Senior School Certificate Examination-2020
Marking Scheme – BIOLOGY (SUBJECT CODE - 044)
(PAPER CODE – 57/5/1,2,3)

General Instructions: -

1. You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested that before starting evaluation, you must read and understand the spot evaluation guidelines carefully.**Evaluation is a 10-12 days mission for all of us. Hence, it is necessary that you put in your best efforts in this process.**

2. Evaluation is to be done as per instructions provided in the Marking Scheme. It should not be done according to one's own interpretation or any other consideration. Marking Scheme should be strictly adhered to and religiously followed. **However, while evaluating, answers which are based on latest information or knowledge and/or are innovative, they may be assessed for their correctness otherwise and marks be awarded to them.**

3. The Head-Examiner must go through the first five answer books evaluated by each evaluator on the first day, to ensure that evaluation has been carried out as per the instructions given in the Marking Scheme. The remaining answer books meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.

4. Evaluators will mark(√) wherever answer is correct. For wrong answer 'X"be marked. Evaluators will not put right kind of mark while evaluating which gives an impression that answer is correct and no marks are awarded. **This is most common mistake which evaluators are committing.**

5. If a question has parts, please award marks on the right-hand side for each part. Marks awarded for different parts of the question should then be totaled up and written in the left-hand margin and encircled. This may be followed strictly.

6. If a question does not have any parts, marks must be awarded in the left-hand margin and encircled. This may also be followed strictly.

7. If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out.

8. No marks to be deducted for the cumulative effect of an error. It should be penalized only once.

9. A full scale of marks 0-70 has to be used. Please do not hesitate to award full marks if the answer deserves it.

10. Every examiner has to necessarily do evaluation work for full working hours i.e. 8 hours every day and evaluate 20 answer books per day in main subjects and 25 answer books per day in other subjects (Details are given in Spot Guidelines).

11. Ensure that you do not make the following common types of errors committed by the Examiner in the past:-
    * Leaving answer or part thereof unassessed in an answer book.
    * Giving more marks for an answer than assigned to it.
    * Wrong totaling of marks awarded on a reply.

- Wrong transfer of marks from the inside pages of the answer book to the title page.
- Wrong question wise totaling on the title page.
- Wrong totaling of marks of the two columns on the title page.
- Wrong grand total.
- Marks in words and figures not tallying.
- Wrong transfer of marks from the answer book to online award list.
- Answers marked as correct, but marks not awarded. (Ensure that the right tick mark is correctly and clearly indicated. It should merely be a line. Same is with the X for incorrect answer.)
- Half or a part of answer marked correct and the rest as wrong, but no marks awarded.

12. While evaluating the answer books if the answer is found to be totally incorrect, it should be marked as cross (X) and awarded zero (0)Marks.

13. Any unassessed portion, non-carrying over of marks to the title page, or totaling error detected by the candidate shall damage the prestige of all the personnel engaged in the evaluation work as also of the Board. Hence, in order to uphold the prestige of all concerned, it is again reiterated that the instructions be followed meticulously and judiciously.

14. The Examiners should acquaint themselves with the guidelines given in the Guidelines for spot Evaluation before starting the actual evaluation.

15. Every Examiner shall also ensure that all the answers are evaluated, marks carried over to the title page, correctly totaled and written in figures and words.

16. The Board permits candidates to obtain photocopy of the Answer Book on request in an RTI application and also separately as a part of the re-evaluation process on payment of the processing charges

SECTION – A

1. 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]

2. 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]

3. The hypothesis that "Life originated from non-living organic pre-existing molecules was proposed by

    (a)   Oparin and Haldane

    (b)   Louis Pasteur

    (c)   S.L. Miller

    (d)   Hugo de Vries

Ans. (a) / Oparin and Haldane

[1 Mark]

4. 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]

5.   **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]

SECTION –B

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

6.   **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 × 2

[2 Marks]

7.   **Explain when is a genetic code said to be**

    (a)   Degenerate

    (b)   Universal

Ans. (a)   Some amino acids are coded by more than one codon / explained with any correct
example = 1

4

(b)   A particular codon codes for the same amino acid in all organisms / as an example from bacteria to human UUU would code for phenylalanine (Phe) / any other correct example = 1

[2 Marks]

8.   Differentiate between opioids and cannabinoids on the basis of their

(a)   specific receptor site in human body.

(b)   mode of action in human body.

	Opioids	**Cannabinoids**
a.	central nervous system / gastrointestinal tract	Brain = 1
b.	depressant /slows down body functions / sedative / pain killer	effects on cardiovascular system of the body functions /analgesic / increased muscle strength / increased performance in sports persons / hallucinogen =1

[1 + 1 = 2 Marks]

9   (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 = ½ × 2

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

(*Any two*) = ½ × 2

[2 Marks]

OR

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

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

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

[1 + 1 = 2 Marks]

10.   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 × 2

[2 Marks]

11 **Mention how have plants developed mechanical and chemical defence against herbivores 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]

12. **Name and explain the processes earthworm and bacteria carry on detritus.**

Ans. (Earthworm) - breaks down detritus into smaller particles , fragmentation = ½ × 2

(Bacteria) - (Enzymes of it) break down detritus into simple inorganic substances , catabolism / mineralization = ½ × 2

[2 Marks]

SECTION - C

13. **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]

14. **State Mendel's law of dominance. How did he deduce the law ? Explain with the help of a suitable example.**

Ans. Factors (characters are controlled by discrete units called factors) which occur in pairs , in a dissimilar pair of factors / heterozygous one member of a pair dominates (dominant) the other (recessive) = $½ \times 2$

In a cross between tall (TT) plant and dwarf (tt) plant , tall trait appears in F1 , tallness and dwarfness appear in F2 , in the ratio 3 : 1 = $½ \times 4$

// In lieu of the above explanation any other typical monohybrid cross till F2 generation can be considered.

