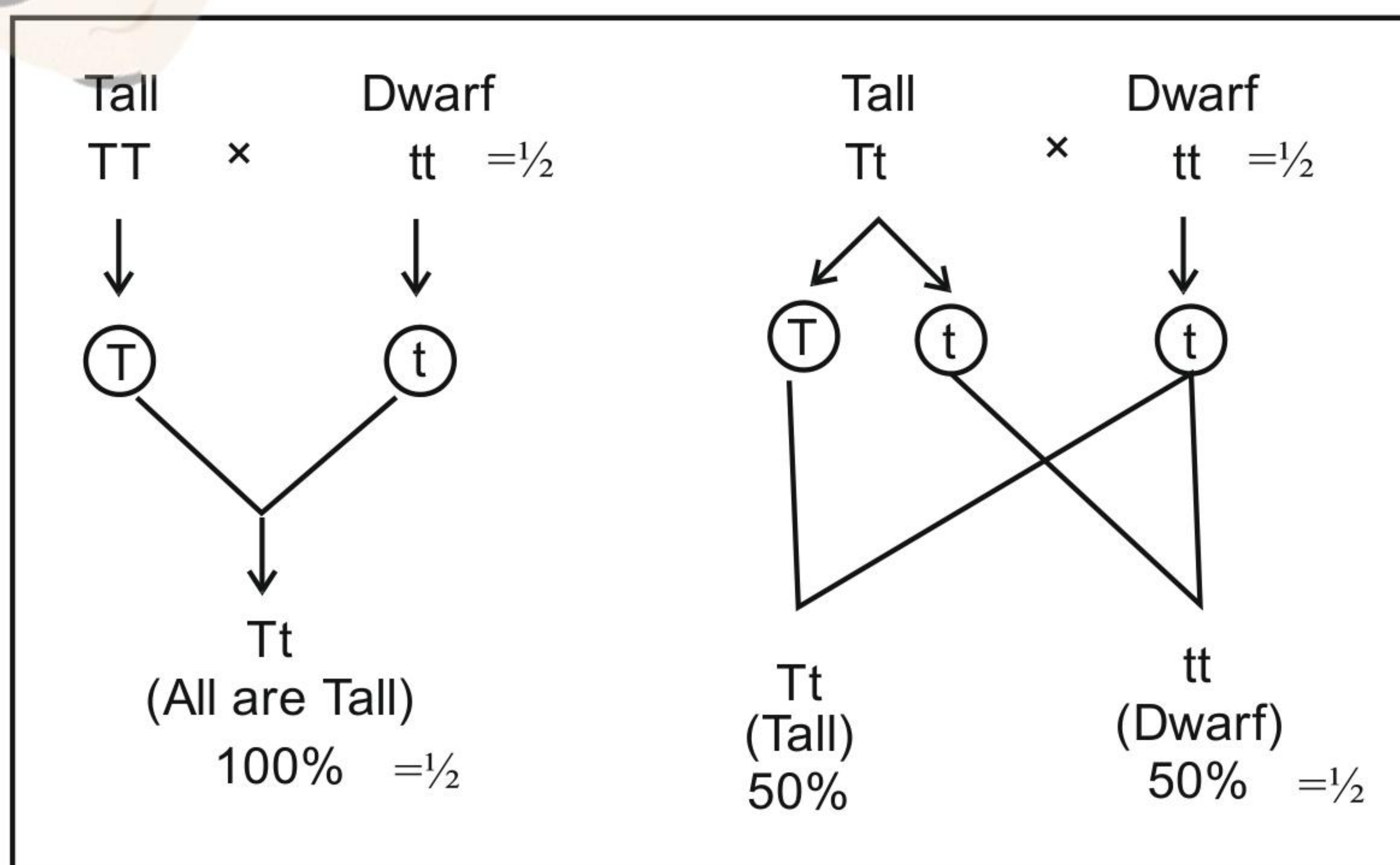
Law of segregation = $\frac{1}{2}$, Allele/factors of a pair segregate from each other such that a gamete receives only one of the two factors = $\frac{1}{2}$

