

SECTION – A

1. In a bacterium when RNA-polymerase binds to the promoter on a transcription unit during transcription, it
- (a) terminates the process
  - (b) helps remove introns
  - (c) initiates the process
  - (d) inactivates the exons

Ans. (c) / initiates the process

[1 Mark]

2. The first cellular form of life evolved
- (a) in air
  - (b) on land
  - (c) in water environment
  - (d) in deep soil

Ans. (c) / in water environment

[1 Mark]

3. Mating of a superior male of a breed of a cattle to a superior female of another breed is called
- (a) in breeding
  - (b) out crossing
  - (c) out breeding
  - (d) cross breeding

Ans. (d) / cross breeding

[1 Mark]

OR

Large-holes in 'Swiss-Cheese' are due to

- (a) *Propionibacterium sharmanii*
- (b) *Saccharomyces cerevisae*
- (c) *Penicillium chrysogenum*
- (d) *Acetobacter aceti*

Ans. (a) / *Propionibacterium sharmanii*

[1 Mark]

4. Increased concentration of DDT in fish-eating birds is due to

- (a) eutrophication
- (b) bio-magnification
- (c) cultural eutrophication
- (d) accelerated eutrophication

Ans. (b) / bio-magnification

[1 Mark]

OR

Species-Area relationship is represented on a log scale as

- (a) hyperbola
- (b) rectangular hyperbola
- (c) linear
- (d) inverted

Ans. (c) / linear

[1 Mark]

5. Which one of the following part of the plant when put into the soil is likely to produce new offspring ?

- (a) Part of an internode
- (b) A stem cutting with a node
- (c) Part of a primary root
- (d) A flower

Ans. (b) / a stem cutting with a node

[1 Mark]

### SECTION - B

6. Name the Scientists and write how did they explain Mendel's laws after the chromosomes were discovered.

Ans. Walter Sutton , Theodore Boveri =  $\frac{1}{2} + \frac{1}{2}$

They noted that the behaviour of chromosomes was parallel , to the behaviour of genes (used chromosome movement during meiosis to explain Mendel's laws) =  $\frac{1}{2} + \frac{1}{2}$

[2 Marks]

7. State two advantages of an apomictic seed to a farmer.

Ans. There is no segregation of characters in apomictic seeds ,  
the farmers can keep on using the hybrid seeds to raise new crops year after year / desired varieties can be cultivated year after year ,  
hybrid characters can be preserved ,  
the farmers do not have to buy hybrid seeds every year  
*Any two* =  $1 \times 2$

[2 Marks]

8. List two diseases that spread through inhaling droplets or aerosols. Write one prominent symptoms for each one of them.

Ans. Pneumonia =  $\frac{1}{2}$  - fever / chills / cough / headache / in severe cases the lips and finger nails may turn gray to bluish in colour / severe problems in respiration (any one) =  $\frac{1}{2}$

Common cold =  $\frac{1}{2}$  - by nasal congestion and discharge / sore throat / hoarseness / cough / headache / tiredness (any one) =  $\frac{1}{2}$

Any other correct example with corresponding symptom to be evaluated

[2 Marks]

9. What makes humus a reservoir of nutrients? Name and write about the process humus undergoes that enriches the soil.

Ans. Being colloidal in nature it serves as a reservoir of nutrients ,

Mineralization , the humus is further degraded by some microbes , release of inorganic nutrients =  $\frac{1}{2} \times 4$

[2 Marks]

10. (a) Name the two techniques employed to meet the increasing demand of fish in the world.

(b) Name any two fresh water fishes.

Ans. (a) Aquaculture , Pisciculture =  $\frac{1}{2} \times 2$

(b) Catla / *Catla catla* , Rohu / *Labeo rohita* , Common Carp , *Clarias* / Magur , *Anabas* / Climbing Perch , Calbasu , Mrigal / *Cirrhina mrigala* , Singhara / *Mystus* , Singhi / *Hetrogneustes*

(Any two) =  $\frac{1}{2} \times 2$

[2 Marks]

OR

Describe the contributions of Alexander Fleming, Ernest Chain and Howard Florey in the field of microbiology.