[1 + 2 = 3 Marks]

15. **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 = $½ \times 2$

[3 Marks]

16. (a) **State what does the study of Fossils indicate.**

(b) **Rearrange the following group of plants according to their evolution from Palaeozoic to Cenozoic periods :**

Rhynia; Arborescent Lycopods; Conifers; Dicotytedon.

Ans. (a) They are an evidence of evolution / they indicate common ancestry / they represent extinct organisms / which existed in different geological period / life forms varied over time and certain life forms were restricted to certain geological time spans / new forms of life have arisen at different times in the history of earth (any two) = 1 + 1

(b) <u>Rhynia → Arborescent Lycopods</u> → Conifers → Dicotyledon
                       ½   ½

// if a student writes given sequence is correct = 1

[3 Marks]

17. (a) **Explain the mode of action of 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) ?**

Ans. (a) 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) = ½ × 2

[3 Marks]

18. **(a)** **Explain why bee-hives are set up 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 = ½

Sunflower / *Brassica* / Apple / Pear/ any other appropriate examples (any two) = ½ × 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) = ½ × 3

[3 Marks]

19. **Why GMOs are so called ? List the different ways in which GMO plants have benefitted and have become useful to humans.**

Ans. Plants / bacteria / fungi / animals whose genes have been altered by manipulation are called Genetically Modified Organisms (GMO) = 1

(i) Made crops more tolerant to abiotic stresses (cold / drought / salt / heat) /

(ii) Reduced reliance on chemical pesticides (pest-resistant crops) /

(iii) Helped to reduce post harvest losses /

(iv) Increased efficiency of mineral usage by plants (this prevents early exhaustion of fertility of soil) /

(v) Enhanced nutritional value of food, e.g., Vitamin 'A' enriched rice /

(vi) To create tailor-made plants to supply alternate resources to industries (in the form of starch / fuels / pharmaceuticals)

Any other correct beneficial uses of genetically modified bacteria / fungi / animals to be evaluated

(any four) = ½× 4

[1 + 2 = 3 Marks]

20. **Differentiate between "Pioneer-species"; "Climax-community" and "Seres".**

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]

OR

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 × 3

[3 Marks]

21. **Explain 'Integrated organic' farming as successfully practiced by Ramesh C. Dagar, a farmer in Sonepat (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]

SECTION - D

22. **Study the diagram showing the entry of HIV into the human body and the processes that are followed :**
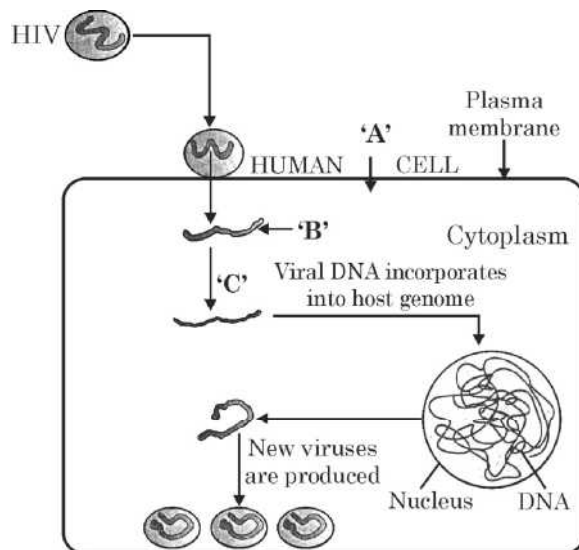
(a) **Name the human cell 'A' HIV enters into.**

(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]

23. **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]

24. **"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]

SECTION - E

25. **(a)** Describe the process of megasporogenesis, in an angiosperm.

(b) Draw a diagram of a mature embryo sac of angiosperm, label its any six parts.