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

OR

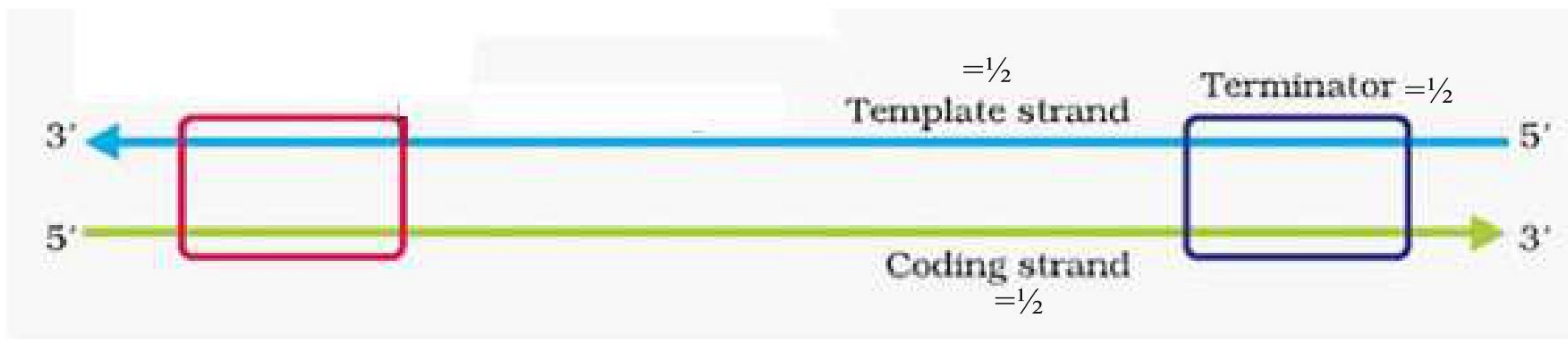
Your teacher gave you a tall pea plant and asked you to find whether the plant is homozygous tall or heterozygous tall. How will you proceed to find the genotype of the given plant ?

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]