Ans. (Alexander Fleming) - discovered antibiotic Penicillin , = 1

(Ernest Chain & Howard Florey) - its full potential as an effective antibiotic was established by them = 1

[1 + 1 = 2 Marks]

11. All cloning vectors do have a 'selectable marker'. Describe its role in recombinant DNA-technology.

Ans. It helps in identifying and eliminating non-transformants (non-recombinants) , and selectively permitting the growth of transformants (recombinants) =  $1 \times 2$

[2 Marks]

12. Mention how have plants developed mechanical and chemical defence against herbi-

**vores to protect themselves with the help of one example of each.**

Ans. Mechanical - By developing (modified) Thorns (which are means of defence) eg. Acacia / Cactus / any other appropriate example = 1

Chemical - by producing and storing poisonous chemicals / like cardiac glycosides / nicotine / caffeine / quinine / strychnine / opium / Calotropis has cardiac glycosides / any other appropriate example - provides defence against grazers / browsers = 1

**[2 Marks]**

### SECTION - C

**13. Explain 'Integrated organic' farming as successfully practiced by Ramesh C. Dagar, a farmer in Sonapat (Haryana).**

Ans. He includes bee-keeping / dairy management / water harvesting / composting / and agriculture in a chain of processes which support each other (any three) = 1½

Cattle excreta (dung) are used as manure / Crop waste is used to create compost / which can be used as a natural fertiliser / generate natural gas for satisfying the energy needs of the farm (any three) = 1½

**[1½ + 1½ = 3 Marks]**

**14. Explain three different modes of pollination that can occur in a chasmogamous flower.**

Ans. (Autogamy / Self pollination) - Pollination is achieved within the same flower / transfer of pollen grains from the anther to the stigma of the same flower = 1 //

(Geitonogamy) - Transfer of pollen grains from the anther to the stigma of another flower of the same plant = 1 //

(Xenogamy / Cross pollination) - Transfer of pollen grains from anther to the stigma of flowers of a different plant = 1 //

(Anemophily) - Transfer of pollen grains from anther to stigma of same / another flower through wind = 1 //

(Zoophily) - Transfer of pollen grains from anther to stigma of same / another flower through animals = 1 //

(Chiropterophily) - Transfer of pollen grains from anther to stigma of same / another flower through bats = 1 //

(Hydrophily) - Transfer of pollen grains from anther to stigma of same / another flower through water = 1 //

(Entomophily) - Transfer of pollen grains from anther to stigma of same / another flower through insects = 1 //

(Ornithophily) - Transfer of pollen grains from anther to stigma of same / another flower through birds = 1 //

(Malacophily) - Transfer of pollen grains from anther to stigma of same / another flower through snails = 1

(any three) = 1 × 3

**[1 × 3 = 3 Marks]**

**OR**

**Explain the formation of placenta after implantation in a human female.**

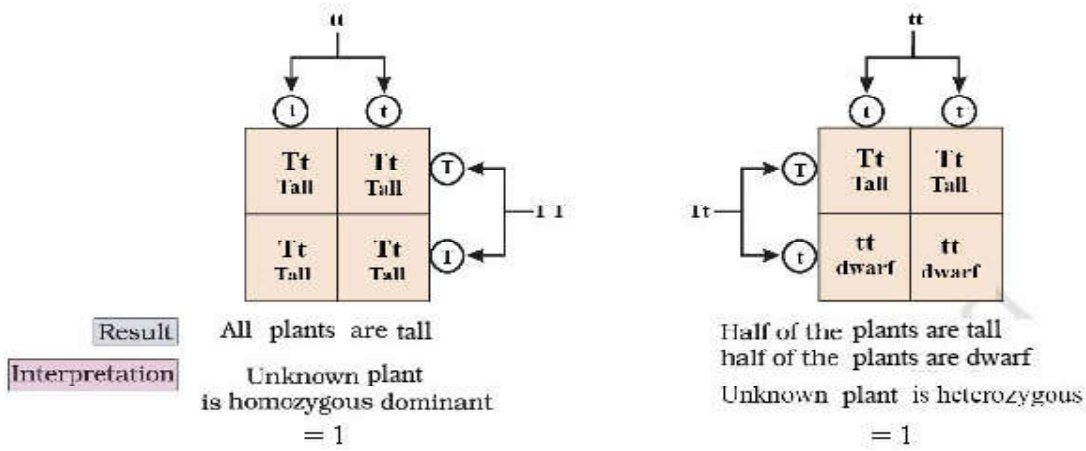
Ans. Trophoblast (of blastocyst) forms finger like projections / chorionic villi , which are surrounded by the uterine tissue and maternal blood , The chorionic villi and uterine tissue become interdigitated to form placenta = 1 × 3

