

Question Paper Code 57/2/3

SECTION – A

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

1. Suggest a molecular diagnostic procedure that detects HIV in a suspected AIDS patient.

Ans. PCR / ELISA = 1

[1 Mark]

2. Mention one difference to distinguish an exon from an intron.

Ans. Exon : coded / expressed sequence of nucleotides in mRNA , = $\frac{1}{2}$

Intron : Intervening sequence of nucleotides not appearing in processed mRNA = $\frac{1}{2}$

[1 Mark]

3. What does nature's carrying capacity for a species indicate ?

Ans. (In nature) a given habitat has enough (limited) resources to support a maximum possible number , no further growth in population is possible = $\frac{1}{2} + \frac{1}{2}$

[1 Mark]

4. Mention two causes of frame- shift Mutation.

Ans. Insertion , deletion of three bases / one codon or multiple of three bases / multiple codon (hence one or more amino acid) (reading frame remains unaltered from that point onwards) = $\frac{1}{2} + \frac{1}{2}$

[1 Mark]

5. Name two animals that exhibit Oestrus cycle.

Ans. cow / sheep / rat / deer / dog / tiger / anyother (correct example) = $\frac{1}{2} \times 2$

[1Mark]

SECTION – B

Q. Nos. 6 - 10 are of two marks each

6. Suggest four advanced ex-situ methods to conserve threatened biodiversity .

Ans. Cryopreservation , in vitro fertilisation , tissue culture , seed banks = $\frac{1}{2} \times 4$

[2 Marks]

7. (a) List two advantages of keeping beehives in a crop field during flowering season.

(b) Name one annual and one perennial crop species favourable to beeswax collection.

Ans. (a) Bees help in increasing pollination efficiency , leading to improved yield = $\frac{1}{2} + \frac{1}{2}$

(b) Annual : Sunflower / Brassica or any other correct example = $\frac{1}{2}$

Perennial : Apple / pear or any other correct example = $\frac{1}{2}$

[2 Marks]

8. Sewage discharge into a clean-water body leads to increased fish mortality. Explain.

Ans. Leads to increase in nutrients , promotes algal growth , increases BOD reduces dissolved oxygen

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(aquatic animals deprived of oxygen leading to death) , some bloom forming algae are extremely toxic to fish / other pollutants of sewage = $\frac{1}{2} \times 4$

[2 Marks]

9. How does a test cross help to determine the genotype of an individual ?

Ans. Individual of unknown genotype crossed with recessive parent , = 1

All dominant in progeny - Homozygosity , dominant to recessive ratio 1:1 in progeny - Heterozygosity = $\frac{1}{2} + \frac{1}{2}$

[2 Marks]

OR

Mention two applications of DNA polymorphism.

Ans. Genetic mapping , DNA finger printing = 1 + 1

[2 Marks]

10. Explain the events that follow upto fertilization when the sperms come in contact with the ovum in the fallopian tube of a human female.

Ans. The secretion of the acrosome help the sperm enter into the cytoplasm of ovum through zona pellucida and the plasma membrane , this induces the completion of second meiotic division of the secondary oocyte , forming second polar body and a haploid ovum , soon the haploid nucleus of the sperm and that of the ovum fuse together to form a diploid zygote = $\frac{1}{2} \times 4 = 2$

[2 Marks]

SECTION - C

Q. Nos. 11 - 22 are of three marks each

11. Narrowly utilitarian arguments are put forth in support of biodiversity conservation. Explain the other two arguments that are put forth in support of the same cause.

Ans. - Broadly utilitarian = $\frac{1}{2}$

Ecosystem services - Purify air , cycling of nutrients , habitat for wildlife , pollinating crops , aesthetic pleasure (any two) = $\frac{1}{2} \times 2 = 1$

- Ethical = $\frac{1}{2}$

Philosophical / spiritual / moral duty towards future generations = $\frac{1}{2} \times 2 = 1$

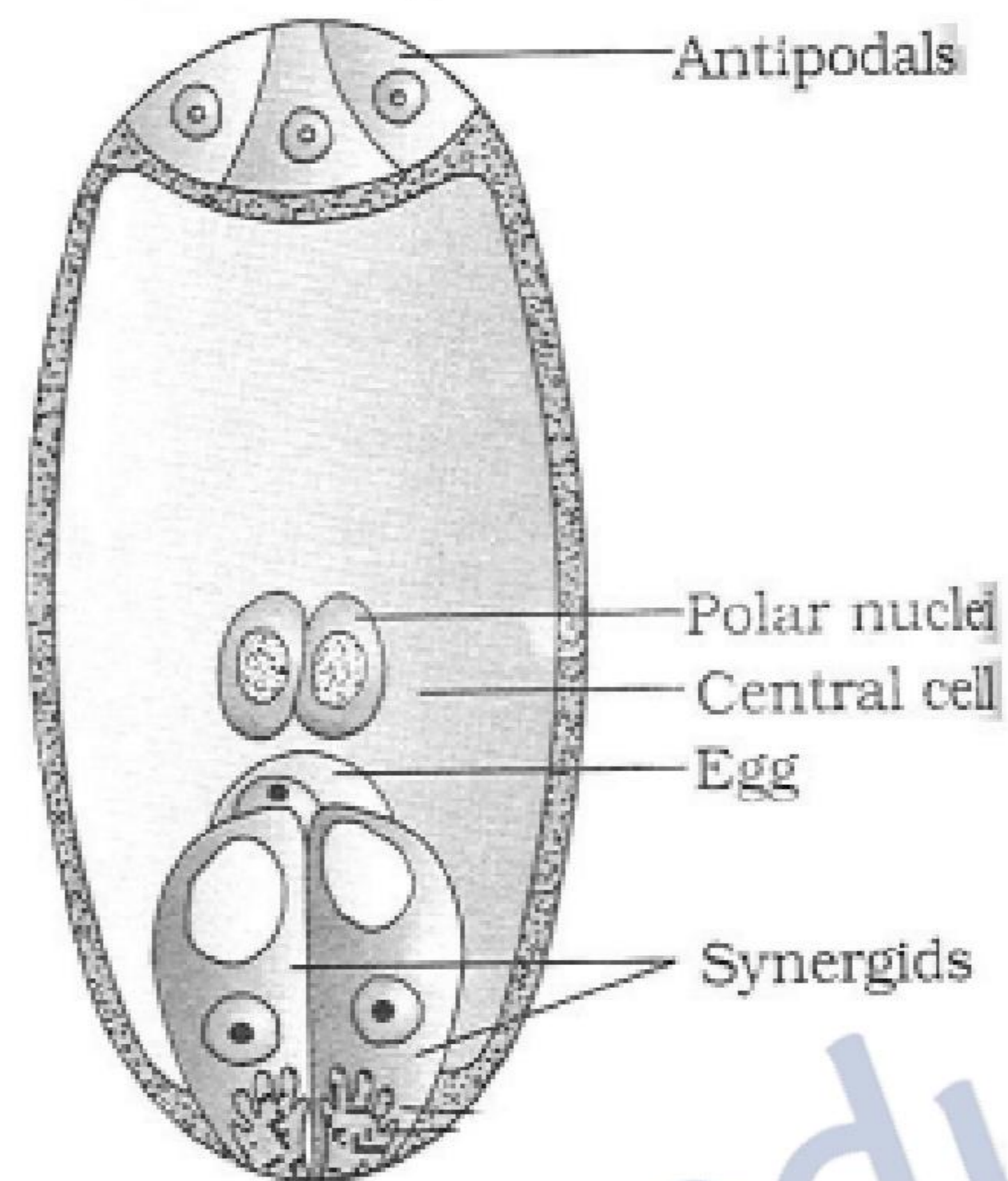
($\frac{1}{2} + 1 + \frac{1}{2} + 1$)