Ans. (a) The MMC in the nucellus undergoes meiotic division , results in the production of four megaspores , one of the megaspores is functional , while the other three degenerate = ½ × 4

(b)
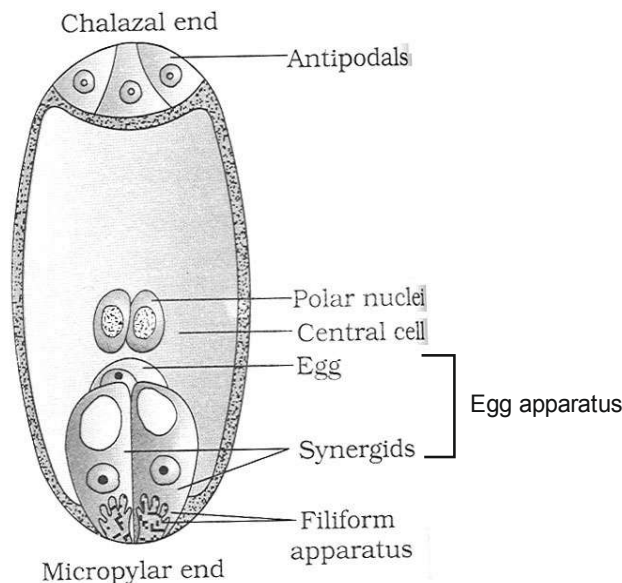
(any 6 correct labels) = ½ × 6

OR

(a) Where and how in the testes process of spermatogenesis occur in humans.

(b) Draw diagram of human sperm and label four parts.

Ans. (a) Seminiferous Tubules = ½

The spermatogonia multiply by mitotic division to form primary spermatocytes , which undergo meiosis leading to formation of two equal (haploid) cells called secondary spermatocytes , The secondary spermatocytes undergo the second meiotic division to produce four (equal haploid) spermatids , The spermatids are transformed into spermatozoa (sperms) by the process called , spermiogenesis = ½ × 5

//
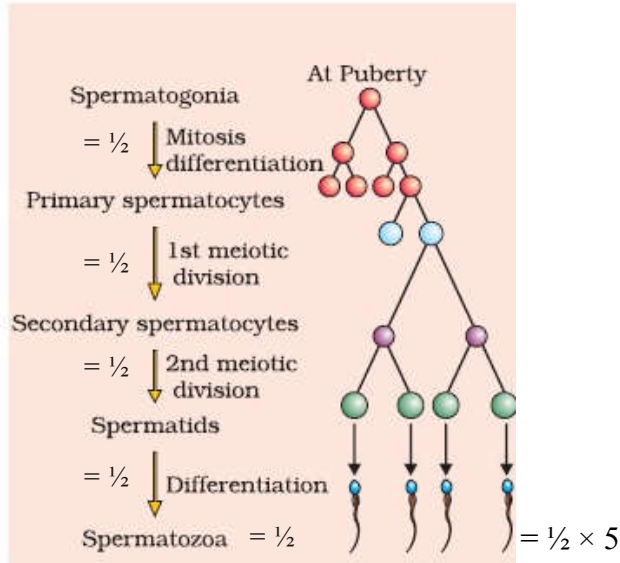
(b)
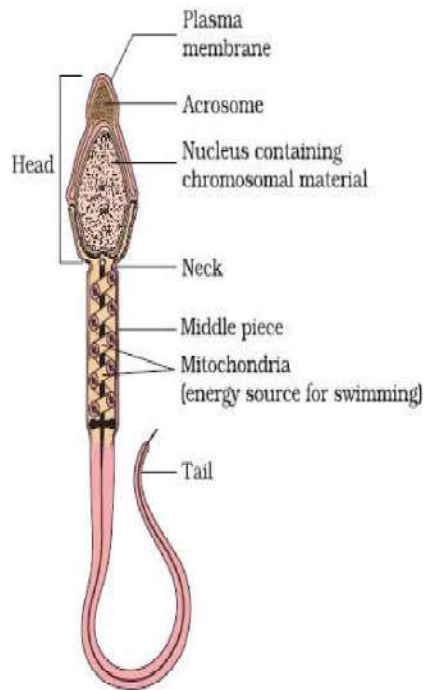
Any four correct labels = ½ × 4

[3 + 2 = 5 Marks]

26. **(a)** **Why did T.H. Morgon select <u>Drosophila</u> <u>melanogaster</u> 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) = ½ × 4

b) Solving challenges in health care/ agriculture /energy production/ environmental remediation / diagnosed disorder / treat disorders / prevents disorders (any four) = ½ × 4

c) BAC - bacterial artificial chromosomes = ½

Used as vector for cloning of DNA fragments = ½

[2 + 2 + 1 = 5 Marks]

27. **(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 = ½ × 6

b) crylAb 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

Ans. (a)

5' 3' ds DNA

Heat — Denaturation =1

5' 3'

Primers — Annealing =1

5' 3'

DNA polymerase (Taq polymerase) + deoxynucleotides

5' 3'

Extension =1

3' 5'

= 1 × 3

30 cycles

Amplified (~1 billion times)

//

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 nucleotide provided in the reaction = ½ + ½

(b) (i) Multiple copy of gene of interest can be made in vitro / gene amplification = ½

(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 = ½

[4 + 1 = 5 Marks]

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]

16

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

<div align="right">

[1 Mark]

</div>

<div align="center">

OR

</div>

   Species-Area relationship is represented on a log scale as

   (a)   hyperbola

   (b)   rectangular hyperbola

   (c)   linear

   (d)   inverted

Ans. (c) / linear

<div align="right">

[1 Mark]

</div>

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

<div align="right">

[1 Mark]

</div>

<div align="center">

SECTION - B

</div>

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

Ans. Walter Sutton , Theodore Boveri = ½ + ½

   They noted that the behaviour of chromosomes was parallel , to the behaviour of genes (used chromosome movement during meiosis to explain Mendel's laws) = ½ + ½