[3 Marks]

**15. You are asked to find the genotypes of a tall pea plant growing in your school garden. Name the cross and explain how would you confirm the genotypes.**

Ans. Test cross = 1

The tall pea plant (growing in the school garden) should be crossed with a dwarf pea plant.



**16. What are ‘SNPs’ ? Where are they located in a human cell ? State any two ways the discovery of SNPs can be of importance to humans.**

Ans. SNPs - Single Nucleotide Polymorphism / locations where single base DNA differences occur in humans = 1

Location - human genome / human chromosome = 1

Importance - Finding chromosomal location for disease - associated sequences , and tracing human history = 1/2 × 2

[3 Marks]

**17. What is adaptive radiation ? Explain with the help of a suitable example.**

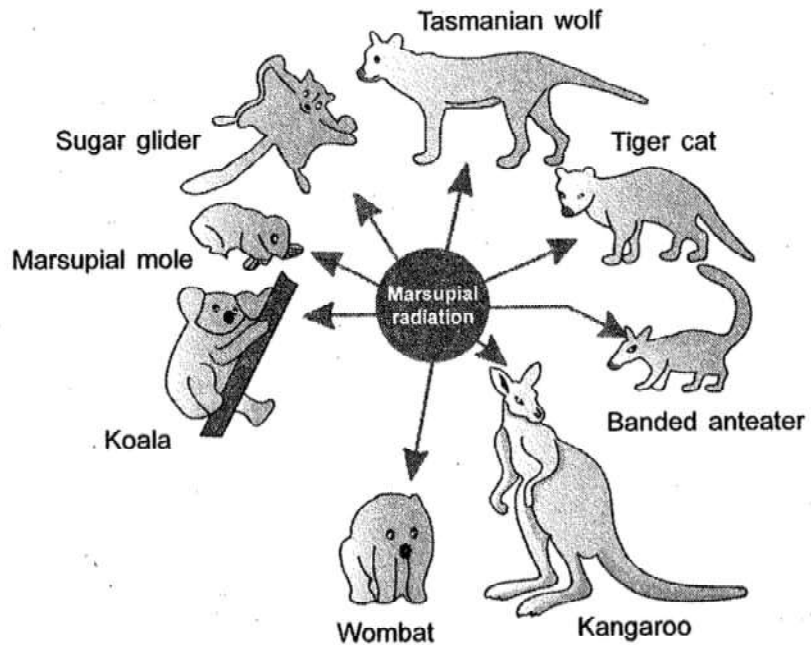
Ans. The process of evolution of different species in a given geographical area starting from a point and literally radiating to other areas of geography (habitats) is called adaptive radiation = 1

*Example -*

Small black bird / later called Darwin’s Finches in Galapagos island , from the original seed - eating features many other forms with altered beaks arose enabling them to become insectivorous and vegetarian finches = 1 × 2

//

A number of marsupials each different from the other , evolved from an ancestral stock but all within the Australian island continent = 1 × 2