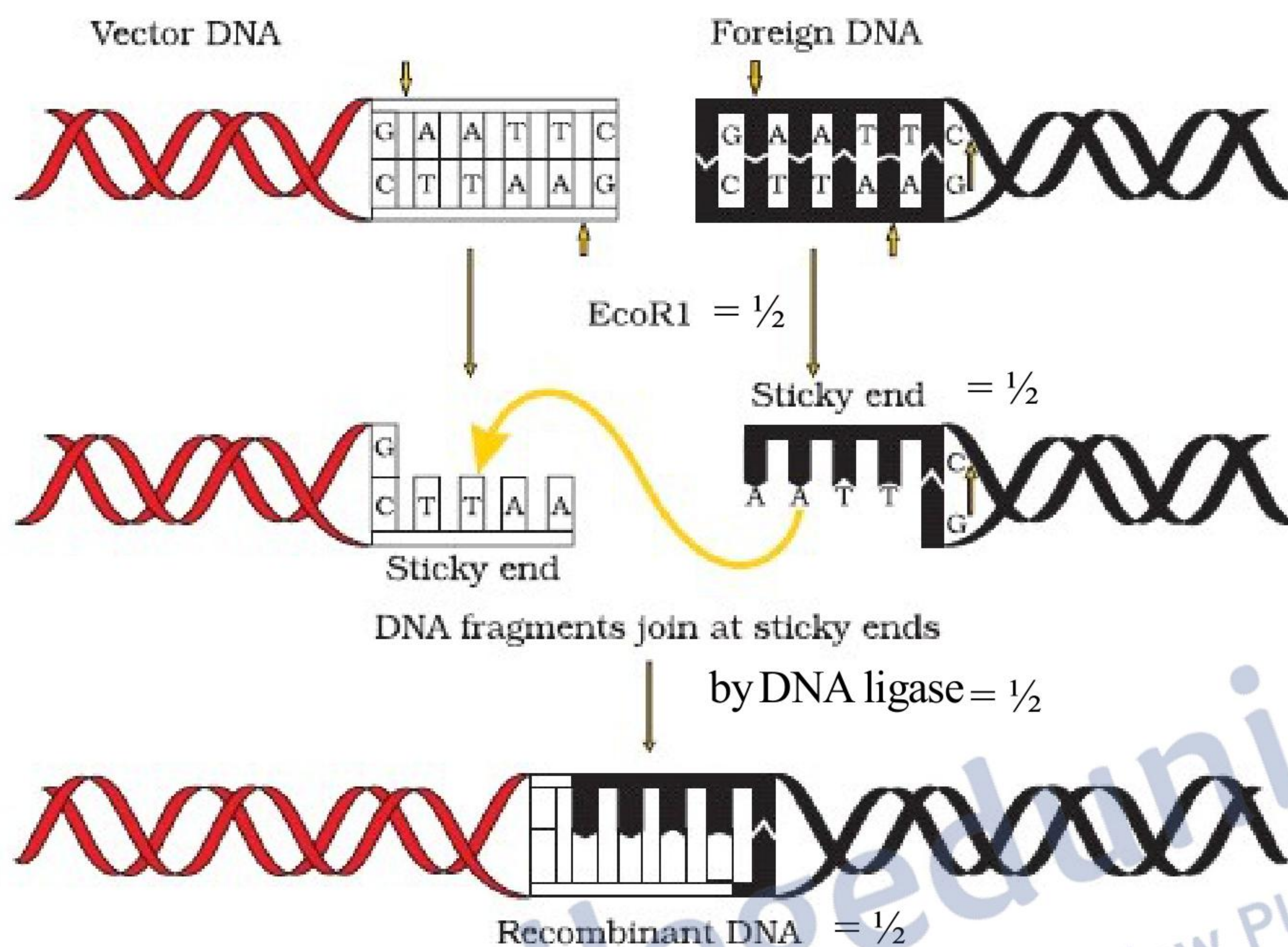
12. Explain the action of EcoRI on DNA in rDNA technology experiment.

- Ans. - It cuts vector and foreign DNA at specific sites (palindromic nucleotide sequence / GAATTC / between G & A on the opposite strands) ,
 - forming sticky ends ,
 - that facilitates the action of DNA ligase ,
 - to form recombinant DNA / recombinant plasmid = $\frac{1}{2} \times 4$

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

//

(In lieu of the above explanation, the following diagram with the given marking point can be considered)



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

7



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 polymearse 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 CH₄ (Methane) H₂ (Hydrogen) NH₃ (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. Name the two primary lymphoid organs in humans. Explain their functions in providing immunity.

Ans. Bone marrow, Thymus = $\frac{1}{2} = \frac{1}{2}$

Immature lymphocytes differentiate into antigen sensitive lymphocytes, provide microenvironments for the development and maturation of T-lymphocytes (lymphocytes are produced in bone marrow) = 1 + 1

[1 + 2 = 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.

