BIOLOGY (Theory)

Time allowed : 3 hours ***Maximum Marks : 70***

General Instructions:

(i) All questions are compulsory.

(ii) The question paper consists of four sections A, B, C and D. Section A contains 8 questions of one mark each, Section B is of 10 questions of two marks each, Section C is of 9 questions of three marks each and Section D is of 3 questions of five marks each.

(iii) There is no overall choice. However, an internal choice has been provided in one question of 2 marks, one question of 3 marks and all the three questions of 5 marks weightage. A student has to attempt only one of the alternatives in such questions.

(iv) Wherever necessary, the diagrams drawn should be neat and properly labelled.

QUESTION PAPER CODE 57/1/1

SECTION A

1. Name the type of cell division that takes place in the zygote of an organism exhibiting haplontic life cycle. 1

2. Write the scientific name of the microbe used for fermenting malted cereals and fruit juices. 1

3. Write the unit used for measuring ozone thickness. 1

4. Name the event during cell division cycle that results in the gain or loss of chromosome. 1

5. How can bacterial DNA be released from the bacterial cell for biotechnology experiments? 1

6. Write the importance of cryopreservation in conservation of biodiversity. 1

7. Mention the role of the codons AUG and UGA during protein synthesis. 1

8. Normally one embryo develops in one seed but when an orange seed is squeezed many embryos of different shapes and sizes are seen. Mention how it has happened. 1

SECTION-B

9. How do histones acquire positive charge ? 2

10. Why is CuT considered a good contraceptive device to space children ? 2

11. Differentiate between albuminous and non-albuminous seeds, giving one example of each. 2

12. Explain the process of RNA interference. 2

13. List the key tools used in recombinant DNA technology. 2

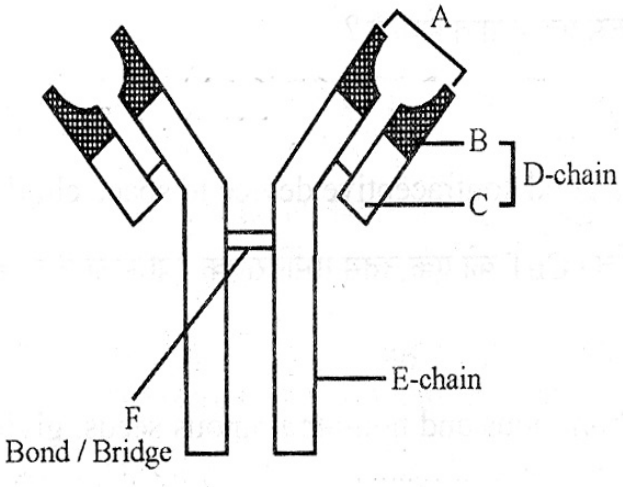
14. Name the two types of immune systems in a human body. Why are cell mediated and humoral immunities so called ? 2

OR

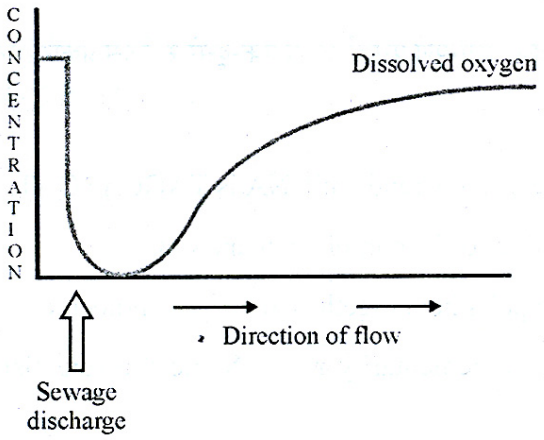
Write the scientific names of the causal organisms of elephantiasis and ringworm in humans. Mention the body parts affected by them.

15 Justify with the help of an example where a deliberate attempt by humans has led to the extinction of a particular species. 2

16. Identify A, D, E and F in the diagram of an antibody molecule given below : 2



17. Study the graph given below. Explain how is oxygen concentration affected in the river when sewage is discharged into it. 2



18. Explain how a hereditary disease can be corrected. Give an example of first successful attempt made towards correction of such diseases. 2

SECTION-C

19. Draw a diagram of a male gametophyte of an angiosperm. Label any **four** parts. Why is sporopollenin considered the most resistant organic material ? 3

20. How are dominance, codominance and incomplete dominance patterns of inheritance different from each other ? 3

21. The base sequence in one of the strands of DNA is TAGCATGAT 3

    (i) Give the base sequence of its complementary strand.

    (ii) How are these base pairs held together in a DNA molecule ?

    (iii) Explain the base complementarity rules. Name the scientist who framed this rule.

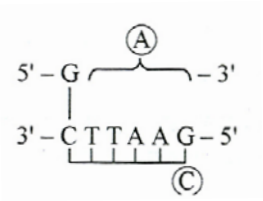
22. (a) Sickle celled anaemia in humans is a result of point mutation. Explain. 3

    (b) Write the genotypes of both the parents who have produced a sickle celled anaemic offspring.

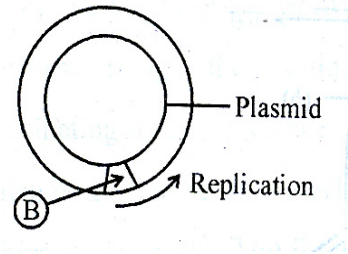
23. What is inbreeding depression and how is it caused in organisms ? Write any two advantages of inbreeding. 3

24. (a) Identify (A) and (B) illustrations in the following : 3

(i)



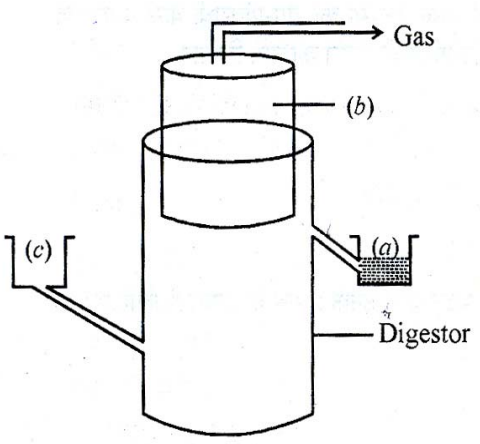
(ii)



(b) Write the term given to (A) and (C) and why ?

(c) Expand PCR. Mention its importance in biotechnology

25.