<div align="right">

[2 Marks]

</div>

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 × 2

<div align="right">

[2 Marks]

</div>

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

Ans. Pneumonia = ½ - 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) = ½

Common cold = ½ - by nasal congestion and discharge / sore throat / hoarseness / cough / headache / tiredness (any one) = ½

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 = ½ × 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 = ½ × 2

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

        (*Any two*) = ½ × 2

[2 Marks]

OR

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

Ans. (Alexander Fleming) - discoverd 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 × 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 Sonepat (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 $= 1 \times 3$

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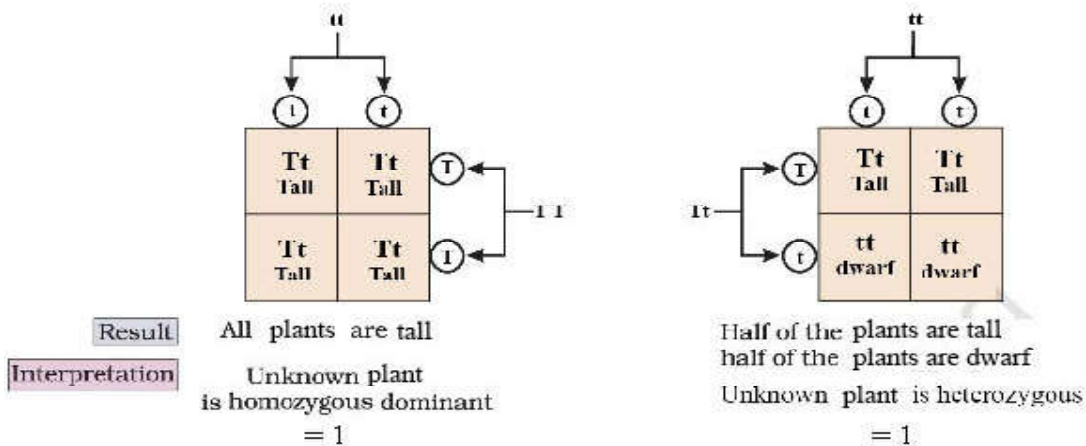
16. **What are 'SNPs' ? Where are they located in a human cell ? State any two ways the discovery of SNPs can be of importance to humans.**

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

[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 $= 1 \times 2$
//
A number of marsupials each different from the other , evolved from an ancestral stock but all within the Australian island continent $= 1 \times 2$

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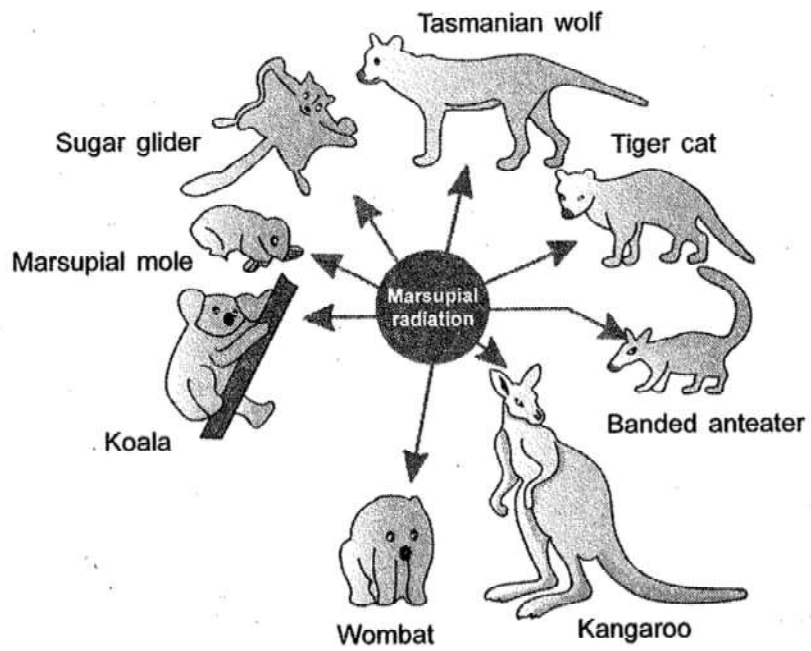
Placental mammals in Australia also exhibit adaptive radiation , in evolving into varieties of such placental mammals each of which appears to be 'similar' to a corresponding marsupial (e.g., Placental wolf and Tasmanian wolf marsupial) = 1 × 2

[1 + 2 = 3 Marks]

18. (a) Explain the mode of action of 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) 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) = ½ × 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 = ½

Sunflower / *Brassica* / Apple / Pear/ any other appropriate examples (any two) = ½ × 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) = ½ × 3

[3 Marks]

20. **Explain the role of *Agrobacterium tumifacience* in developing resistance in tobacco plant against nematode *Meloidegyne incognitia*. 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. = ½ × 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]