//

Placental mammals in Australia also exhibit adaptive radiation, in evolving into varieties of such placental mammals each of which appears to be 'similar' to a corresponding marsupial (e.g., Placental wolf and Tasmanian wolf marsupial) =  $1 \times 2$



[1 + 2 = 3 Marks]

18. (a) Explain the mode of action of  $\text{Cu}^{++}$  releasing IUDs as a good contraceptive. How is hormone releasing IUD different from it ?
- (b) Why is 'Saheli' a preferred contraceptive by women (any two reasons) ? 3

Ans. (a)  $\text{Cu}^{++}$  releasing IUDs - Suppress sperm motility / suppress the fertilizing capacity of sperms = 1

Hormone releasing IUDs - Make the uterus unsuitable for implantation / the cervix hostile to the sperms = 1

(b) It is a 'once a week' pill / oral contraceptive / with very few side effects / high contraceptive value / non-steroidal / easy to use / not expensive (any two) =  $\frac{1}{2} \times 2$

[3 Marks]

19. (a) Explain why bee-hives are setup on the farms for some of our crop-species. Name any two such crop species.

(b) List any three important steps to be kept in mind for successful bee keeping.

Ans. (a) Increases pollination efficiency / improves the crop yield / increases honey yield =  $\frac{1}{2}$

Sunflower / *Brassica* / Apple / Pear / any other appropriate examples (any two) =  $\frac{1}{2} \times 2$

(b) Knowledge of the nature and habits of bees / Selection of suitable location for keeping the beehives / Catching and hiving of swarms (group of bees) / Management of beehives during different seasons / Handling and collection of honey and of beeswax (Any three) =  $\frac{1}{2} \times 3$

[3 Marks]

20. Explain the role of *Agrobacterium tumifaciens* in developing resistance in tobacco plant against nematode *Meloidogyne incognita*. Name the processes responsible for this.

Ans. Using *Agrobacterium* as a vector nematode specific gene were introduced into the host tobacco plant, the introduction of DNA was such that it produced both sense and antisense RNA in the host cell, the two RNA being complementary to each other formed a double stranded RNA (dsRNA), this prevents translation of mRNA / silencing of mRNA of parasite. =  $\frac{1}{2} \times 4$

RNA interference / RNAi = 1

[2 + 1 = 3 Marks]

21. Differentiate between "Pioneer-species"; "Climax-community" and "Seres". 3

Ans. Pioneer species - The species that invade a bare area = 1

Climax community - a community that is in near equilibrium with the environment / remains stable as long as the environment remains unchanged = 1

Sere - The entire sequence of communities that successively change in a given area = 1

[3 Marks]

**Explain any three ways other than zoological parks, botanical gardens and wildlife safaries, by which threatened species of plants and animals are being conserved 'ex situ'.**

- Ans. - Gametes of threatened species can be preserved in viable / fertile condition for long periods using cryopreservation techniques /
- eggs can be fertilized in vitro /
  - plants can be propagated using tissue culture methods /
  - Seeds of different genetic strains of commercially important plants can be kept for long periods in seed banks /
  - Storing semen / sperms in sperm bank /
  - pollen grains can be stored in pollen banks
- (any three) =  $1 \times 3$

**[3 Marks]**

#### **SECTION - D**

**22. Following a road accident four injured persons were brought to a nearby clinic. The doctor immediately injected them with tetanus antitoxin.**

- (a) What is tetanus antitoxin ?**
- (b) Why were the injured immediately injected with this antitoxin ?**
- (c) Name the kind of immunity this injection provided.**

- Ans. a) A preparation containing (pre-formed / readymade) antibodies to the toxin = 1
- b) To provide quick immune response / to neutralize or nullify the effect of the tetanus bacteria / pathogen = 1
- c) Passive immunity = 1

**[3 Marks]**

**23. "The population of a metro city experiences fluctuations in its population density over a period of time."**

- (a) When does the population in a metro city tend to increase ?**
- (b) When does the population in metro city tend to decline ?**
- (c) If 'N' is the population density at the time 't', write the population density at the time 't + 1'.**