The diagram above is that of a typical biogas plant. Explain the sequence of events occurring in a biogas plant. Identify a, b and c. 3

26. How can crop varieties be made disease resistant to overcome food crisis in India ? Explain. Name one disease resistant variety in India of: 3

(a) Wheat to leaf and stripe rust

(b) Brassica to white rust

OR

Write the source and the effect on the human body of the following drugs :

(i) Morphine

(ii) Cocaine

(iii) Marijuana

27. Name the type of interaction seen in each of the following examples : 3

(i) Ascaris worms living in the intestine of human

(ii) Wasp pollinating fig inflorescence

(iii) Clown fish living among the tentacles of sea-anemone

(iv) Mycorrhizae living on the roots of higher plants

(v) Orchid growing on a branch of a mango tree

(vi) Disappearance of smaller barnacles when Balanus dominated in the Coast of Scotland.

SECTION-D

28. (a) Draw a labelled diagram of the human female reproductive system. 5

(b) Enumerate the events in the ovary of a human female during :

(i) Follicular phase

(ii) Luteal phase of menstrual cycle

OR

(a) Write the specific location and the functions of the following cells in human males :

(i) Leydig cells

(ii) Sertoli cells

(iii) Primary spermatocyte

(b) Explain the role of any **two** accessory glands in human male reproductive system

29. Explain the salient features of Hugo de Vries theory of mutation. How is Darwin's theory of natural selection different from it ? Explain. 5

OR

(a) Name the primates that lived about 15 million years ago. List their characteristic features.

(b) (i) Where was the first man-like animal found ?

(ii) Write the order in which Neanderthals, Homo habilis and Homo erectus appeared on earth. State the brain capacity of each one of them.

(iii) When did modern Homo sapiens appear on this planet ?

30. (a) Explain primary productivity and the factors that influence it. 5

(b) Describe how do oxygen and chemical composition of detritus control decomposition.

OR

(a) What is El Nino effect ? Explain how it accounts for biodiversity loss.

(b) Explain any three measures that you as an individual would take, to reduce environmental pollution.

QUESTION PAPER CODE 57/1
SECTION A

1. Name the embryonic stage that gets implanted in the uterine wall of a human female. 1

2. State the importance of biofortification. 1

3. Biotechnologists refer to *Agrobacterium tumifaciens* as a natural genetic engineer of plants. Give reasons to support the statement. 1

4. How do algal blooms affect the life in water bodies ? 1

5. Name the common ancestor of the great apes and man. 1

6. Write a difference between net primary productivity and gross productivity. 1

7. Mention the contribution of genetic maps in human genome project. 1

8. Name the phase all organisms have to pass through before they can reproduce sexually. 1

SECTION B

9. Name the enzyme produced by *Streptococcus* bacterium. Explain its importance in medical sciences. 2

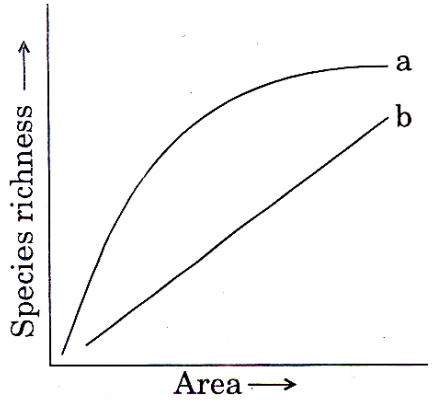
10. How is 'Rosie' considered different from a normal cow ? Explain. 2

11. State the use of Biodiversity in modern agriculture. 2

12. Write the full form of VNTR. How is VNTR different from 'Probe'? 2

13. Differentiate between benign and malignant tumours. 2

14.

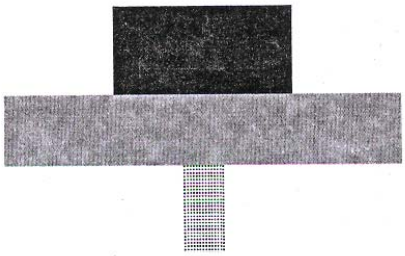


The above graph shows Species-Area relationship. Write the equation of the curve 'a' and explain. 2

OR

Differentiate between *in situ* and *ex situ* approaches of conservation of biodiversity.

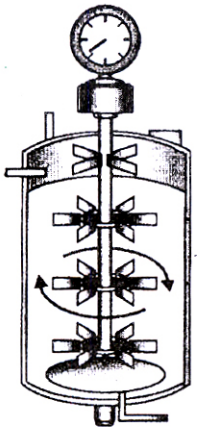
15. The cell division involved in gamete formation is not of the same type in different organisms. Justify. 2

16. 

Identify the type of the given ecological pyramid and give one example each of pyramid of number and pyramid of biomass in such cases. 2

17. Describe the Lactational Amenorrhea method of birth control. 2

18. Name the type of bioreactor shown. Write the purpose for which it is used. 2



SECTION C

19. Draw a labelled diagram of the reproductive system in a human female. 3

20. Branching descent and natural selection are the two key concepts of Darwinian Theory of Evolution. Explain each concept with the help of a suitable example. 3

21. Scientists have succeeded in recovering healthy sugarcane plants from a diseased one.

    (a) Name the part of the plant used as explant by the scientists.

    (b) Describe the procedure the scientists followed to recover the healthy plants.

    (c) Name this technology used for crop improvement. 3

22. (i) Name the enzyme that catalyses the transcription of hnRNA.

(ii) Why does the hnRNA need to undergo changes ? List the changes hn RNA undergoes and where in the cell such changes take place. 3

23. (i) Write the scientific names of the two species of filarial worms causing filariasis.

(ii) How do they affect the body of infected person(s) ?

(iii) How does the disease spread ? 3

24. Name the genus to which baculoviruses belong. Describe their role in the integrated pest management programmes. 3

25. Unambiguous, universal and degenerate are some of the terms used for the genetic code. Explain the salient features of each one of them. 3

26. Water is very essential for life. Write any three features both for plants and animals which enable them to survive in water scarce environment. 3

OR

How do organisms cope with stressful external environmental conditions which are localised or of short duration ?

27. (i) State the consequence if the electrostatic precipitator of a thermal plant fails to function.

(ii) Mention any four methods by which the vehicular air pollution can be controlled. 3

SECTION D

28. Give reasons why :

(i) most zygotes in angiosperms divide only after certain amount of endosperm is formed.

(ii) groundnut seeds are exalbuminous and castor seeds are albuminous.

(iii) Micropyle remains as a small pore in the seed coat of a seed.

(iv) integuments of an ovule harden and the water content is highly reduced, as the seed matures.

(v) apple and cashew are not called true fruits. 5

OR

(a) Draw a labelled diagram of L.S. of an embryo of grass (any six labels).

(b) Give reason for each of the following :

(i) Anthers of angiosperm flowers are described as dithecous.

(ii) Hybrid seeds have to be produced year after year.

29. Describe the mechanism of pattern of inheritance of ABO blood groups in humans. 5

OR

(a) Why is haemophilia generally observed in human males ? Explain the conditions under which a human female can be haemophilic.