[3 Marks]

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12. (a) Draw a labelled sketch of a mature 7-celled, 8-nucleate embryo-sac.
 (b) Which one of the cell in an embryo-sac produces endosperm after double fertilization?

Ans. (a)



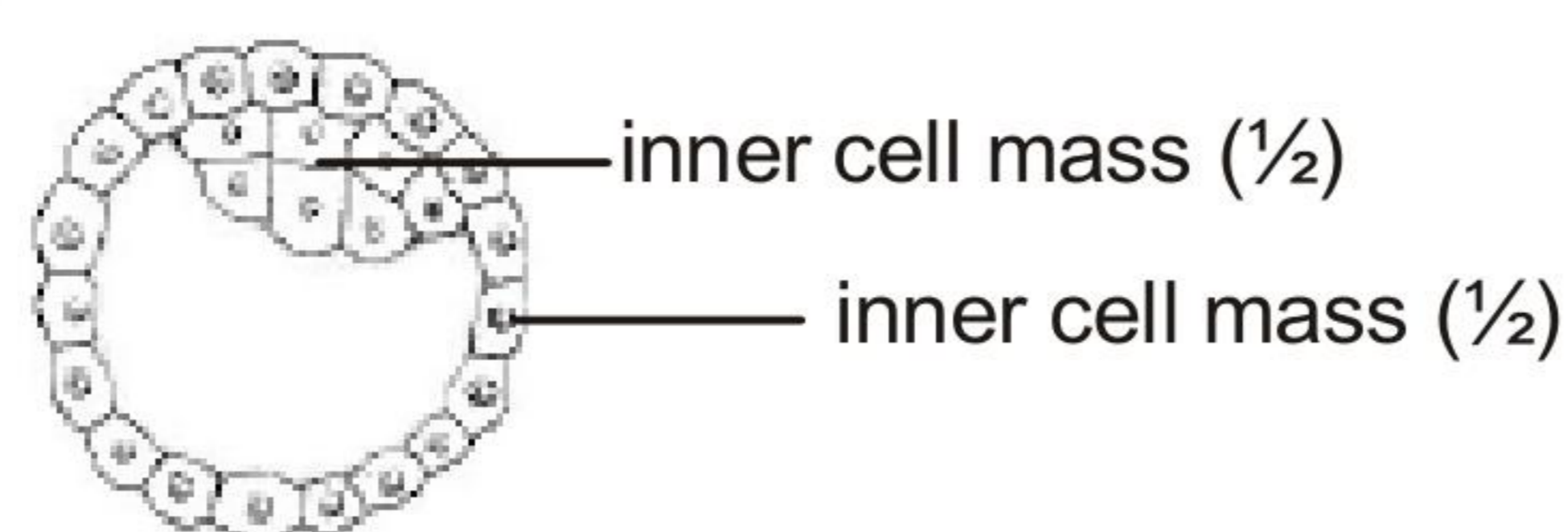
(b) Central cell = $\frac{1}{2}$

$$= \frac{1}{2} \times 5 = 2\frac{1}{2}$$

[3 Marks]

13. Draw a labelled diagram of the embryonic stage that get implanted in the human uterus. State the functions of the two parts labelled.

Ans.



-Trophoblast - helps in implantation / attachment to endometrium / attachment to uterus = 1

-Inner cell mass - gets differentiated into an embryo = 1

[3 Marks]

14. Where is an 'operator' located in a prokaryote DNA ? How does an operator regulate gene expression at transcriptional level in a prokaryote ? Explain.

Ans. The operator region is located adjacent to promoter elements / prior to structural gene = $\frac{1}{2}$

In regulation of gene expression

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switch off - the repressor binds to the operator region , & prevents transcription = $\frac{1}{2} + \frac{1}{2}$

switch on - In the presence of inducer the repressor is inactivated , (by the interaction with the inducer) and operator allows RNA polymerase access to the promoter , & transcription proceeds = $\frac{1}{2} \times 3$

[3 marks]

15. How does a restriction endonuclease help in DNA recombinant technology ?

Ans. Restriction endonuclease(EcoRI) inspects length of DNA and recognises specific palindromic nucleotide sequence , binds with DNA , cuts each of the two strands of double helix at specific points = 1×3

[3 Marks]

16 Human blood group is a good example of multiple allelism and co-dominance. Justify.

Ans. **Multiple allelism** : Generally in an individual / population , only two alleles of a trait govern the character , but in case of ABO blood group , three alleles I^A , I^B and i are found to govern blood group in human population = $\frac{1}{2} \times 4 = 2$

Co-dominance : Allele I^A and I^B when present in an individual , both being dominant express their own types of sugars / traits (no marks for the second step if two alleles are not given correctly) = $\frac{1}{2} \times 2 = 1$

[3 Marks]

17. Why does the 'insertional inactivation' method to detect recombinant DNA is preferred to 'antibiotic resistance' procedure?