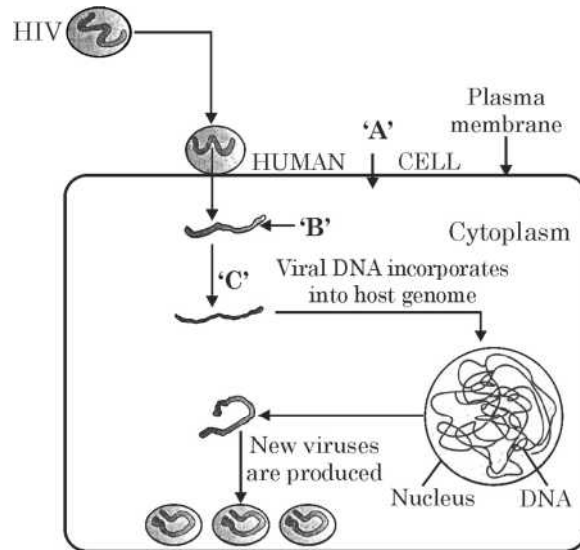
- Ans. (a) Number of births / Natality / Number of immigrants / (B+I) is more than the number of deaths / mortality / number of emigrants / (D+E) //
- Pre-reproductive population far exceeds reproductive population = 1
- (b) If number of deaths / mortality / number or emigrants / (D + E) is more than (B+I) //
- Pre-reproductive population is less than reproductive population = 1

(c)  $N_{t+1} = N_t + [(B+I) - (D+E)]$

(B = Natality , I = Immigration , D = Mortality , E = Emigration) = 1

[3 Marks]

24. Study the diagram showing the entry of HIV into the human body and the processes that are followed :



- (a) Name the human cell 'A' HIV enters into.  
 (b) Mention the genetic material 'B' HIV releases into the cell.  
 (c) Identify enzyme 'C'.

- Ans. (a) Macrophage  
 (b) RNA / viral RNA  
 (c) Reverse transcriptase

[1 × 3 = 3 Marks]

### SECTION - E

25. (a) Why did T.H. Morgan select *Drosophila melanogaster* for his experiments ?  
 (b) How did he disprove Mendelian dihybrid  $F_2$  phenotypic ratio of 9 : 3 : 3 : 1 ? Explain giving reasons.

- Ans. a) They could be grown on simple synthetic medium in the laboratory / they complete their life cycle in about two weeks / a single mating could produce a large number of progeny flies / there was a clear differentiation of the sexes - the male and female flies are easily distinguishable / it has many types of hereditary variations that can be seen with low power microscopes. (any 3) = 1 × 3  
 b) Morgan observed that genes of the traits closely linked on the same chromosome show

much less recombinant percentage, whereas genes of the traits loosely linked on the same chromosome showed higher recombinant percentage. (This proved deviation from  $9 : 3 : 3 : 1 = 1 + 1$ )

[3 + 2 = 5 Marks]

OR

- (a) List any four major goals of Human Genome project.
- (b) Write any four ways the knowledge from HGP is of significance for humans.
- (c) Expand BAC and mention its importance.

Ans. a) Some of the important goals of HGP were as follows:

- (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 4) =  $\frac{1}{2} \times 4$

b) Solving challenges in health care/ agriculture /energy production/ environmental remediation / diagnosed disorder / treat disorders / prevents disorders  
(any four) =  $\frac{1}{2} \times 4$

c) BAC - bacterial artificial chromosomes =  $\frac{1}{2}$

Used as vector for cloning of DNA fragments =  $\frac{1}{2}$

[2 + 2 + 1 = 5 Marks]

26. (a) Name the insect that attacks cotton crops and causes lot of damage to the crop. How has Bt cotton plants overcome this problem and saved the crop? Explain.

(b) Write the role of gene Cry IAb.