(b) A pregnant human female was advised to undergo M.T.P. It was diagnosed by her doctor that the foetus she is carrying has developed from a zygote formed by an XX-egg fertilized by Y-carrying sperm. Why was she advised to undergo M.T.P. ?

30. (i) Describe the characteristics a cloning vector must possess.

(ii) Why DNA cannot pass through the cell membrane ? Explain. How is a bacterial cell made 'competent' to take up recombinant DNA from the medium ? 5

OR

If a desired gene is identified in an organism for some experiments, explain the process of the following :

(i) Cutting this desired gene at specific location

(ii) Synthesis of multiple copies of this desired gene

Marking Scheme — Biology (Theory)

General Instructions :

The Marking Scheme and mechanics of marking

1 In the marking scheme the marking points are separated by commas, one oblique line (/) indicates acceptable alternative, two obliques (//) indicate complete acceptable alternative set of marking points.

2. Any words/phrases given within brackets do not have marks.

3. Allow spelling mistakes unless the misspelt word has another biological meaning. Ignore plurals unless otherwise stated in the marking scheme.

4. In any question exclusively on diagram no marks on any description. But in questions on descriptions, same value points may be marked on the diagrams as a subsitute.

5. All awarded marks are to be written in the left hand margin at the end of the question or its part.

6. Place a tick (ü) in red directly on the key/operative term or idea provided it is in correct context. Place "Half-tick" ½ wherever there is ½ mark in the marking scheme. (Do not place tick indiscriminately just to show that you have read the answer).

7. If no marks are awarded to any part or question put a cross (×) at incorrect value portion and mark it zero (in words only).

8. Add up ticks or the half ticks for a part of the question, do the calculation if any, and write the part total or the question total in the left hand margin.

9. Add part totals of the question and write the question total at the end. Count all the ticks for the entire question as a recheck and draw a circle around the question total to confirm correct addition.

10. If parts of a Qustion have been attempted at different places do the totalling at the end of the part attempted last.

11. If any extra part is attempted or any question is reattempted, score out the last one and write "extra".

12. In questions where only a certain number of items are asked evaluate only that many numbers in sequence as is asked ignoring all the extra ones even if otherwise correct.

13. Transcribe the marks on the cover page. Add up question totals. Recheck the script total by adding up circled marks in the script.

14. Points/answer given in brackets in marking scheme are not so important and may be ignored for marking.

QUESTION PAPER CODE 57/1/1

EXPECTED ANSWERS/VALUE POINTS

SECTION A

Q.Nos. 1 - 8 are of one mark each.

1. Name the type of cell division that takes place in the zygote of an organism exhibiting haplontic life cycle.

Ans. Meiosis [1 mark]

2. Write the scientific name of the microbe used for fermenting malted cereals and fruit juices.

Ans. Saccharomyces cerevisiae [1 mark]

3. Write the unit used for measuring ozone thickness.

Ans. Dobson (Unit) / D.U. [1 mark]

4. Name the event during cell division cycle that results in the gain or loss of chromosome.

Ans. Failure of segregation of chromatids / non-disjunction / aneuploidy. [1 mark]

5. How can bacterial DNA be released from the bacterial cell for biotechnology experiments?

Ans. (Breaking the cell open) Treating with lysozyme. = 1 [1 mark]

6. Write the importance of cryopreservation in conservation of biodiversity.

Ans. Gametes of threatened species / seeds of commercially important strains can be preserved , in viable and fertile condition / for long periods = ½ + ½ [1 mark]

7. Mention the role of the codons AUG and UGA during protein synthesis.

Ans. AUG - codes for methionine / initiation codon ,

UGA - termination codon / stop codon = ½ + ½ [1 mark]

8. Normally one embryo develops in one seed but when an orange seed is squeezed many embryos of different shapes and sizes are seen. Mention how it has happened.

Ans. Some nucellar cells / diploid cells / integument cells surrounding the embryo sac start dividing and protrude into the embryo sac and develop into embryos. (In such spe cies each ovule contains many embryos-polyembryony). [1 mark]

SECTION-B

9. How do histones acquire positive charge ?

Ans. Histones are rich in basic amino acids, Lysine, Arginine (present as residues in their side chains), which are positively charged = ½ × 4 [2 marks]

10. Why is CuT considered a good contraceptive device to space children ?

Ans. Non-hormonal, non-medicated, releases Copper ions, suppresses sperm motility , suppresses fertilising capacity of sperms , phagocytosis of sperms. ***Any two*** = 1 + 1 [2 marks]

11. Differentiate between albuminous and non-albuminous seeds, giving one example of each.

Ans. Albuminous - (with residual) endosperm is not completely used up during embryonic development eg, wheat / maize / castor / sunflower.

Non albuminous - (without residual) endosperm is completely consumed during embryonic development eg. pea / groundnut. = ½ × 4

(If endosperm present or absent written = ½ mark). [2 marks]

12. Explain the process of RNA interference.

Ans. This method involves silencing of a specific mRNA of the parasite due to complementary dsRNA molecule that binds to and prevents translation of the mRNA (silencing). The source of this complementary RNA could be from an infection from viruses having RNA genomes or mobile genetic elements (transposons) that replicate via RNA intermediate [2 marks]

13. List the key tools used in recombinant DNA technology.

Ans. Restriction enzymes / Polymerase enzymes / Ligase enzymes / Vectors / Host organizms / E. coli /Agrobacterium ***Any four*** = ½ × 4 [2 marks]

14. Name the two types of immune systems in a human body. Why are cell mediated and humoral immunities so called ?

Ans. Active , Passive // Innate , Acquired // Cell mediated , Humoral // Immune system consisting of Lymphoid organs / tissues / cells , immune system with soluble molecules like antibodies.

Any one pair = ½ + ½ = 1

Cell mediated immunity is called so because cells like T-lymphocytes provide immunity / T-cells kill or destroy the antigens.

Humoral immune system is called so because antibodies which attack antigens are found in the blood. (Humor) = ½ + ½ = 1 [1+1 = 2 marks]

OR

Write the scientific names of the causal organisms of elephantiasis and ringworm in humans. Mention the body parts affected by them.

Elephantiasis is caused by Wuchereria bancrofti , Legs / scrotum / lymphatic vessels of lower limb = ½ + ½

Ringworm is caused by Trichophyton / Microsporum / Epidermophyton ,Skin = ½ + ½

[1 + 1 = 2 marks]

15 Justify with the help of an example where a deliberate attempt by humans has led to the extinction of a particular species.