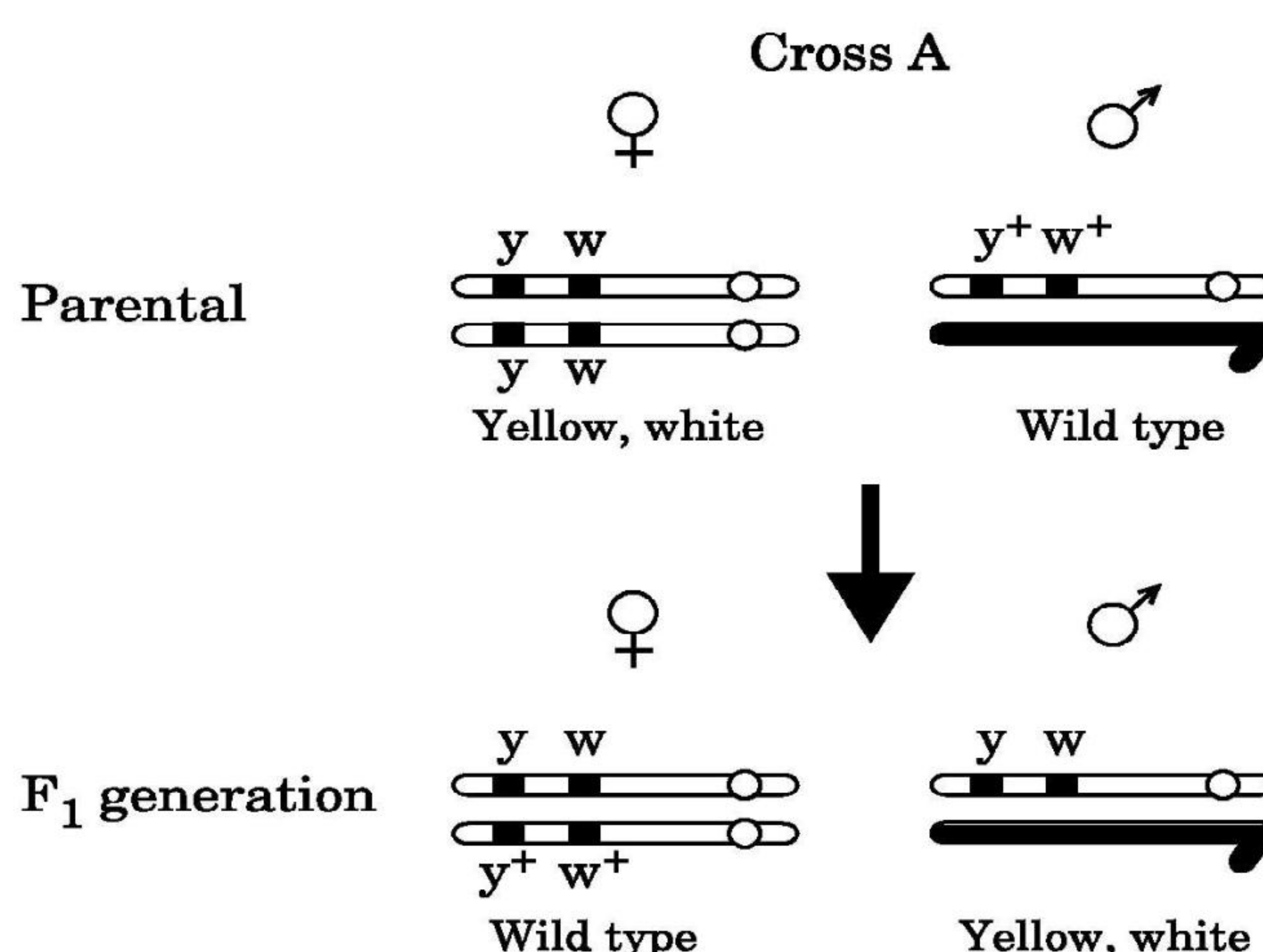
Ans. (a) Habitat loss and fragmentation / prey depletion = 1

(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 ?