Ans. (a) (cotton) bollworms = 1

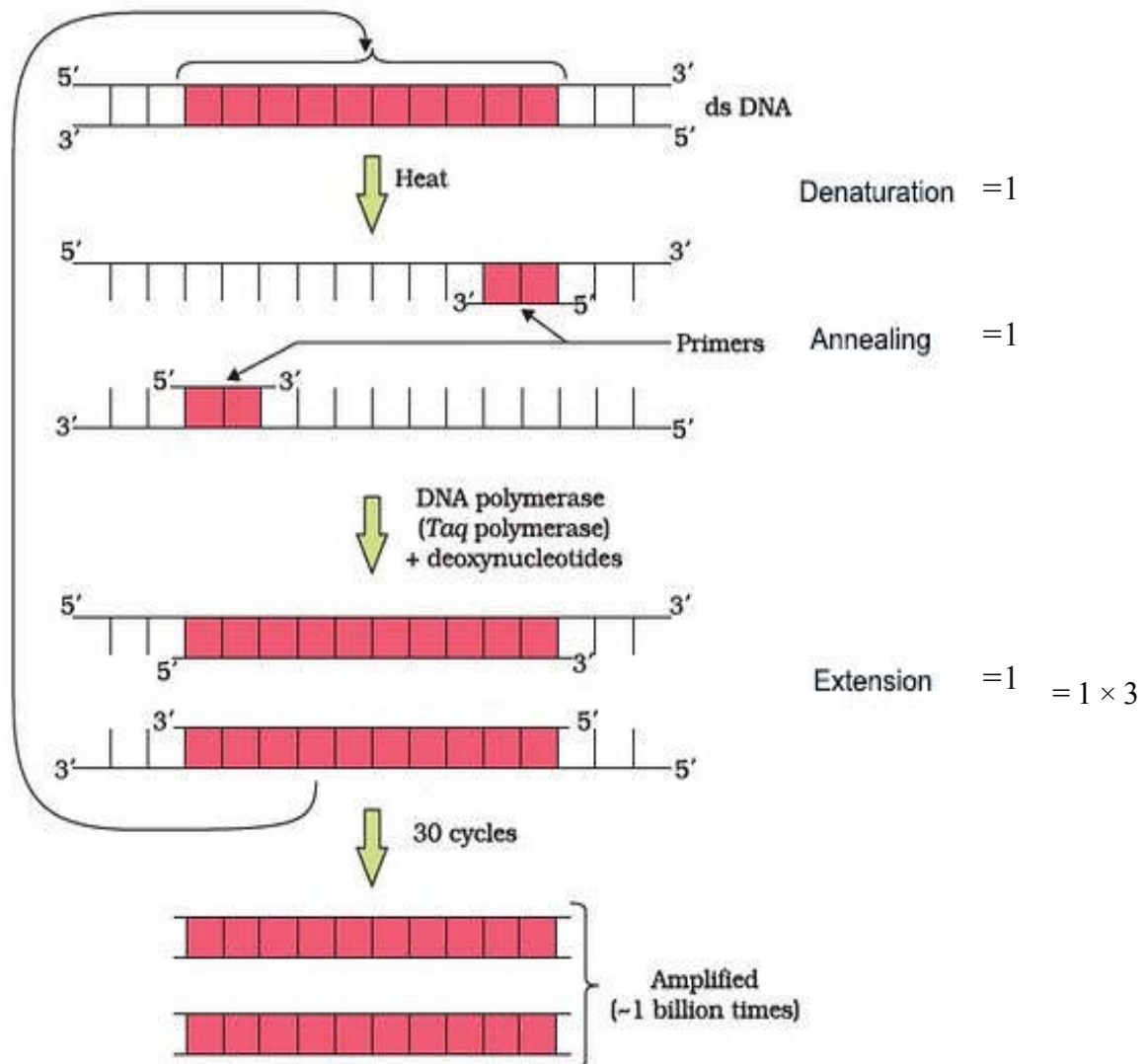
*B. thuringiensis* forms protein crystals (during a particular phase of their growth), these crystals contain a toxic insecticidal protein, the Bt toxin protein exist as inactive protoxins but once an insect ingest the inactive toxin, it is converted into an active form of toxin due to the alkaline pH of the gut which solubilise the crystal, the activated toxin binds to the surface of midgut epithelial cells and create pores, that cause cell swelling and lysis and eventually cause death of the insect =  $\frac{1}{2} \times 6$

b) cryIAb controls corn borer = 1 //

**Since the capital 'C' denotes protein (Cryprotein) and not the gene (cry gene), hence every student should be awarded 1 mark whether question is attempted or not attempted.**