Ans. The presence of a chromogenic substrate gives blue coloured colonies , in absence of an insert / in non-transformants , presence of an insert (in the enzyme site) , results into (insertional inactivation of the β -galactosidase) colonies which do not produce colour = $\frac{1}{2} \times 4$

Antibiotic resistance method requires duplicate plating / cumbersome procedure = 1

[3 Marks]

18. On a visit to a Hill station, one of your friend suddenly became unwell and felt uneasy.

(A) List two symptoms you would look for to term it to be due to allergy.

(B) Explain the response of the body to an allergen.

(C) Name two drugs that can be recommended for immediate relief.

Ans. (a) sneezing , watery eyes, running nose , difficulty in breathing (any two) = $\frac{1}{2} + \frac{1}{2}$

(b) body releases antibodies , IgE type = $\frac{1}{2} + \frac{1}{2}$

(c) Antihistamine , adrenalin , steroids (any two) = $\frac{1}{2} + \frac{1}{2}$

[3 Marks]

19. (a) Why did Hershey and Chase use radioactive sulfur and radioactive phosphorus in their experiment?

(b) Write the conclusion they arrived at and how.

Ans. (a) In order to label protein coat of virus with radioactive sulfur , label DNA with radioactive phosphorus = $\frac{1}{2} + \frac{1}{2}$

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- (b) Bacteria which were infected with viruses having radioactive DNA were found to contain radioactive DNA later on = $\frac{1}{2}$

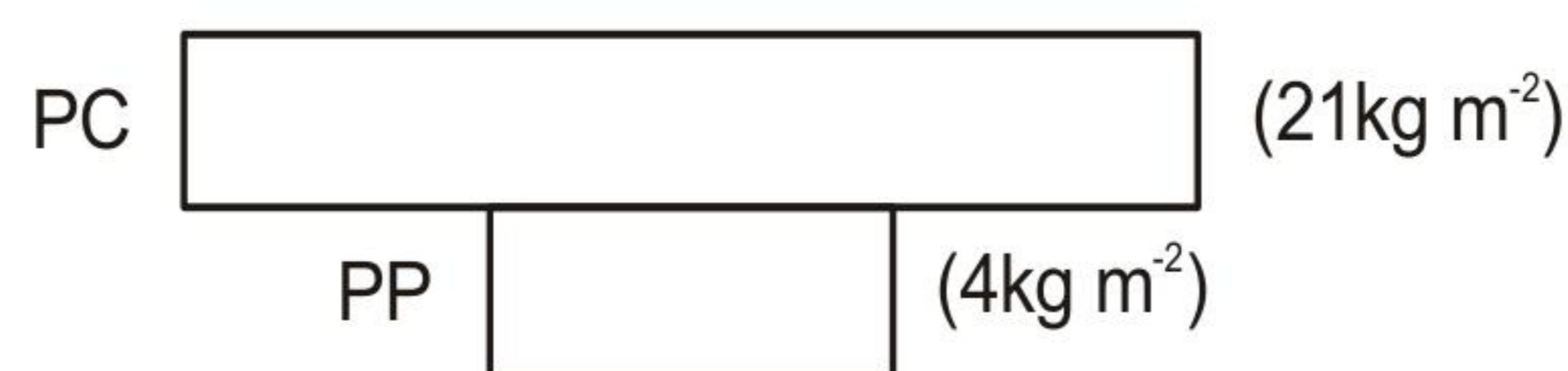
Bacteria which were infected with viruses having radioactive protein coat were not found to contain radioactivity = $\frac{1}{2}$

Conclusion - DNA is the genetic material = 1

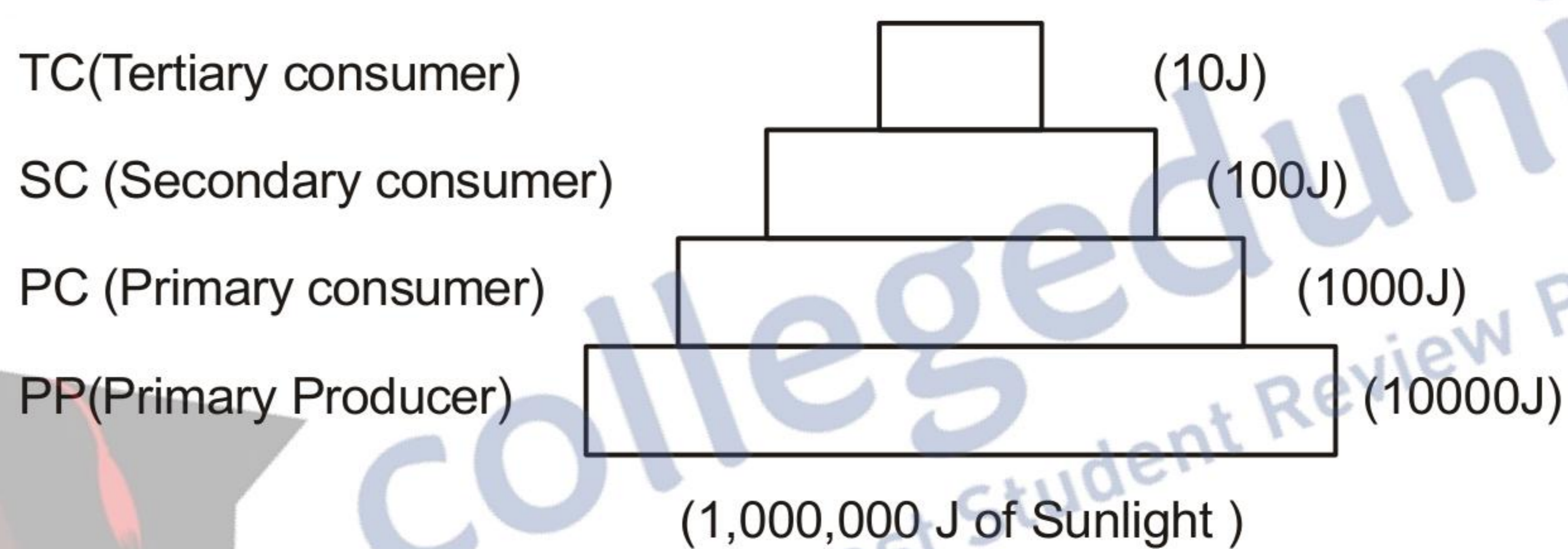
[3 Marks]

- 20 Draw a pyramid of biomass and pyramid of energy in sea. Give your comment on the type of pyramids drawn.