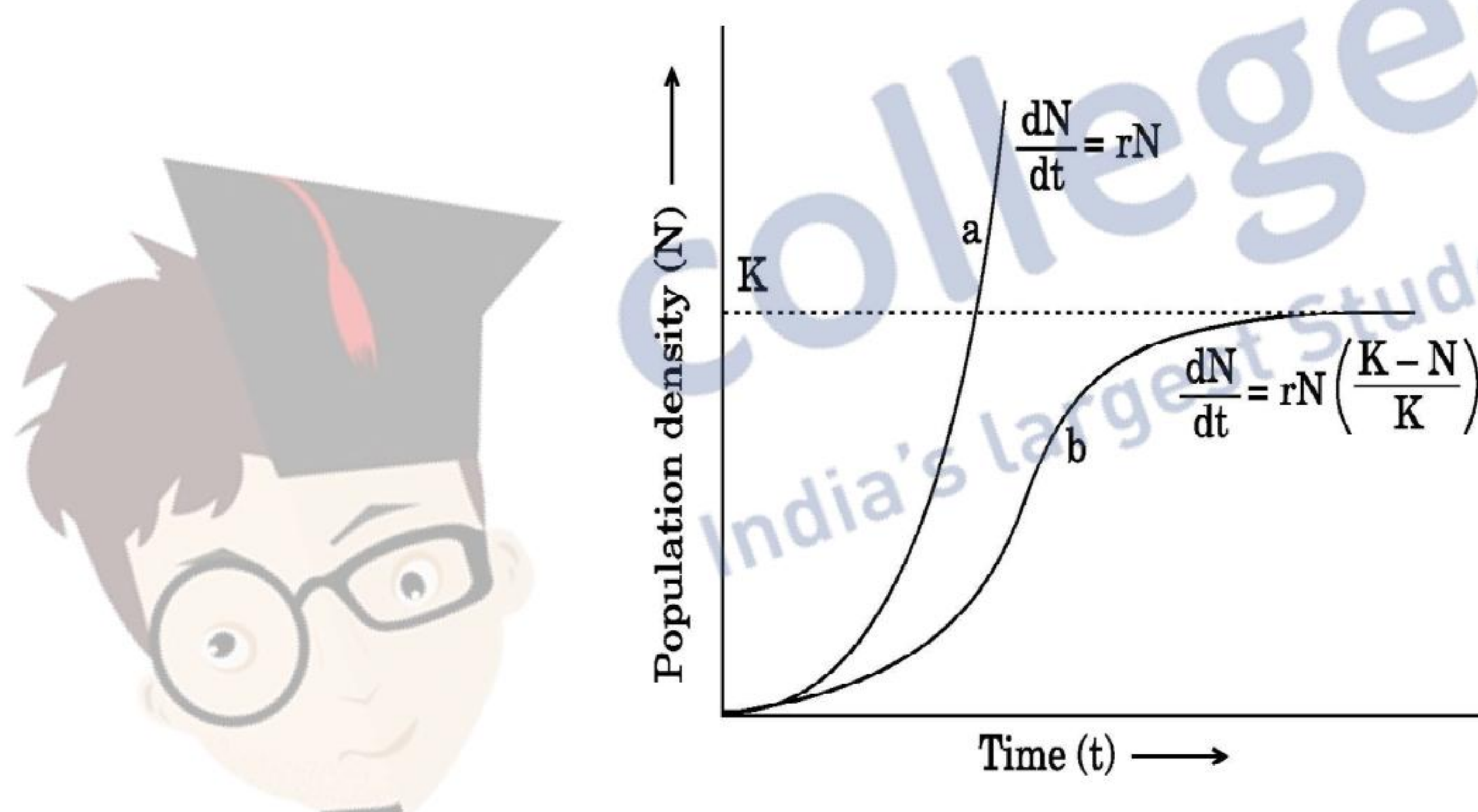
- Ans. (a) Dihybrid cross = 1
 (b) Red eye / phenotype of w^+ = 1
 (c) Linked genes / sex linked genes = 1

[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. List the different components of a Lac Operon. Explain the role of these components, when the operon is in an 'open state'.