OR

- (a) Explain the different steps carried out in Polymerase Chain Reaction, and the specific roles of the enzymes used.
- (b) Mention application of PCR in the field of
- (i) Biotechnology
  - (ii) Diagnostics



//

Explanation of different steps of PCR in lieu of the diagram can be evaluated

Enzyme DNA polymerase / Taq polymerase , the enzyme extends the primers using nucle-

otide provided in the reaction =  $\frac{1}{2} + \frac{1}{2}$

- (b) (i) Multiple copy of gene of interest can be made in vitro / gene amplification =  $\frac{1}{2}$   
(ii) Early detection of disease at a time when the symptoms are not yet visible // or the toxin is in low concentration / used to detect mutations in genes in suspected cancer patients / a powerful technique to identify many other genetic disorders =  $\frac{1}{2}$

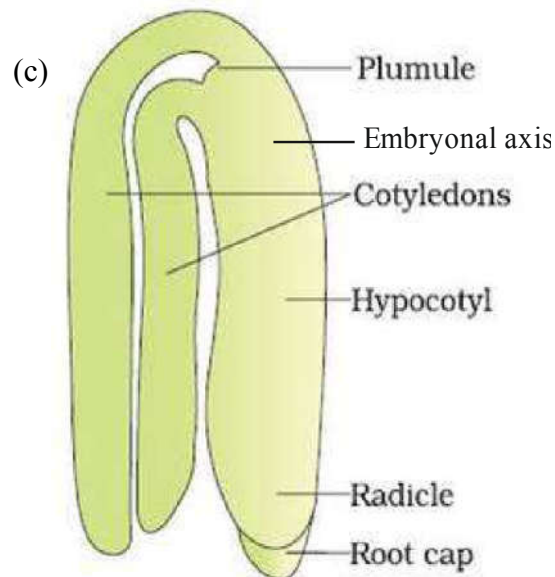
[4 + 1 = 5 Marks]

27. (a) Explain the process of syngamy and triple fusion in angiosperms.  
(b) Trace the development of the product of syngamy upto its mature stage in a dicot plant.  
(c) Draw and label three important parts of a mature dicot embryo.

Ans. (a) Fusion of the male gamete with the nucleus of the egg cell is called syngamy , this results in the formation of the diploid zygote =  $\frac{1}{2} + \frac{1}{2}$

Fusion of a male gamete with two polar nuclei , to produce triploid primary endosperm nucleus is called triple fusion =  $\frac{1}{2} + \frac{1}{2}$

- (b) The zygote divides mitotically at the micropylar end , (only after certain endosperm is formed) to give rise to proembryo , subsequently to mature embryo (globular and heart shaped) =  $\frac{1}{2} \times 3$



any three labels =  $\frac{1}{2} \times 3$

[5 Marks]

OR

Name the gonadotropins in human. Explain their role in human male and female,

**respectively.**

Ans. Gonadotropins - luteinising hormone (LH), follicle stimulating hormone (FSH) =  $\frac{1}{2} + \frac{1}{2}$   
In males: LH acts on the Leydig cells , stimulates synthesis and secretion of androgens / testosterone, FSH acts on the Sertoli cells , stimulates secretion which help in the process of spermiogenesis

In females : FSH stimulates follicular development / secretes estrogen , LH surge , induces rupture of Graafian follicle , to release of ovum / ovulation =  $\frac{1}{2} \times 8$

**[1 + 4 = 5 Marks]**