Ans.



Pyramid of biomass in sea = 1



Pyramid of energy in sea = 1

The pyramid of biomass in sea is inverted = $\frac{1}{2}$

The pyramid of energy in sea is upright = $\frac{1}{2}$

[3 Marks]

OR

- (a) Rearrange the following green house gases in increasing order of their relative contribution to the total global warming:

N_2O ; CFC; CO_2 ; C_2H_4 .

- (b) What is the effect of global warming on polar ice-caps? Comment on its possible ecological impact.

Ans. (a) $C_2H_4 \rightarrow N_2O \rightarrow CFC \rightarrow CO_2$ / $N_2O \rightarrow CFC \rightarrow CH_4 \rightarrow CO_2$ (Highest) = 1

Note - Ignore C_2H_4/CH_4 and give one mark for remaining three greenhouse gases if sequence is correct

- (b) (Global warming) \rightarrow Rise in Atmospheric temperature \rightarrow polar ice melts \rightarrow increase in sea level \rightarrow coastal land mass submerge = $\frac{1}{2} \times 4 = 2$

[3 Marks]

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21. **Co-evolution is a spectacular example of mutualism between an animal and a plant. Describe co-evolution with the help of an example.**

Ans. Fig & wasp = 1

The female wasp uses the fruit for oviposition / egg laying , uses seeds within the fruit (developing seeds) for nourishing its larvae , the wasp pollinates the fig inflorescence, the given fig species can be pollinated by its 'partner' wasp species & no other species = $\frac{1}{2} \times 4 = 2$

or any other correct example

[3 marks]

22. (a) **What is Gene therapy?**

(b) **Describe the procedure of such a therapy that could be a permanent cure for a disease. Name the disease.**

Ans. (a) (Collection of) methods that allows correction of gene defect that has been diagnosed in a child / embryo // Genes are inserted into a person's cells and tissues to treat a disease , this involves delivery of a normal gene into the individual / embryo to take over the function of and compensate for non-functional / a defective gene = 1

(b) If the desired gene is isolated and introduced into cells at early embryonic stages it can provide a permanent cure = 1

ADA/Adenosine deaminase deficiency = 1

[3 Marks]

Section – D

Q No. 23 is of four mark

23. **You have a friend whose parents are too indulgent in his/her daily affairs. They think him/her to be still young which makes him/her sad and is upset all the time. As he/she feels that the parents should give him/her opportunity to take independent decision on some issues.**

(a) **Would you support your friend and why ?**

(b) **Write the characteristics of this age group.**

(c) **List two curative measures.**

Ans. (a) Yes , because of peer understanding = $\frac{1}{2} + \frac{1}{2} = 1$

(b) Curious , adventurous , look for excitement , experimentation = $\frac{1}{2} \times 4 = 2$

(c) Avoid undue peer pressure / education & counselling / help from parents & peers / identifying the danger signs / professional and medical help or any other appropriate measures (**any two**) = $\frac{1}{2} + \frac{1}{2} = 1$

[4 Marks]