Ans. The Nile perch introduced into Lake Victoria in East Africa , eventually led to the extinction of an ecologically unique assemblage of more than 200 species of cichlid fish in the lake //

Abingdon tortoise in Galapagos islands became extinct , after goats were introduced due to greater browsing efficiency of goats //

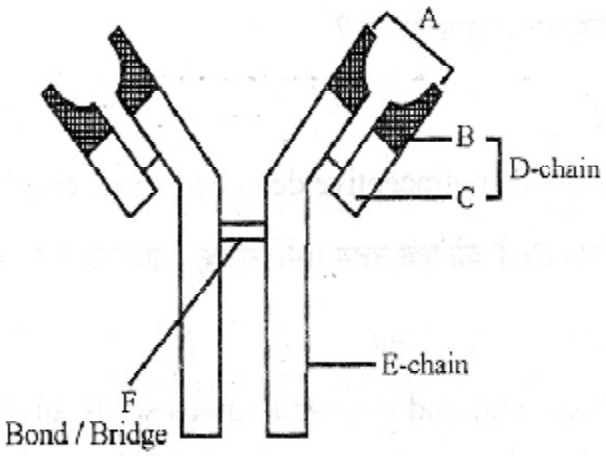
Connell's field experiment showed that the competitively superior barnacle Balanus , excludes smaller barnacle Chathamalus //

over exploitation by man , caused extinction of Stellar's sea cow / Passenger pigeon.

Any one example with justification = 1 + 1

[2 marks]

16. Identify A, D, E and F in the diagram of an antibody molecule given below :



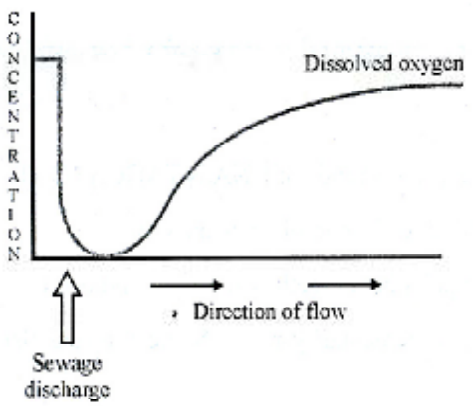
Ans. A - antigen binding site ,

D - light chain ,

E - heavy chain (constant region) ,

F - disulphide bond = ½ × 4 [2 marks]

17. Study the graph given below. Explain how is oxygen concentration affected in the river when sewage is discharged into it.



Ans. Oxygen is used up by microorganisms involved in biodegradation resulting in sharp decline at the point of sewage discharge , the concentration of oxygen increases as we move farther from the point of sewage discharge = 1 + 1 [2 marks]

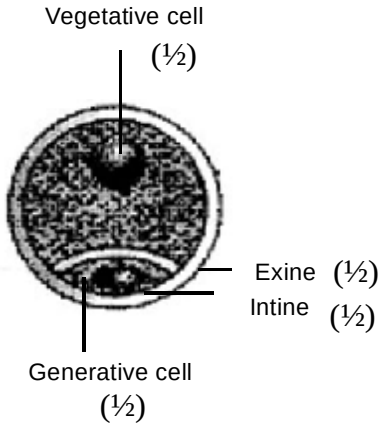
18. Explain how a hereditary disease can be corrected. Give an example of first successful attempt made towards correction of such diseases.

Ans. Introduction of required genes into cells and tissues to treat diseases / by delivery of normal gene to take over the function of non-functional gene / by gene therapy ,

First gene therapy was given to four year old girl with Adenosine deaminase deficiency. [2 marks]

SECTION-C

19. Draw a diagram of a male gametophyte of an angiosperm. Label any four parts. Why is sporopollenin considered the most resistant organic material ?



½ × 4 = 2

Sporopollenin can withstand high temperature / strong acids / strong alkali.
Any two = ½ + ½ [3 marks]

20. How are dominance, codominance and incomplete dominance patterns of inheritance different from each other ?

Ans. Dominance : one allele expresses itself in the hybrid heterozygous condition , other is suppressed

Co dominance : both the alleles of a gene express in a heterozygous hybrid containing two dominant alleles.

Incomplete dominance : Neither of the two alleles of a gene is completely dominant over the other in heterozygous condition , the hybrid is intermediate. = 1 × 3 [3 marks]

21. The base sequence in one of the strands of DNA is TAGCATGAT

(i) Give the base sequence of its complementary strand.

(ii) How are these base pairs held together in a DNA molecule ?

(iii) Explain the base complementarity rules. Name the scientist who framed this rule.

Ans. (i) ATCGTACTA = 1

(ii) Through Hydrogen bonds , between A and T and C and G on the two strands = ½ + ½

(iii) A = T and C ≡ G , Watson and Crick / Chargaff = ½ + ½ [3 marks]

22. (a) Sickle celled anaemia in humans is a result of point mutation. Explain.

(b) Write the genotypes of both the parents who have produced a sickle celled anaemic offspring.

Ans. (a) Mutation arising due to change in a single base pair of DNA , the defect is caused by the subsititution of Glutamic acid (Glu) by Valine (Val) at the sixth position of the beta globin chain of the haemoglobin molecule. = 1 + 1 = 2

(b) Father - Hb^A Hb^S , Mother - Hb^A Hb^S = ½ + ½

(Both parents are heterozygous) [2 + ½ + ½ = 3 marks]

23. What is inbreeding depression and how is it caused in organisms ? Write any two advantages of inbreeding.

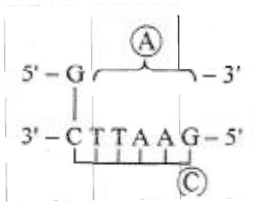
Ans. Continuous close inbreeding for several generations, reduces fertility and productivity is called inbreeding depression = ½ + ½

Advantages - produces pure lines / eliminates inferior genes , accumulation of superior genes

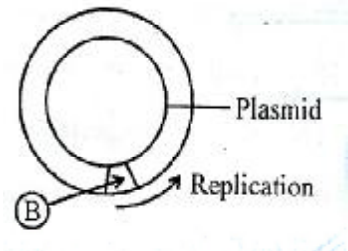
Any two = 1 + 1 = 2 [1 + 2 = 3 marks]

24. (a) Identify (A) and (B) illustrations in the following :

(i)



(ii)



(b) Write the term given to (A) and (C) and why ?