Ans. Components : Regulatory gene / the 'i' gene (inhibitor),

and three structural genes i.e. z, y, and a = $\frac{1}{2} \times 4$

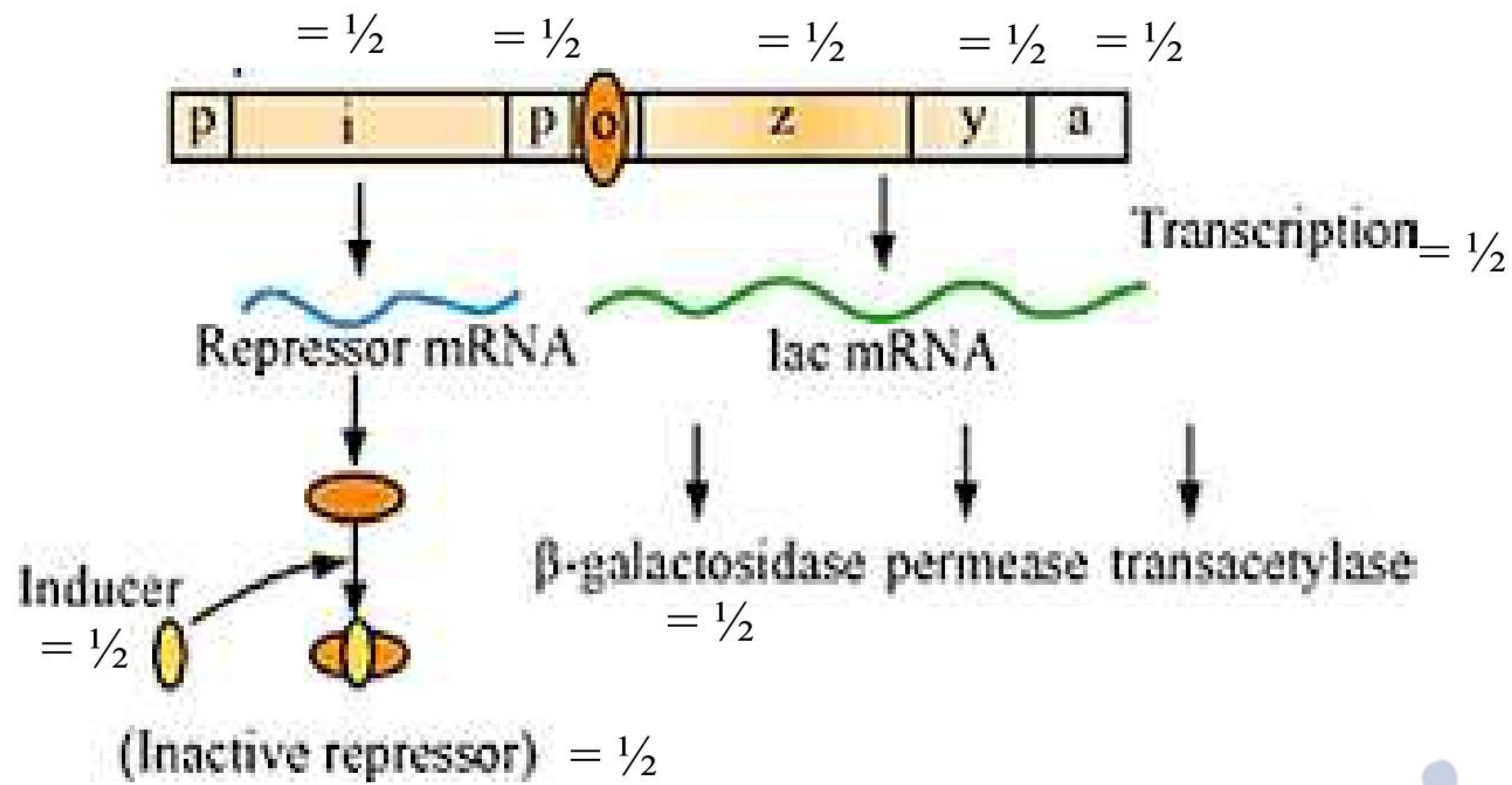
Repressor, which is synthesised (all-the-time – constitutively) from the *i* gene, is inactivated by interaction with the inducer (lactose or allolactose), this allows RNA polymerase access to the promoter, turning on the transcription of these three genes in the lac operon, which in turn producing

enzymes responsible for digestion of lactose (β galactosidase break lactose to glucose and galactose)
 $= \frac{1}{2} \times 6$

[2 + 3 = 5 marks]

//

(In lieu of the above explanation, the following diagram with the given marking point can be considered)



[$\frac{1}{2} \times 10 = 5$ marks]

OR

Write the five important goals of Human Genome Project (HGP).