Section – E

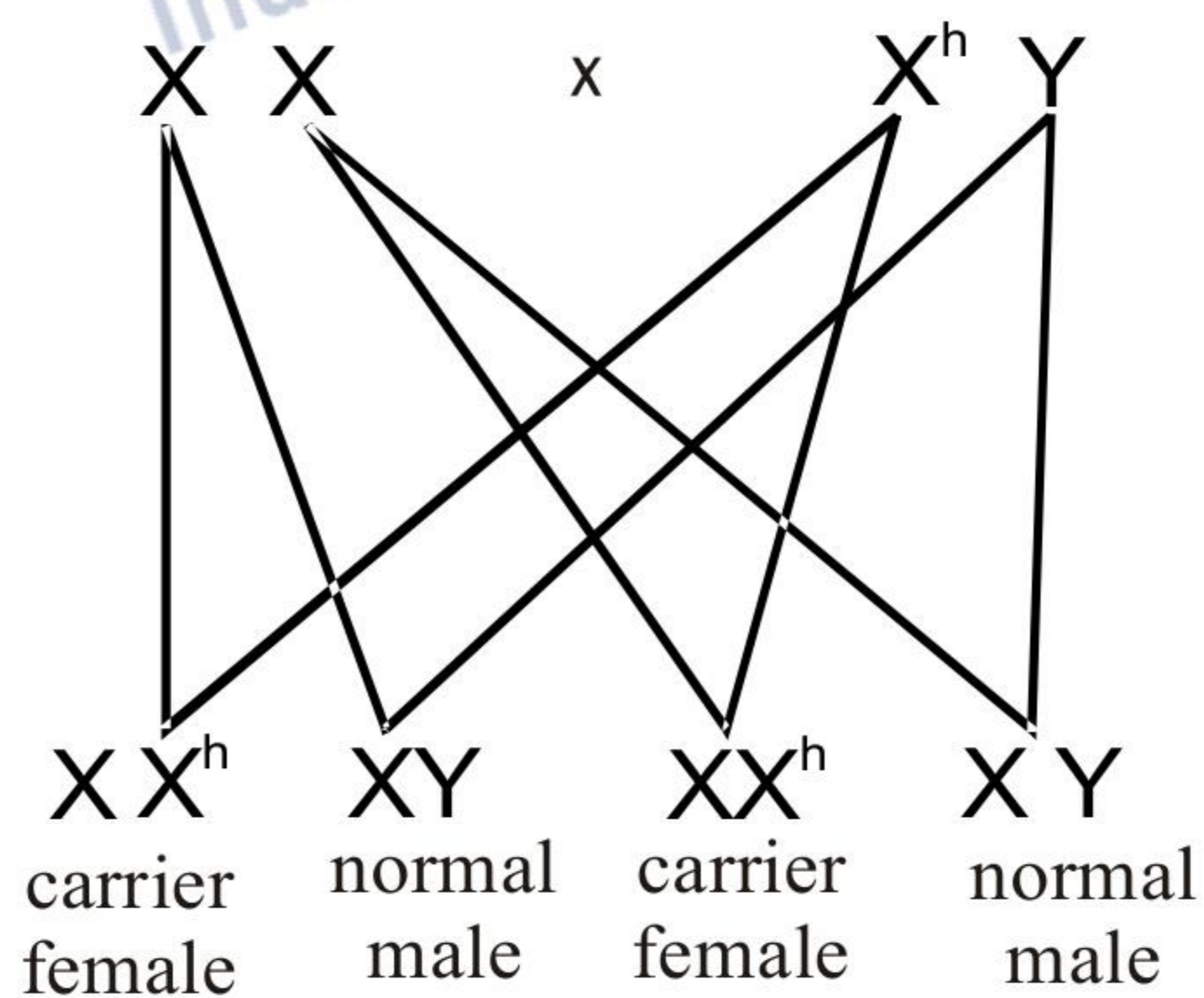
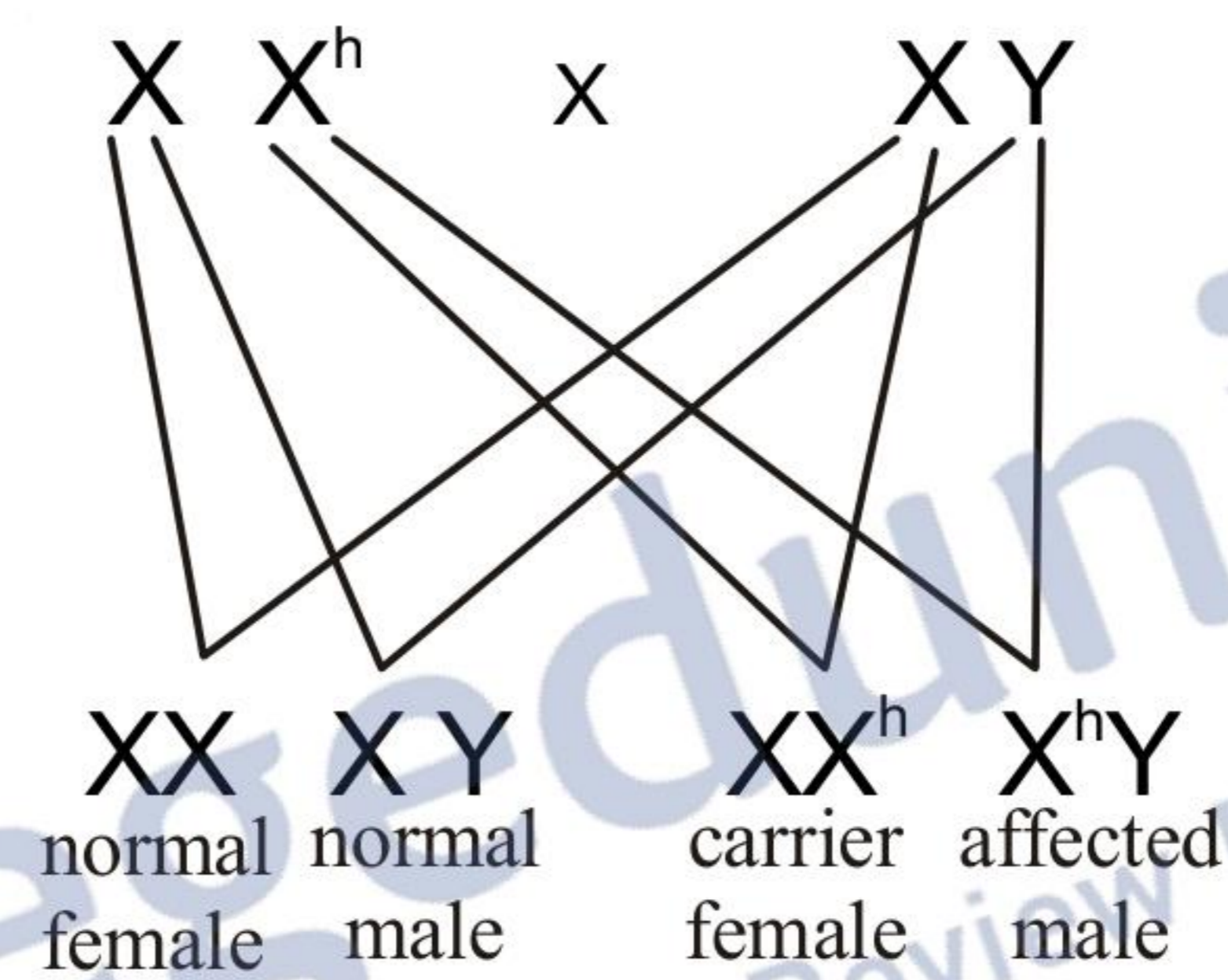
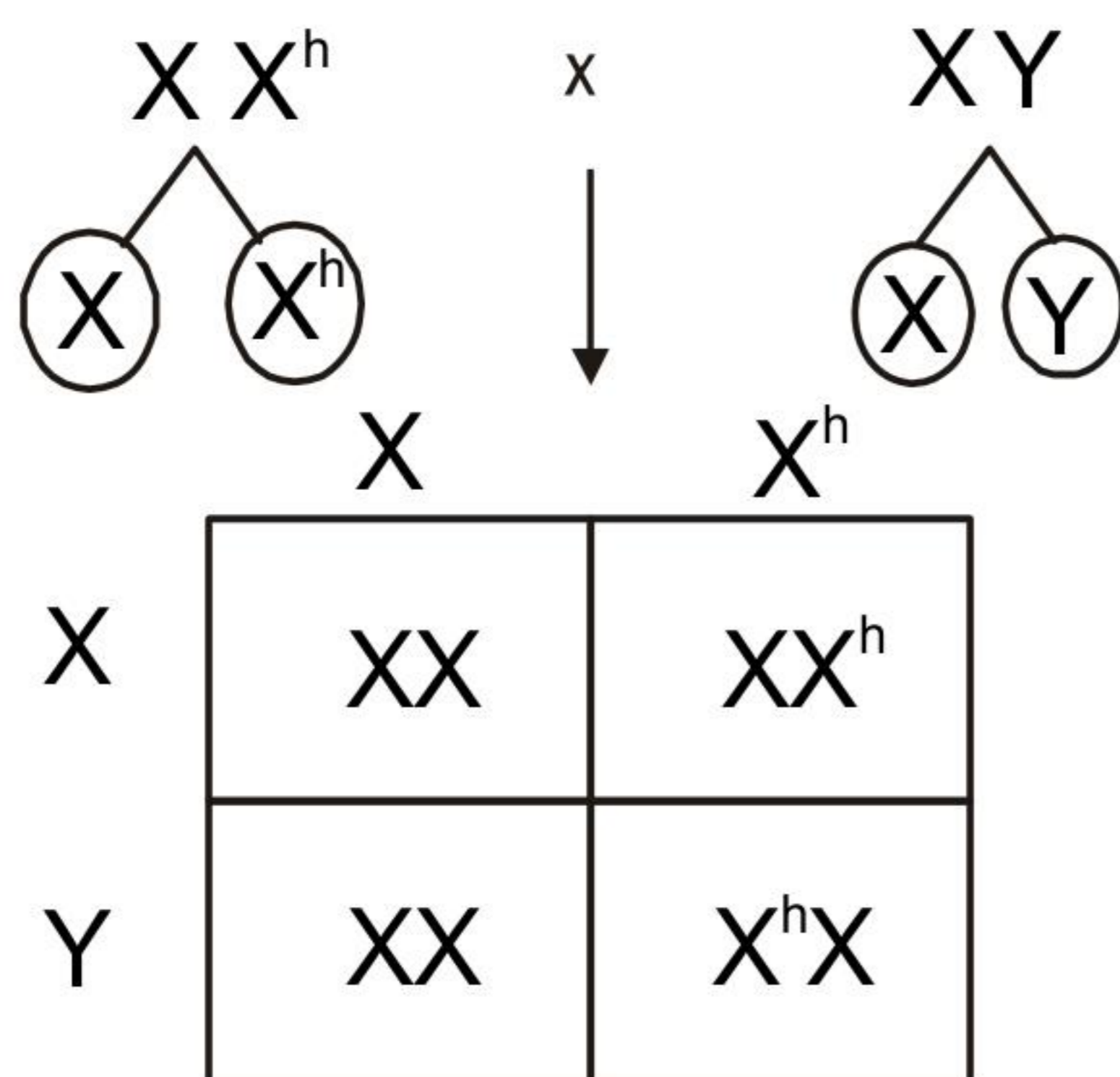
Q. Nos. 24 - 26 are of five marks each