(c) Expand PCR. Mention its importance in biotechnology

Ans. (a) (A) - AATTC / Sticky end = ½

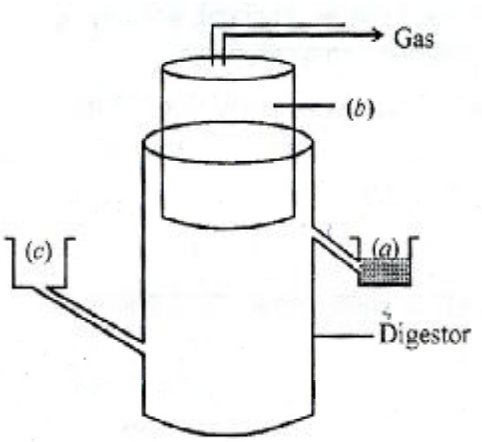
(B) - Ori / Origin of Replication = ½

(b) Pallindromic sequence , because the sequence of base pairs reads same on the two strands when orientation of reading is kept the same = ½ + ½ = 1

(c) PCR - Polymerase Chain Reaction = ½ ,

Importance - amplification of gene of interest (in vitro) = ½ [3 marks]

25.



The diagram above is that of a typical biogas plant. Explain the sequence of events occurring in a biogas plant. Identify a, b and c.

Ans. Bio wastes are collected and a slurry of dung is fed , a floating cover having gas outlet is placed over slurry which keeps on rising as the gas is produced in the tank, the spent slurry is removed through another outlet and may be used as fertiliser = ½ × 3 = 1½

(a) sludge loader

(b) gas holder / CH_4 and CO_2

(c) dung and water = ½ × 3 = 1½ [3 marks]

26. How can crop varieties be made disease resistant to overcome food crisis in India ? Explain. Name one disease resistant variety in India of:

(a) Wheat to leaf and stripe rust

(b) <u>Brassica</u> to white rust

Ans. By screening germplasm for resistance sources , hybridisation of selected parents , selection and evaluation of the hybrids and testing and release of new varieties // mutation breeding - it is possible to induce mutations artificially through use of chemicals or radiations (like gamma radiations) , and selecting and using the plants of desirable character as a source in breeding. // Selection amongst somaclonal variants / Genetic engineering - ***Any one*** explained = 2

(a) Himgiri = ½

(b) Pusa swarnim / Karan rai = ½ [2 + ½ + ½ = 3 marks]

OR

Write the source and the effect on the human body of the following drugs :

(i) Morphine

(ii) Cocaine

(iii) Marijuana

Ans. (i) Morphine - poppy plant / Papaver somniferum , depressant = ½ + ½ = 1

(ii) Cocaine - Erythroxylum coca , stimulates CNS / causes euphoria / hallucination = ½ + ½ = 1

(iii) Marijuana - Cannabis sativa **,** effects cardiovascular system of the body = ½ + ½ = 1

[1 + 1+ 1 = 3 marks]

27. Name the type of interaction seen in each of the following examples :

(i) Ascaris worms living in the intestine of human

(ii) Wasp pollinating fig inflorescence

(iii) Clown fish living among the tentacles of sea-anemone

(iv) Mycorrhizae living on the roots of higher plants

(v) Orchid growing on a branch of a mango tree

(vi) Disappearance of smaller barnacles when Balanus dominated in the Coast of Scotland.

Ans. (i) Parasitism

(ii) Mutualism

(iii) Commensalism

(iv) Mutualism

(v) Commensalism

(vi) Competition = ½ × 6 [3 marks]

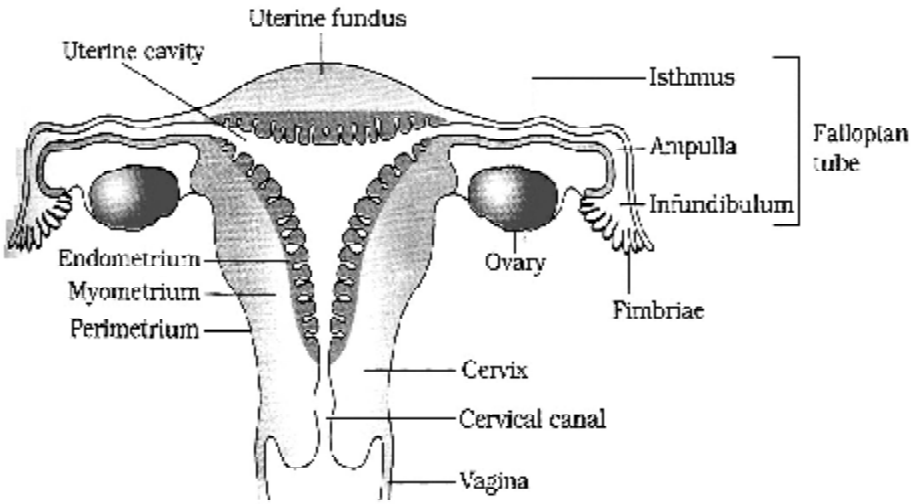
SECTION-D

28. (a) Draw a labelled diagram of the human female reproductive system.

(b) Enumerate the events in the ovary of a human female during :

(i) Follicular phase (ii) Luteal phase of menstrual cycle

Ans. (a)



Any six correct labels on a correct diagram = ½ × 6 = 3

(b) (i) Follicular phase - primary follicles grow and mature , secretion of estrogen , first meiotic division (***Any two*** = ½ × 2)

(ii) Luteal phase - development of corpus luteum , secretion of progestrone = ½ + ½ [3 + 1 + 1 = 5 marks]

OR

(a) Write the specific location and the functions of the following cells in human males :

(i) Leydig cells

(ii) Sertoli cells

(iii) Primary spermatocyte

(b) Explain the role of any two accessory glands in human male reproductive system

Ans. (a) (i) Leydig cells - found in interstitial spaces between seminiferous tubules , secrete androgens / testosterone = ½ + ½ = 1

(ii) Sertoli cells - found in between spermatocyte inside seminiferous tubules, nourish developing spermatozoa / sperms / germ cells = ½ +½ = 1

(iii) Primary spermatocytes - found in the inner lining of seminiferous tubules, they undergo meiosis and form sperms = ½ + ½ = 1

(b) The accessory glands are seminal vesicle, protstate gland, bulbourethral gland ***any two*** mentioned = ½ + ½

Secretions of these glands constitute seminal plasma which is rich in fructose, calcium and certain enzymes provide nourishment to sperms / Secretions of bulbourethral glands also help in lubrication of penis ***Any two*** mentioned = ½ + ½

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

29. Explain the salient features of Hugo de Vries theory of mutation. How is Darwin's theory of natural selection different from it ? Explain.

Ans. Hugo de Vries based his work on evening primrose, brought forth the idea of mutations - differences arising suddenly in a population, He believed large single step mutation called saltation, caused speciation. = ½ × 4 = 2

	Darwin's theory	Hugo de Vries
(i)	Directional	Directionless
(ii)	Gradual / slow	sudden
(iii)	Continuous variation	Random

1 × 3 = 3

[2 + 3 = 5 marks]

OR

(a) Name the primates that lived about 15 million years ago. List their characteristic features.

(b) (i) Where was the first man-like animal found ?