- Ans. (i) Identify all the approximately 20,000 - 25,000 genes in human DNA
 (ii) Determine the sequences of the 3 billion chemical base pairs that make up human DNA
 (iii) Store this information in databases
 (iv) Improve tools for data analysis
 (v) Transfer related technologies to other sectors, such as industries
 (vi) Address the ethical, legal, and social issues (ELSI) that may arise from the project

(any five) $1 \times 5 = 5$

[1 \times 5 = 5 marks]

26. (a) Describe the different stages of development a fertilised ovum in a human female undergoes up to the blastocyst stage.
 (b) Name the parts of a blastocyst and write the fate of these parts till the onset of pregnancy.

Ans. (a) Zygote moves through the oviduct towards uterus, and the mitotic division called cleavage begins, forms 2- 4- 8- 16 daughter cells, called blastomeres, the embryo with 8 to 16 blastomeres is called a morula, the morula continues to divide and transforms into blastocyst
 $= \frac{1}{2} \times 6$

- (b) Trophoblast $= \frac{1}{2}$, gets attached to the endometrium for implantation / helps in formation of placenta, $= \frac{1}{2}$

Inner cell mass $= \frac{1}{2}$, the inner cell mass gets differentiated as the embryo $= \frac{1}{2}$

[3 + 2 = 5 marks]