24. **Thalassemia and haemophilia are both Mendelian disorders related to blood. Write the symptoms of the diseases. Explain with the help of crosses the difference in the inheritance pattern of the two diseases.**

Ans. Thalassemia - Anaemia = $\frac{1}{2}$

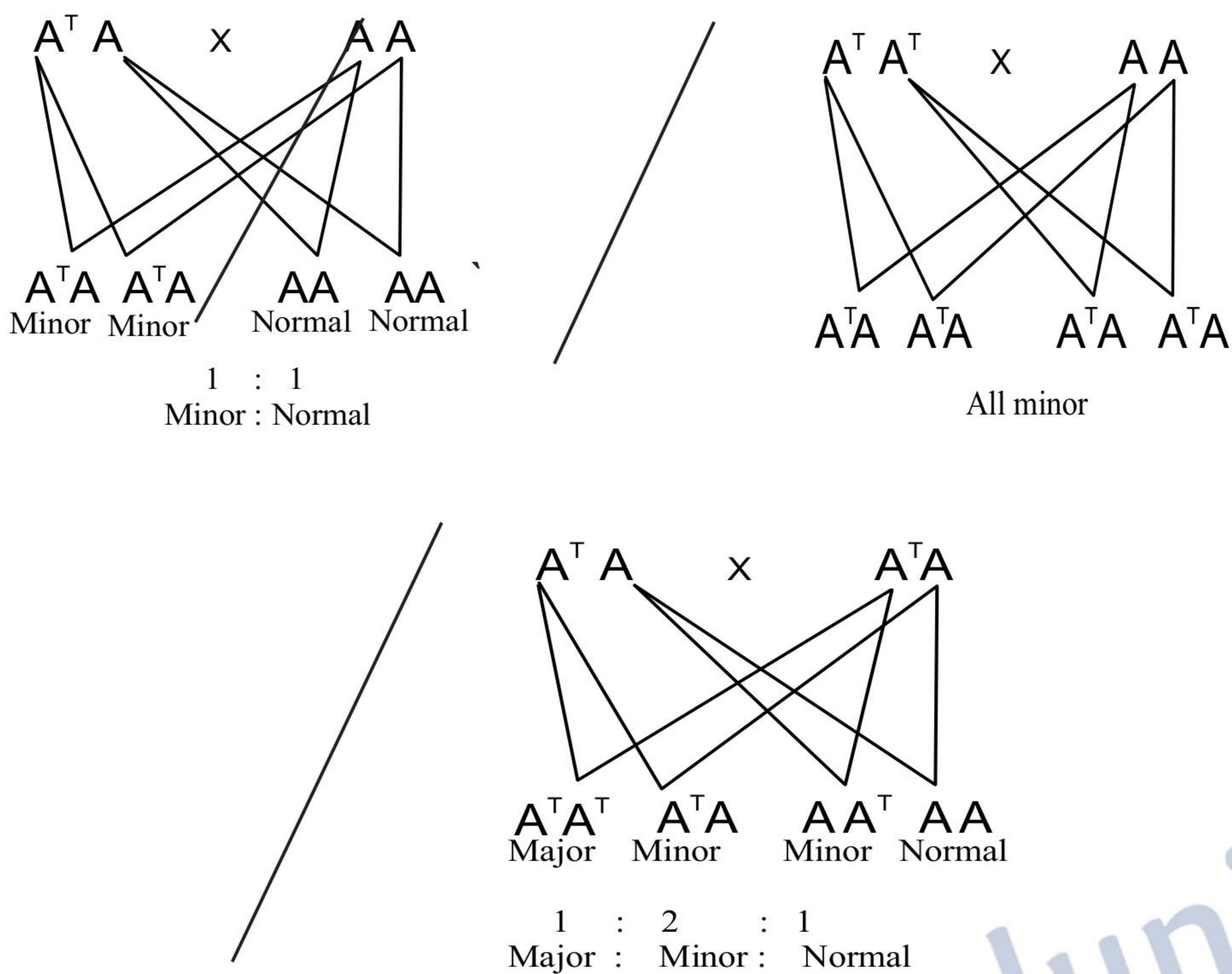
Haemophilia - Non stop bleeding = $\frac{1}{2}$