OR

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 × 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 :**
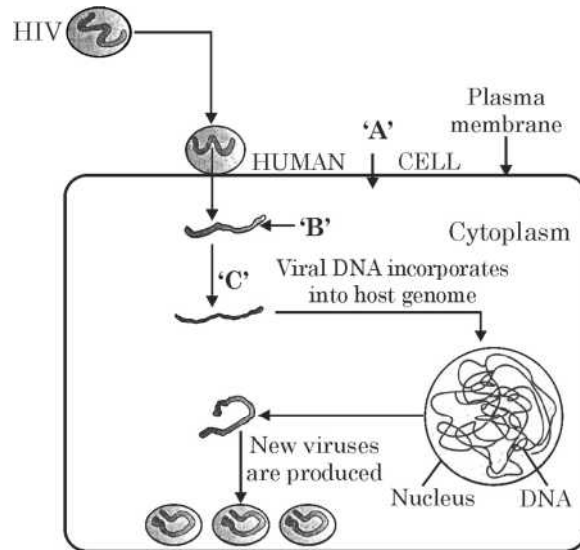
(a)   **Name the human cell 'A' HIV enters into.**

(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. Morgon 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) = ½ × 4

b) Solving challenges in health care/ agriculture /energy production/ environmental remediation / diagnosed disorder / treat disorders / prevents disorders (any four) = ½ × 4

c) BAC - bacterial artificial chromosomes = ½

Used as vector for cloning of DNA fragments = ½

[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.**
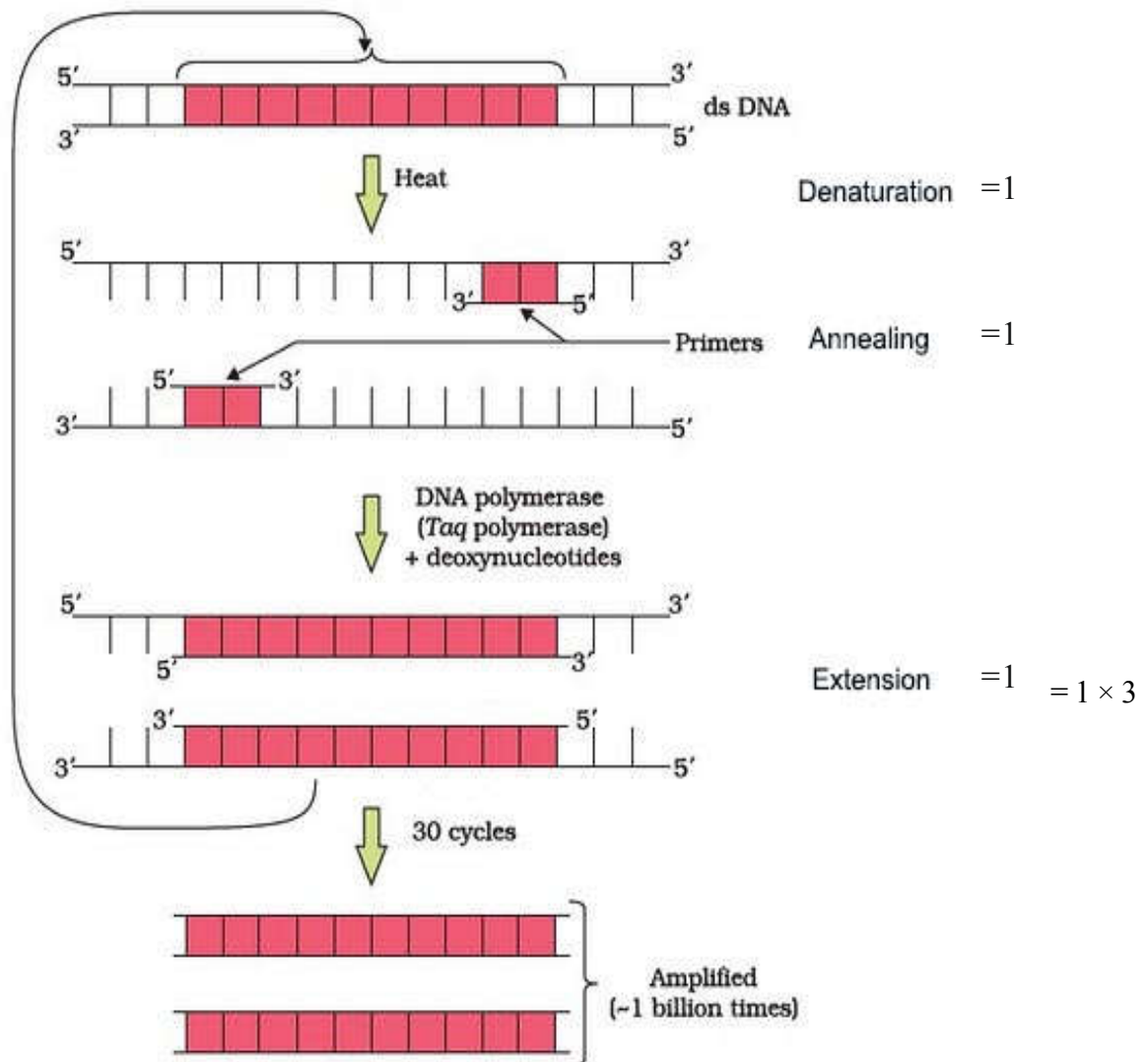
Ans. (a) (cotton) bollworms = 1
B. thuringiensis forms protein crystals (during a particular phase of their growth) , these crystals contain a toxic insecticidal protein, the Bt toxin protein exist as inactive protoxins but once an insect ingest the inactive toxin, it is converted into an active form 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 = ½ × 6

(b) crylAb 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.