(ii) Write the order in which Neanderthals, Homo habilis and Homo erectus appeared on earth. State the brain capacity of each one of them.

(iii) When did modern Homo sapiens appear on this planet ?

Ans. (a) Dryopithecus , Ramapithecus = ½ + ½ = 1

Dryopithecus is ape like and hairy , walked like Gorillas and Chimpanzees , Ramapithecus more man like , ***Any two*** = ½ + ½ = 1

(b) (i) Ethiopia / Tanzania / Eastern Africa = ½

(ii) Order = Homo habilis , Homo erectus , Neanderthals = ½

Cranial capacity = Homo habilis = 650 - 800 cc, Homo erectus = 900 cc, Neanderthals = 1400 cc = ½ × 3 = 1½

(iii) During ice age / 75000 - 10000 years ago = ½

[1 + 1 + ½ + ½ + 1½ + ½ = 5 marks]

30. (a) Explain primary productivity and the factors that influence it.

(b) Describe how do oxygen and chemical composition of detritus control decomposition.

Ans. (a) Primary productivity : amount of biomass / organic matter produced per unit area over a time period by the plant during photosynthesis = 1

Factors : availability of nutrients / quality of light available / availability of water / temperature of the given place / type of plant species of the area / photosynthetic capacity of the plants ***Any four*** = ½ × 4 = 2

(b) Oxygen increases rate of decomposition = 1

Chemical : decomposition is slow when chitin and lignin are present = 1

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

OR

(a) What is El Nino effect ? Explain how it accounts for biodiversity loss.

(b) Explain any three measures that you as an individual would take, to reduce environmental pollution.

Ans. (a) Rise in temperature leading to deleterious changes in the environment and resulting in odd climatic changes is El Nino effect = 1

Increased melting of polar ice / submerging of coastal areas / flood / loss of habitat leading to loss of biodiversity ***Any two*** = ½ + ½ = 1

(b) Less use of fossil fuel / Planting more trees / Use of lead free petrol or diesel / Use of low sulphur petrol and diesel / Following laws laid down in relation to sound / avoiding use of DDT / Reducing our garbage generation etc.

Any three = 1 × 3 = 3 [1 + 1 + 3 = 5]

QUESTION PAPER CODE 57/1

EXPECTED ANSWERS/VALUE POINTS

SECTION A

Q.Nos. 1 - 8 are of one mark each.

1. Name the embryonic stage that gets implanted in the uterine wall of a human female.

Ans. Blastocyst / blastula [1 Mark]

2. State the importance of biofortification.

Ans. Breeding of crops for improvement of nutritional quality , = ½

higher level of vitamins / proteins / minerals / healthier fats. (Any one) = ½ [½ + ½ = 1 Mark]

3. Biotechnologists refer to *Agrobacterium tumifaciens* as a natural genetic engineer of plants. Give reasons to support the statement.

Ans. Can transfer gene naturally / Can deliver a piece of T DNA / has tumour inducing plasmid = 1 [1 Mark]

4. How do algal blooms affect the life in water bodies ?

Ans. Pollutes water / deterioration of the water quality / oxygen depletion / water becomes toxic / BOD increases = ½

Fish mortality / death of aquatic organism = ½ [½ + ½ = 1 Mark]

5. Name the common ancestor of the great apes and man.

Ans. Dryopithecus/Ramapithecus [1 Mark]

6. Write a difference between net primary productivity and gross productivity.

Ans. Gross productivity - Rate of production of organic matter during photosynthesis = ½

Net primary productivity - Available biomass for the consumption to heterotrophs /

GPP - R = NPP = ½ [½ + ½ =1 Mark]

7. Mention the contribution of genetic maps in human genome project.

Ans. Sequencing of genes , DNA finger printing , tracing human history, chromosomal location for disease associated sequences (***Any one***) [1 Mark]

8. Name the phase all organisms have to pass through before they can reproduce sexually.

Ans. Juvenile / growth = 1 [1 Mark]

SECTION B

Q.Nos. 9 - 18 are of 2 marks each.

9. Name the enzyme produced by *Streptococcus* bacterium. Explain its importance in medical sciences.

Ans. Streptokinase = 1

Used as a clot buster / for removing clots from the blood vessels (in a patient suffering from myocardial infarction / or in a heart patient) = 1 [1 + 1 = 2 Marks]

10. How is 'Rosie' considered different from a normal cow ? Explain.

Ans. Rosie is a transgenic cow = 1,

Rosie produced human protein enriched milk, containing human alpha - lactalbumin = ½ + ½ =1, [1 + 1 = 2 Marks]

11. State the use of Biodiversity in modern agriculture.

Ans. A source of hybrids , GM plants , biopesticides , organic farming , biofertiliser , Improved varieties of plants , disease resistant plants or any other relevant use (***Any two***) [1 + 1 = 2 Marks]

12. Write the full form of VNTR. How is VNTR different from 'Probe'?

Ans. VNTR - Variable Number Tandem Repeats = 1

Probe - is labelled / radio active (single stranded hybridise DNA fragments) = 1

[1 + 1 = 2 Marks]

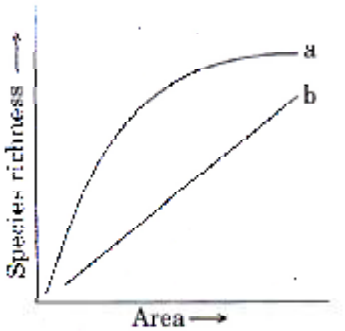
13. Differentiate between benign and malignant tumours.

Ans.

Benign tumours	Malignant tumours
- Non - cancerous	- cancerous
- remains confined	- spreads to other parts of the body
- no metastasis	- shows metastasis
- causes limited damage	- causes serious damage (any two comparisons)

[1 + 1 = 2 Marks]

14.



The above graph shows Species-Area relationship. Write the equation of the curve 'a' and explain.

Ans. $S = CA^z = 1$

(i) Within a region , species richness increases with increasing explored area but only up to a limit = ½

(ii) Relationship between species richness and area for a wide variety of taxa turns out to be rectangular hyperbola = ½ [1 + ½ + ½ = 2 Marks]

OR

Differentiate between in situ and ex situ approaches of conservation of biodiversity.

Ans.

in situ	ex situ
- Protection of endangered species of plants and animals = ½ , by protecting the natural habitat / ecosystem = ½	- Protection of endangered species by removing them from the natural habitat = ½, by placing under special care = ½

[½ × 4 = 2 Marks]

15. The cell division involved in gamete formation is not of the same type in different organisms. Justify.

Ans. Parents may be haploid or diploid , but the gametes have to be haploid , diploids undergo meiosis to produce haploid gametes , haploids undergo mitosis to produce gametes = ½ × 4 = 2 [2 Marks]

16.