Haemophilia - Sex linked recessive disorder , is generally passed on from (carrier) mother to some of her sons / from affected father to daughter (carrier) = $\frac{1}{2} + \frac{1}{2}$



Note : - Any one cross , one mark to be given if the entire diagram (cross) is correct

Thalassemia - Autosome linked recessive blood disease , inheritance is like Mendelian inheritance pattern = $\frac{1}{2} + \frac{1}{2}$



Note : - Any one cross , one mark to be given if the entire diagram (cross) is correct

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

OR

- (a) What are fossils ? How are they an evidence for evolution ?
- (b) “Anthropogenic action can lead to evolution.” Explain with the help of an example.

Ans. (a) Fossil - remains / impression of hard parts of life-forms existed in past , found in rocks
 $= \frac{1}{2} + \frac{1}{2}$

study of fossils in different sedimentary layers indicates the geological periods in which they existed , and showed that life forms varied over time = 1 + 1

- (b) Excess use of herbicides & pesticides , in crop production , has resulted in selection of resistant varieties of pests , in a much lesser time scale // use of antibiotics or drugs , against microbes , leads to resistant organism , in lesser time scale = $\frac{1}{2} \times 4$

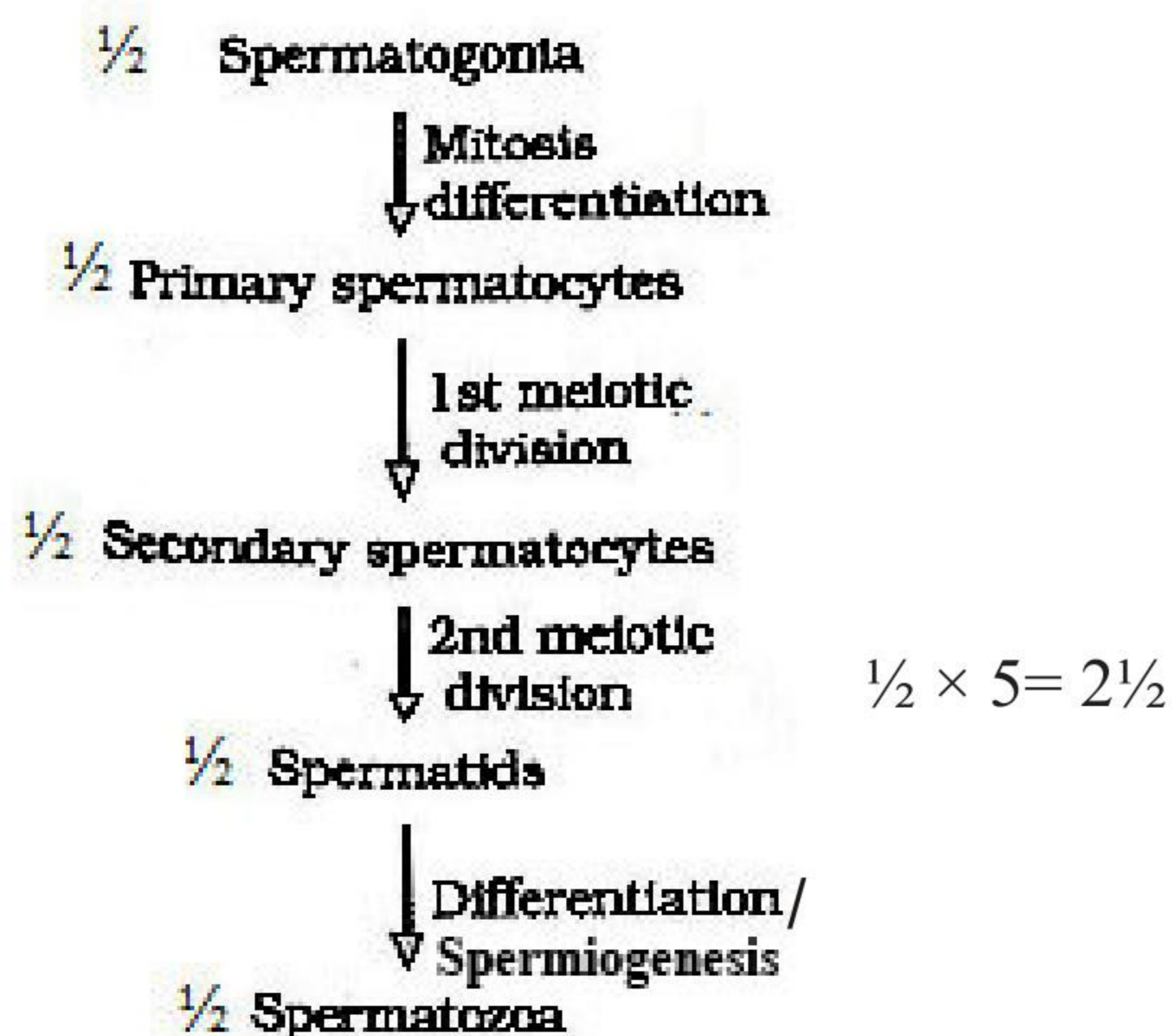
[5 Marks]

25. (a) Where does spermatogenesis occur in human testes ? Describe the process of spermatogenesis up to the formation of spermatozoa.



(b) Trace the path of spermatozoa from the testes upto the ejaculatory duct only.

Ans. (a) Seminiferous tubules = $\frac{1}{2}$



(b) Seminiferous tubules $\xrightarrow{\frac{1}{2}}$ rete testis $\xrightarrow{\frac{1}{2}}$ Vasa efferentia $\xrightarrow{\frac{1}{2}}$ Epididymis $\xrightarrow{\frac{1}{2}}$ vas deferens \rightarrow (ejaculatory duct)

[5 Marks]

OR

Explain the events upto fertilization that occur in a flower after the pollen grain has landed on its compatible stigma.