(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 = ½ + ½

(b) (i) Multiple copy of gene of interest can be made in vitro / gene amplification = ½
(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 = ½
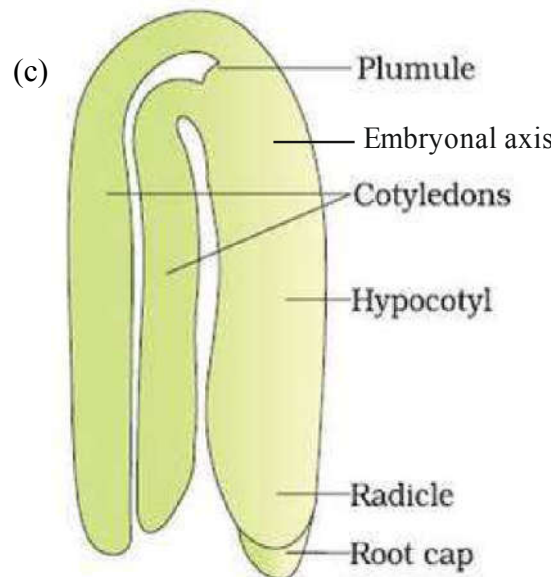
[4 + 1 = 5 Marks]

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 = ½ + ½

Fusion of a male gamete with two polar nuclei , to produce triploid primary endosperm nucleus is called triple fusion = ½ + ½

(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) = ½ × 3

(c)

- Plumule
- Embryonal axis
- Cotyledons
- Hypocotyl
- Radicle
- Root cap

any three labels = ½ × 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) = ½ + ½
<u>In males</u>: 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
<u>In females</u> : FSH stimulates follicular development / secretes estrogen , LH surge , induces rupture of Graafian follicle , to release of ovum / ovulation = ½ × 8

[1 + 4 = 5 Marks]

SECTION – A

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

1. **Louis Pasteur demonstrated that**

    (a) **early life came from outer space**

    (b) **non-living chemicals produced living molecules**

    (c) **life comes from pre-existing life**

    (d) **life originated spontaneously**

Ans. (c) / life comes from pre-existing life

[1 Mark]

2. **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]

3. **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]

4.   **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]

5.   **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]

SECTION - B

6.   **Name one air-borne and a water borne disease in humans. List one specific symptom of each one of them.**

Ans. <u>Air-borne</u>   -

Pneumonia - fever / chills / cough (any one) = ½+ ½ //

Common cold - Nasal congestion and discharge / sore throat / hoarseness / cough (any one) = ½+½

<u>Water-borne</u> -

Amoebiosis - constipation / abdominal pain and cramps / stools with excess mucus and blood clots (any one) = ½ + ½ //

Ascariasis - Internal bleeding / muscular pain / anaemia / blockage of intestinal passage (any one) = ½ + ½

(Any other correct disease with corresponding symptom to be evaluated)

[1 + 1 = 2 Marks]

7. **(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 = ½ × 2

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

    (*Any two*) = ½ × 2

[2 Marks]

OR

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

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

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

[1 + 1 = 2 Marks]

8. **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 × 2

[2 Marks]

9. **Mention how have plants developed mechanical and chemical defence against herbivores 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]

10. **How is humus formed ? Mention any three characteristics of humus.**

Ans. Accumulation of dark coloured amorphous substances through humification = ½

Highly resistant to microbial action , undergoes decomposition at (an extremely) slow rate , being colloidal in nature it serves as a reservoir of nutrients = ½ × 3

[2 Marks]

11. State what are Mendelian disorders. Both thalassemia and colour blindness categorised as Mendelian disorders. Justify.

Ans. Genetic disorders determined by alteration or mutation in a single gene = 1

Thalassemia - á / α is due to mutation or deletion of one or more of the four of two closely linked gene HBA1 and HBA2 on chromosome 16 of each parent // while â / ß thalassemia is controlled by a single gene HBB on chromosome 11 of each parent and occurs due to mutation of one or both the genes = ½

Colour blindness - mutation in certain genes present in X chromosome = ½

[2 Marks]

12. 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 × 2

[2 Marks]

SECTION - C

13. (a) Write the palindromic nucleotide sequence EcoRI recognises.

(b) Draw the vector DNA and a foreign DNA showing the sites where EcoRI has acted to form the sticky ends.

(c) Name the enzyme that helps in forming recombinant DNA.