Identify the type of the given ecological pyramid and give one example each of pyramid of number and pyramid of biomass in such cases.

Ans. Inverted pyramid = 1

Inverted pyramid of biomass in a lake - phytoplankton → Zooplankton → fishes = ½

Inverted pyramid of number - tree → insects → birds = ½

[1 + ½ + ½ = 2 Marks]

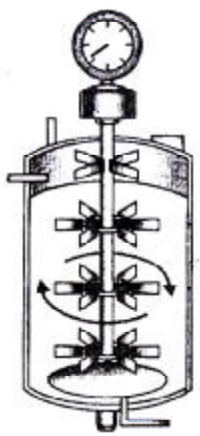
17. Describe the Lactational Amenorrhea method of birth control.

Ans. During intense lactation / breast feeding = 1

No menstrual cycle / No ovulation = 1

[1 + 1 = 2 Marks]

18. Name the type of bioreactor shown. Write the purpose for which it is used.



Ans. Simple stirred tank bioreactor = 1

Large scale production of recombinant protein / Raw materials are biologically converted into specific products or enzymes, using microbial plants / animals / human cells = ½ + ½ = 1

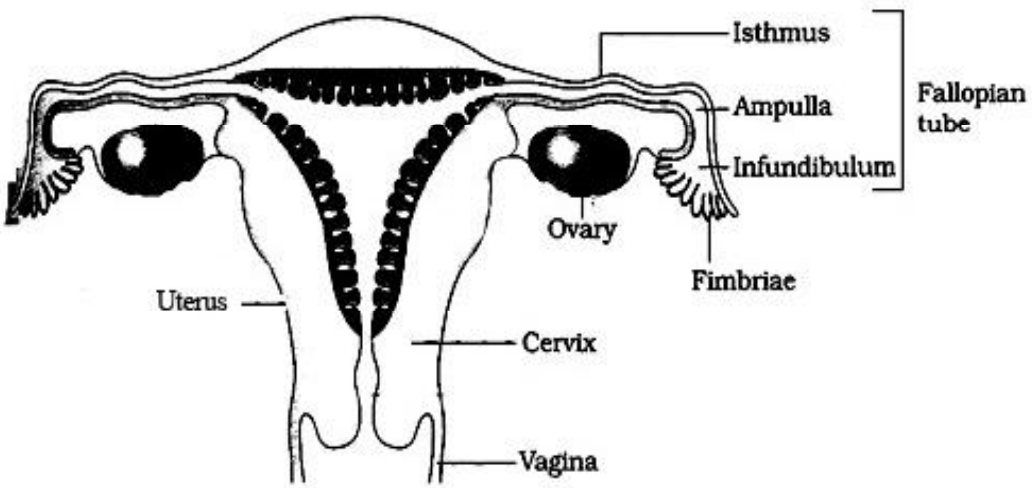
[1 + 1 = 2 Marks]

SECTION C

Q.Nos. 19 - 27 are of 3 marks each.

19. Draw a labelled diagram of the reproductive system in a human female.

Ans.



(Any six) [½ × 6 = 3 Marks]

20. Branching descent and natural selection are the two key concepts of Darwinian Theory of Evolution. Explain each concept with the help of a suitable example.

Ans. Branching descent :

Different species descending from the common ancestor - get adapted in different habitats = ½

e.g. Darwins finches - varieties of finches arose from grain eaters /
Australian marsupials - evolved from common marsupial = ½ + ½ = 1

Natural selection :

A process in which heritable variations enable better survival of a species to reproduce in large number. = ½

e.g. White moth surviving before the industrial revolution and black moth surviving after industrial revolution / Long necked giraffe survived / DDT resistant mosquito survive

(Any suitable example) = ½ + ½ = 1 [3 Marks]

21. Scientists have succeeded in recovering healthy sugarcane plants from a diseased one.

(a) Name the part of the plant used as explant by the scientists.

(b) Describe the procedure the scientists followed to recover the healthy plants.

(c) Name this technology used for crop improvement.

Ans. (a) Meristem (apical, axillary) = ½

(b) Explant / Virus free meristem is grown in nutrient medium, under aseptic conditions , tissue proliferates to form undifferentiated mass / callus, transferred to a medium containing auxins and cytokinins. = ½ × 4 = 2

(c) Tissue culture / micropropagation = ½ [½ + 2 + ½ = 3 Marks]

22. (i) Name the enzyme that catalyses the transcription of hnRNA.

(ii) Why does the hnRNA need to undergo changes ? List the changes hn RNA undergoes and where in the cell such changes take place.

Ans. (i) RNA polymerase II = ½

(ii) Has (non functional) introns = ½

(Methyl guanosine tri-phosphate is added to 5' end) capping , tailing (Poly A tail at 3' end added) , splicing (introns are removed and exons are joined) = ½ × 3 = 1½

Nucleus = ½ [½ + 2 ½ = 3 Marks]

23. (i) Write the scientific names of the two species of filarial worms causing filariasis.

(ii) How do they affect the body of infected person(s) ?

(iii) How does the disease spread ?

Ans. (i) Wuchereria bancrofti, Wuchereria malayi = ½ + ½ = 1

(ii) Inflammation of the lymphatic vessels of the lower limbs / inflammation of the genital organs / gross deformity of the lower limbs / deformity of the genital organs (Any two) = ½ + ½ = 1

(iii) Through the bite of female (Culex) mosquito = 1 [1 + 1 + 1 = 3 Marks]

24. Name the genus to which baculoviruses belong. Describe their role in the integrated pest management programmes.

Ans. Nucleopolyhedrovirus = 1

They control only species specific pest, do not affect non target organisms / beneficial insects are conserved / they aid in IPM problems / no negative impact on plants or other animals = 1 + 1 = 2 [1 + 2 = 3 Marks]

25. Unambiguous, universal and degenerate are some of the terms used for the genetic code. Explain the salient features of each one of them.

Ans. Unambiguous - One codon codes for one amino acid = ½ , e.g. AUG (Methionine) = ½

Universal - Codon and its corresponding amino acid are the same in all organisms = ½

Example:- Bacteria to human UUU codes for phenylalanine(phe) = ½

Degenerate - Some amino acids are coded by more than one codon = ½

Example:- UUU and UUC code for phenylalanine(phe) = ½

[1 + 1 + 1 = 3 Marks]

26. Water is very essential for life. Write any three features both for plants and animals which enable them to survive in water scarce environment.