Ans. The pollen grain germinates, on the stigma to produce a pollen tube through one of the germ pores, the content of the pollen grain move into the pollen tube, pollen tube grows through the tissues of the stigma and style and reaches the ovary, the generative cell divides and forms two male gametes during the growth of pollen tube (in the stigma), the pollen tube enters the ovule through micropyle, and then enters one of the synergids (through filiform apparatus), the pollen tube releases the two male gametes (in the cytoplasm of synergids), one of the male gamete fuses with egg cell to form zygote (2n) (syngamy), the other male gamete fuses with two polar nuclei (in central cell) to form primary endosperm nucleus (PEN-3n)/PEC = $\frac{1}{2} \times 10$

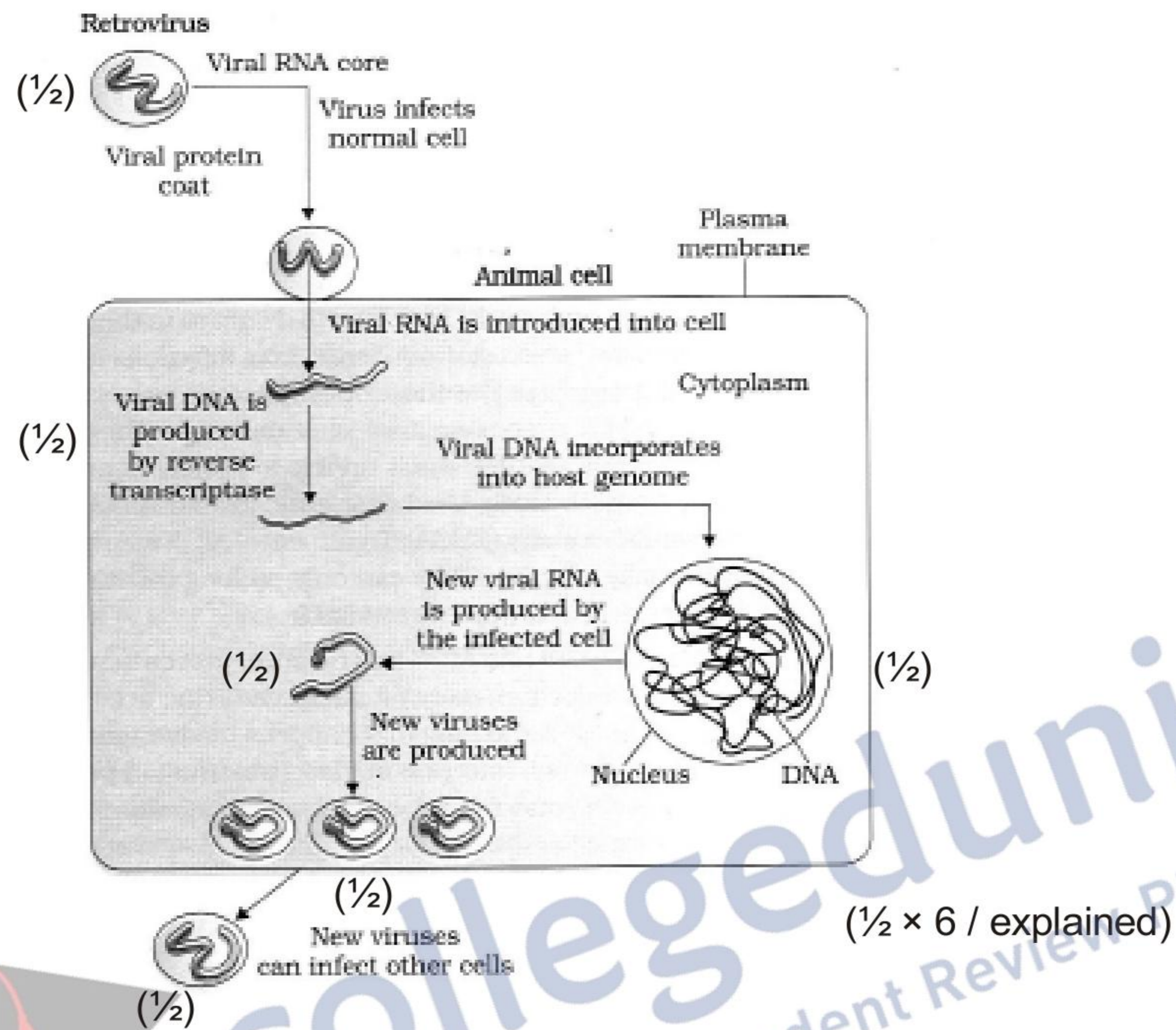
[5 Marks]

26. (a) How does a Human Immunodeficiency Virus (HIV) replicate in a host?



- (b) How does an HIV-infected patient lose immunity?
 (c) List any two symptoms of this disease.

Ans. (a)



(b) Loss of T-lymphocytes = 1

(c) Fever / diarrhoea / susceptibility to other diseases , prone to microbial infection (**any two**)
 = $\frac{1}{2} + \frac{1}{2}$

[5 Marks]

OR

Describe the process of waste- water treatment under the following heads:

- (a) Primary treatment.
 (b) Secondary treatment.

Ans. (a) Primary treatment

- Physical removal of particles through filtration , sedimentation in stages = $\frac{1}{2} + \frac{1}{2}$
- Solids settle to form primary sludge , the supernatants form the effluent = $\frac{1}{2} + \frac{1}{2}$

(b) Secondary Treatment

- Effluent passed into aeration tanks = $\frac{1}{2}$
- Vigorous growth of useful aerobic microbes into flocs = $\frac{1}{2}$
- Significant reduction of BOD = $\frac{1}{2}$

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- Effluent passed on to settling tanks where bacterial flocs settle to form activated sludge = $\frac{1}{2}$
- Activated sludge is passed on to anaerobic sludge digester , where bacteria and fungi are anaerobically digested = $\frac{1}{2} + \frac{1}{2}$

$$= \frac{1}{2} \times 10$$

[5 Marks]



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