Ans. (a) 5'___ GAATTC ___ 3'

3'___ CTTAAG ___ 3'   = ½

(b)

½ × 6
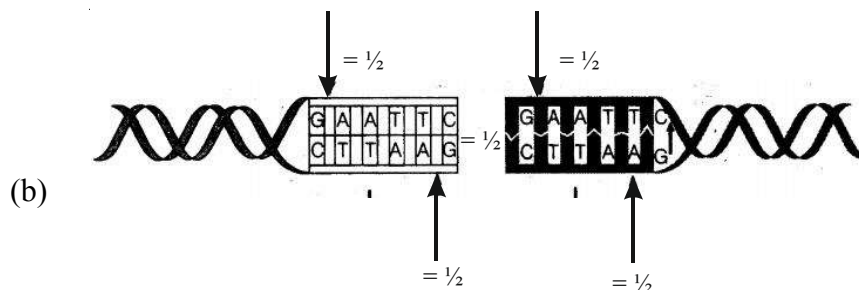
(c) DNA ligase = ½

[3 Marks]

14. 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]

OR

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 × 3

[3 Marks]

15. **Explain 'Integrated organic' farming as successfully practiced by Ramesh C. Dagar, a farmer in Sonepat (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]

16. **(a)** **Explain the mode of action of 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) ?**

Ans. (a) 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) = ½ × 2

[3 Marks]

17. **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 = ½ × 2

[3 Marks]

18. **(a)   Rearrange the following in the correct order of their appearance on Earth between two million years and 40,000 years back.**

Neanderthals. Australopithecus, Homo erectus and Homo habilis.

(b)   Which one of the above

(i)   had the largest brain size

(ii)   ate fruits

Ans. a)   *Australopithecus, Homo habilis, Homo erectus,* Neanderthal = ½ × 4

b)   i)   Neanderthals = ½

ii)   Australopithecus   = ½

[3 Marks]

19. **Explain Mendel's "Law of segregation" in a typical monohybrid cross with the help of a suitable example.**

Ans. Alleles do not show any blending and both the characters are recovered as such in F_2 generation // factors / alleles segregate from each other (during gamete fomation) such that a gamete receives only one of the two factors = 1

$$\text{YY yellow} \quad \times \quad \text{yy green}$$

Y, y $= \frac{1}{2}$

F_1: Yy (yellow)

selfed

F_2: Y, y $= \frac{1}{2}$

	Y	y
Y	YY yellow	Yy yellow
y	Yy yellow	yy green

= 1

Phenotypic ratio = 3 yellow : 1 green

Genotypic ratio = YY : Yy : yy
1 : 2 : 1

[3 Marks]

20. (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. Ans. (a) Increases pollination efficiency / improves the crop yield / increases honey yield = ½

Sunflower / *Brassica* / Apple / Pear/ any other appropriate examples (any two) = ½ × 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) = ½ × 3

[3 Marks]

21. **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]

SECTION - D

22. **"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) //

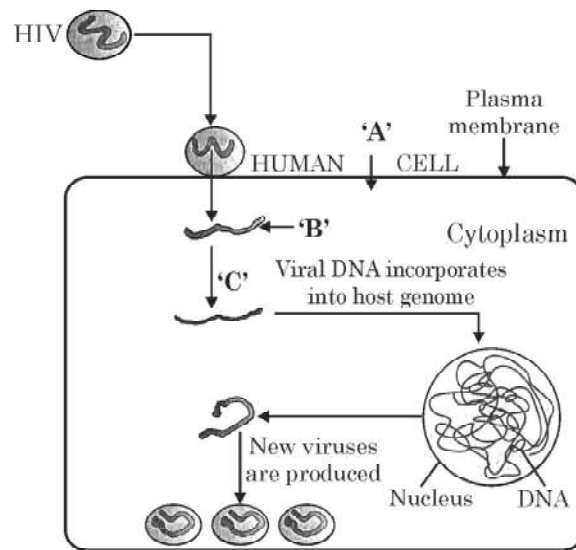Pre-reproductive population is less than reproductive population = 1

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

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

[3 Marks]

23. **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]

24. **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]

SECTION - E

25. (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.