Ans. **Plants:** Ephemeral mode (complete life cycle in short period) / Deep tap roots / Deciduous leaves / Waxy cuticle / sunken stomata / Succulence to store water / C_4 Pathway of Photosynthesis (Any three) = ½×3 = 1½

Animals: No sweating / uricotelic / deposition of fat in sub epidermal layer / burrowing nature / thick skin / body covered with scales (Any three) = ½ × 3 = 1½

[1½ + 1½ = 3 Marks]

OR

How do organisms cope with stressful external environmental conditions which are localised or of short duration ?

Ans. Migrate temporarily from the stressful habitat to a hospitable area / suspended activities

/ Form thick walled spores / Form dormant seeds / Hibernate during winter / Aestivate during summer / Planktons diapause (***Any six***) = ½ × 6 = 3 [½ × 6 = 3 Marks]

27. (i) State the consequence if the electrostatic precipitator of a thermal plant fails to function.

(ii) Mention any four methods by which the vehicular air pollution can be controlled.

Ans. (i) Particulate matter will pollute the air = 1 ,

(ii) Use of CNG / Phasing out of old vehicles / Use of unleaded petrol / Use of low sulphur fuel / Use of catalytic converters / Application of stringent pollution level norms ***(Any four***) = ½ × 4 = 2 [1 + 2 = 3 Marks]

SECTION D

Q.Nos. 28 - 30 are of 5 marks each.

28. Give reasons why :

(i) most zygotes in angiosperms divide only after certain amount of endosperm is formed.

(ii) groundnut seeds are exalbuminous and castor seeds are albuminous.

(iii) Micropyle remains as a small pore in the seed coat of a seed.

(iv) integuments of an ovule harden and the water content is highly reduced, as the seed matures.

(v) apple and cashew are not called true fruits.

Ans. (i) To obtain nutrition from the endosperm for the developing embryo = 1

(ii) ground nut - endosperm completely consumed = ½
castor - endosperm persists = ½

(iii) for the entry of water / oxygen, for germination = ½ + ½ = 1

(iv) Protect the embryo / keep the seed viable , until favourable conditions return for germination = ½ + ½ = 1

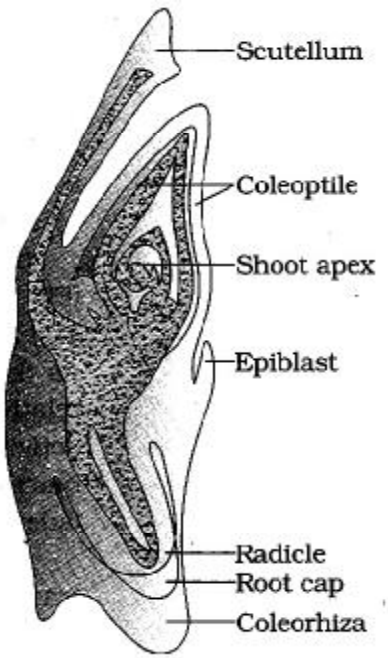
(v) Ovary is not taking part in fruit formation / thalamus contributes to fruit formation = 1

[1 × 5 = 5 Marks]

OR

(a) Draw a labelled diagram of L.S. of an embryo of grass (any six labels).

Ans.



= ½ × 6 = 3

(b) Give reason for each of the following :

(i) Anthers of angiosperm flowers are described as dithecous.

(ii) Hybrid seeds have to be produced year after year.

Ans. (i) Each bilobed anther has two theca =1

(ii) Progeny show segregation, do not maintain hybrid characters = ½ + ½ = 1

[3 + 2 =5 Marks]

29. Describe the mechanism of pattern of inheritance of ABO blood groups in humans.

Ans. Human blood group is determined by glycoprotein / antigen A , and glycoprotein / antigen B = 1

The alleles are I^A , I^B and i - Hence referred to as multiple allelism =1

The individual inherits any two of them as given below

$I^A I^A$, I^A i	—	A group
$I^B I^B$, I^B i	—	B group
$I^A I^B$	—	AB group
ii	—	O group = 1

In the case of A, B and O — Law of dominance is the pattern of inheritance as I^A / I^B dominant over i = 1

In AB group both the alleles I^A and I^B express — It is the case of Co-dominance = 1

[1× 5 = 5 Marks]

OR

(a) Why is haemophilia generally observed in human males ? Explain the conditions under which a human female can be haemophilic.

(b) A pregnant human female was advised to undergo M.T.P. It was diagnosed by her doctor that the foetus she is carrying has developed from a zygote formed by an XX-egg fertilized by Y-carrying sperm. Why was she advised to undergo M.T.P. ?

Ans. (a) Haemophilia is caused due to the recessive , gene on X chromosome , = ½ + ½ = 1

Y has no allele for this / if a male is X^hY then he is haemophilic / if male inherits X^h from the mother he is haemophilic (with the genotype X^hY) = 1

If female inherits $X^h X^h$, one from the carrier mother and one from her haemophilic father (then she can be haemophilic) = 1

(b) Embryo has (trisomy of sex chromosome) XXY / Klinefelter's syndrome = 1

Advised MTP since the child will have the following problems :

Male with feminine traits / like gynaecomastia / under developed testes / sterile =1

[1 + 1 + 1 + 1 + 1 = 5 Marks]

30. (i) Describe the characteristics a cloning vector must possess.

(ii) Why DNA cannot pass through the cell membrane ? Explain. How is a bacterial cell made 'competent' to take up recombinant DNA from the medium ?

Ans. (i)
- Should have ori / origin of replication , = ½
- Has selectable marker , genes encoding for an antibiotic resistance / genes encoding for α - galactosidase , = ½ + ½ = 1
- Has cloning site / recognition site , for the restriction enzyme to recognise = ½ + ½ = 1

(ii) DNA is a hydrophilic molecule = 1

Bacterial cell is made competent by treating with specific concentration of Ca^{++} ion / divalent ions , incubating them on ice , heat shock for a short period and placing it back on ice again = ½ × 3 = 1½

[2½ + 2½ = 5 Marks]

OR

If a desired gene is identified in an organism for some experiments, explain the process of the following :

(i) Cutting this desired gene at specific location

(ii) Synthesis of multiple copies of this desired gene

Ans (i)

- Identifying the restriction endonuclease that recognises the palindromic nucleotide sequence of the desired gene.
- The restriction endonuclease inspects the DNA sequences - finds and recognises the site
- Cuts each of the double helix at the specific point - a little away from the centre of the palindromic site - between the same two bases on the opposite strand
- Makes the over hanging stretch single stranded portion as a sticky end. = ½ × 4 = 2

(ii)

- By PCR / Polymerase Chain Reaction
- Desired gene is synthesised *in vitro*
- DNA is denatured
- Annealed using two sets of primers
- Thermostable Taq polymerase extends the primers using nucleotides (provided in the reaction and genomic DNA as template)
- Amplified fragments are ligated = ½ × 6 = 3

[2 + 3 = 5 Marks]