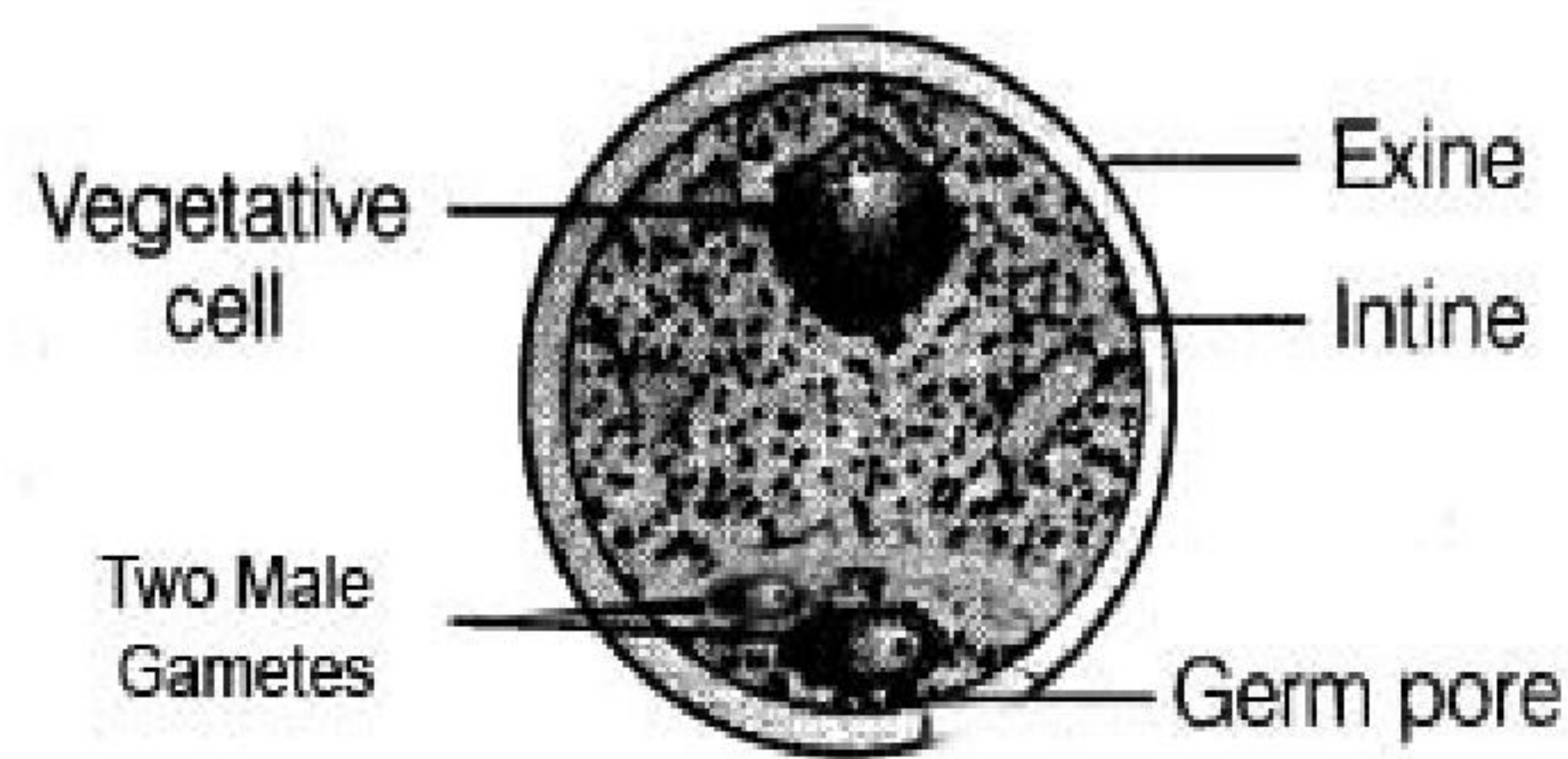
OR

- (a) Name the specific part in the anther and the process responsible for the development of a male gametophyte in an angiosperm.
- (b) Draw a labelled diagram of a mature male gametophyte (3-celled) of an angiosperm. Write the functions of each labelled part.

Ans. (a) Sporogenous tissue / Microsporangium / Microspore mother cell / Pollen mother cell / PMC = 1,

Microsporogenesis = 1

(b)



(Any labellings) = $\frac{1}{2} + \frac{1}{2}$

Vegetative cell - It has abundant food reserve

Male gametes - Participate in double fertilisation / one male gamete fuses with egg and the other fuses with two polar nuclei / secondary nucleus (any two)

Exine - Made up of most resistant organic material sporopollenin / can withstand high temperatures / strong acids / alkali / no enzymes can degrade it /

Intine - Contributes pollen tube formation

Germ pore - Region from where pollen tube arise

(Any two parts with correct function) = 1 + 1

[3 + 2 = 5 marks]

27. (a) Construct a pyramid of biomass of grassland ecosystem. How is the pyramid of biomass in sea different from it ?

(b) Name the primary producer and primary consumer in sea.

(c) What is standing crop ?

(a) Pyramids of biomass in grassland ecosystem - upright, = 1

Pyramid of biomass in sea - (generally) inverted = 1

(b) Primary producers - phytoplankton = 1

Primary consumers - fishes / zooplanktons = 1

(c) Each trophic level has a certain mass of living material at a particular time called as the standing crop = 1

[2 + 2 + 1 = 5 marks]

OR

- (a) **What is eutrophication ? Enumerate the steps leading to eutrophication.**
 (b) **How is accelerated eutrophication different from eutrophication ?**

Ans. (a) Natural aging of a lake by nutrient enrichment of its water = 1

In a young lake the water is cold and clear supporting little life but with time streams draining into the lake introduce nutrients such as nitrogen and phosphorus , which encourage the growth of aquatic organisms , as the lake's fertility increases plant and animal life burgeons and organic remains begin to be deposited on the lake bottom , and over the centuries as silt and organic debris pile up making the lake shallower and warmer with warm-water organisms supplanting those that thrive in a cold environment , marsh plants take root in the shallows and begin to fill in the original lake basin , eventually the lake gives way to large masses of floating plants (bog) grow finally converting into land. = $\frac{1}{2} \times 6$

(b)

Eutrophication	Accelerated Eutrophication
Natural	Man made
Slow Process/takes centuries	Accelerated process/ takes Few years

Any one difference = 1

[4 + 1 = 5 marks]



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