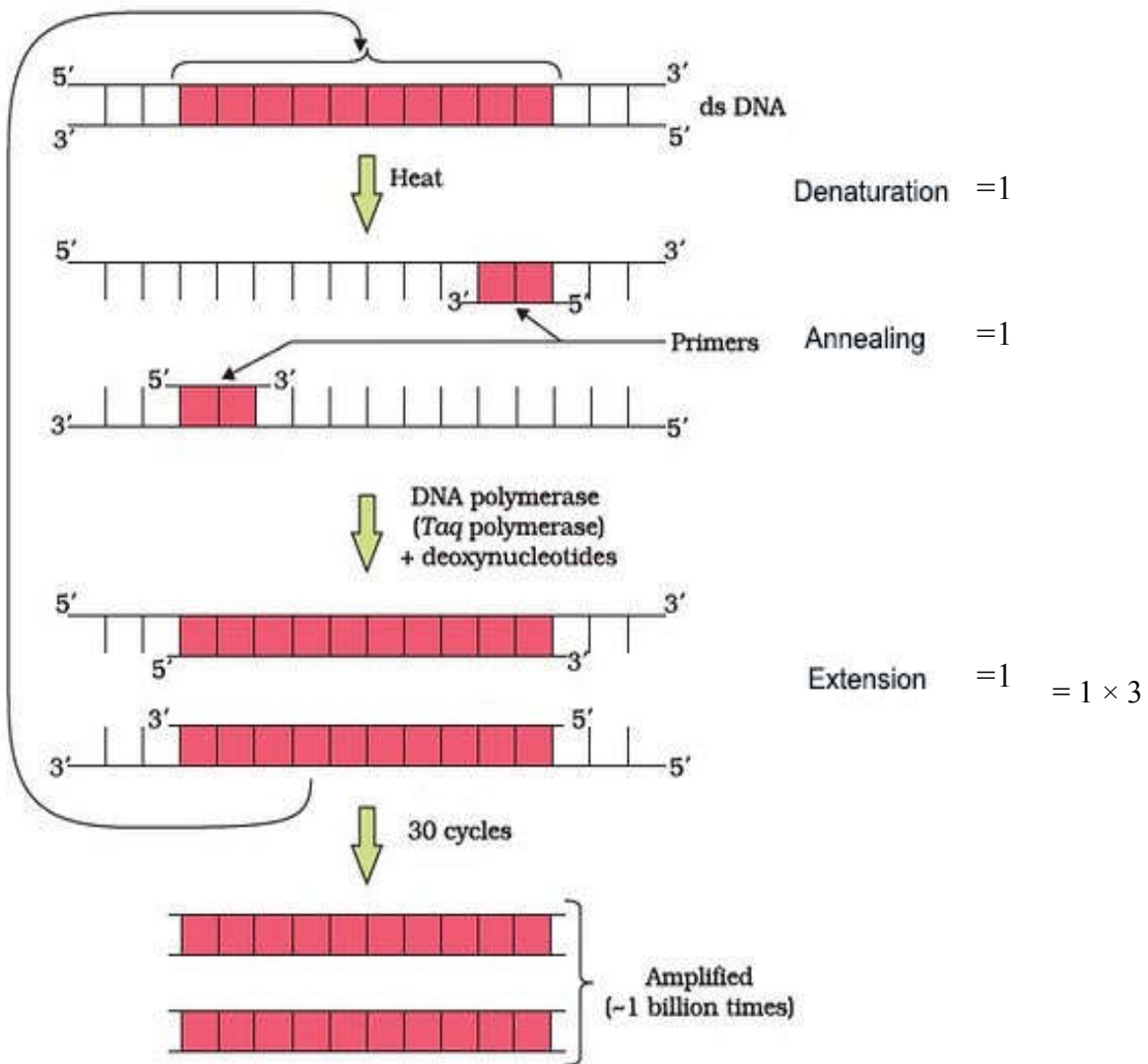**Ans. (a)** (cotton) bollworms = 1

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) crylAb 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**

5′ ———————————————— 3′ ds DNA
3′ ———————————————— 5′

↓ Heat   Denaturation =1

5′ ———————————————— 3′
            3′ ▨▨ 5′ Primers

5′ ▨▨ 3′
3′ ———————————————— 5′   Annealing   =1

↓ DNA polymerase
  (*Taq* polymerase)
  + deoxynucleotides

5′ ———————————————— 3′
      5′   3′

3′   5′
3′ ———————————————— 5′   Extension   =1   = 1 × 3

↓ 30 cycles

▨▨▨▨▨▨▨▨

▨▨▨▨▨▨▨▨   Amplified
                (~1 billion times)

//

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 = ½ + ½

(b) (i) Multiple copy of gene of interest can be made in vitro / gene amplification = ½
     (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 = ½

[4 + 1 = 5 Marks]

40

26. (a) Describe the process of double fertilisation in angiosperms.

(b) Trace the development of polyploidal cell that is formed after double fertilisation in a non-albuminous seed and albuminous seed.

Ans. (a) One of the male gametes , fuses with the nucleus of the egg cell , to form a diploid zygote (syngamy) = ½ × 3

Second male gamete , fuses with two polar nuclei , to form (triploid) primary endosperm nucleus (triple fusion) = ½ × 3

(b) The primary endosperm nucleus undergoes successive nuclear divisions , to give rise to free nuclei / free nuclear endosperm , subsequent cell wall fomation results in cellular endosperm = 1 + 1

[5 Marks]

OR

(a) List any two reasons other than physical and congenital disorders for causing infertility in couples.

(b) Explain how IVF as a technique helped childless couples in having children.

(c) Compare GIFT with ICSI.

Ans. (a) Diseases / drugs / immunological / psychological (any two) = ½ + ½

(b) In in-vitro fertilisation the fertilisation takes place outside the body followed by embryo transfer

in this method ova from wife / donor and sperms from husband / donor are collected and induced to form zygote in the lab , zygote / early embryo is transferred into the fallopian tube , embryos with more than 8 blastomeres , are transferred into the uterus for further development. = ½ × 4

(c) GIFT - Transfer of an ovum collected from a donor into the fallopian tube of another female who cannot produce one = 1

ICSI - Specialised procdure to form embryo by injecting sperm directly into the ovum = 1

[5 Marks]

27. (a) Why did T.H. Morgon select <u>Drosophila melanogaster</u> 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) = ½ × 4

b) Solving challenges in health care/ agriculture /energy production/ environmental remediation / diagnosed disorder / treat disorders / prevents disorders (any four) = ½ × 4

c) BAC - bacterial artificial chromosomes = ½

   Used as vector for cloning of DNA fragments = ½

   [2 + 2 + 1 = 5 Marks]