Question Paper Code 57/1

SECTION – A

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

1. Name the type of cross that would help to find the genotype of a pea plant bearing violet flowers.

Ans Test cross =1 [1 Mark]

2. State two postulates of Oparin and Haldane with reference to origin of life.

Ans (i) First form of life could have come from pre-existing non-living organic molecules / RNA & Protein = ½

(ii) Formation of life was preceded by chemical evolution / formation of diverse organic molecules from inorganic constituents = ½

[1 Mark]

3. A herd of cattle is showing reduced fertility and productivity. Provide one reason and one suggestion to overcome this problem.

Ans Reason: Inbreeding depression / continuous inbreeding = ½
Suggestion: Should be mated with unrelated superior cattle of the same breed / out - breeding / out - crossing = ½

[1 Mark]

4. What are *Cry* genes ? In which organism are they present ?

Ans. The genes which code for Bt toxin / Cry proteins / toxic proteins , *Bacillus thuringiensis* = ½ + ½
[1 Mark]

5. An electrostatic precipitator in a thermal power plant is not able to generate high voltage of several thousands. Write the ecological implication because of it.

Ans Air Pollution //
particulate matter / dust particles released in the air.

[1 Mark]

SECTION - B

Q Nos. 6-10 are of two marks each

6. A pollen grain in angiosperm at the time of dehiscence from an anther could be 2-celled or 3-celled. Explain. How are the cells placed within the pollen grain when shed at a 2-celled stage ?

Ans • In 2-celled stage the mature pollen grain contains a generative and vegetative cell, whereas in 3-celled stage one vegetative cell and two male gametes are present = ½ + ½

• The generative cell floats in the cytoplasm of vegetative cell =1

[2 Marks]

7. Differentiate between the genetic codes given below :

(a) Unambiguous and Universal

(b) Degenerate and Initiator

Ans

(a) **Unambiguous**: One codon codes for only one amino acid = ½ (b)**Degenerate:** More than one codon coding for the same amino acid. = ½	**Universal**: Genetic code / codons are(nearly) same for all organisms / from bacteria to human = ½ **Initiator:** Start codon / AUG = ½

[2 Marks]

8. Mention one application for each of the following :

(a) Passive immunization

(b) Antihistamine

(c) Colostrum

(d) Cytokinin-barrier

Ans (a) Provide preformed antibodies / anti-toxins for quick response in case of infection by deadly microbes(tetanus) or snake bite = ½

(b) Reduces symptoms of allergy = ½

(c) Provides passive immunity / antibodies / Ig A to new born = ½

(d) Protection of non-infected cells from further viral infection = ½

[2Marks]

9. Name the microbes that help production of the following products commercially:

(a) Statin

(b) Citric acid

(c) Penicillin

(d) Butyric acid

Ans *(a) Monascus purpureus*

(b) Aspergillus niger

(c) Penicillium notatum

(d) Clostridium butylicum = ½ × 4

[2 Marks]

10. List four benefits to human life by eliminating the use of CFCs.

Ans (i) Delay in aging of skin

(ii) Prevent damage to skin cells

(iii) Prevent skin cancer

(iv) Prevent snow blindness / inflammation of cornea

(v) Prevent cataract

(vi) Prevents ozone depletion

(vii) Prevents global warming

(viii) Reduces greenhouse effect

(ix) Reduces odd climatic changes or El Nino effect

(Any Four) = ½ × 4

[2 Marks]

OR

Suggest two practices giving one example of each, that help protect rare or threatened species.

Ans: (1) In situ conservation **,** biodiversity hotspot / biosphere reserve / national parks /sanctuaries / Ramsar sites / sacred groves **(Any one)** = ½ + ½

(2) Ex situ conservation **,** Zoological parks / botanical garden / wild life safari parks / cryopreservation techniques / Tissue culture / seed bank / pollen banks **(Any one)** = ½ + ½

[2 Marks]

SECTION - C

Q Nos. 11-22 are of three marks each

11. (a) Can a plant flowering in Mumbai be pollinated by pollen grains of the same species growing in New Delhi ? Provide explanations to your answer.

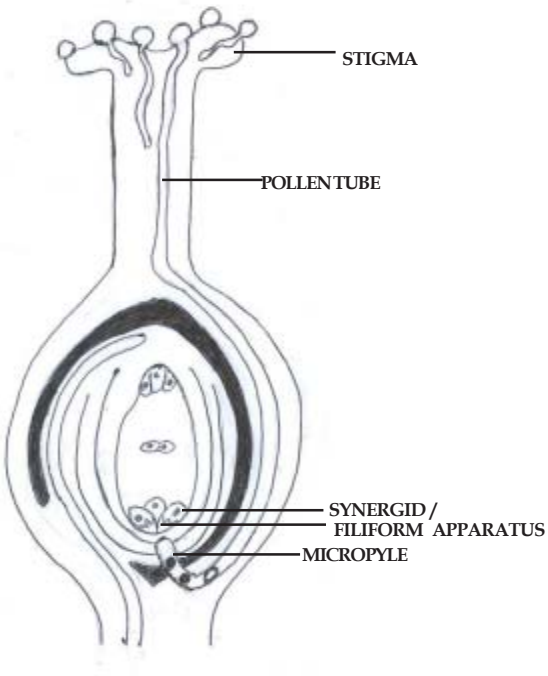
(b) Draw the diagram of a pistil where pollination has successfully occurred. Label the parts involved in reaching the male gametes to its desired destination.

Ans (a) Yes, By artificial means (any relevant explanation) = ½ + ½

(b) Diagram with following labellings

Stigma , Pollen tube , Synergid / Filiform Apparatus , Micropyle

= ½ × 4



[3 Marks]

12. Both Haemophilia and Thalassemia are blood related disorders in humans. Write their causes and the difference between the two. Name the category of genetic disorder they both come under.

Ans

Haemophilia	**Thalassemia**
Single protein involved in the clotting of blood is affected = ½	Defects in the synthesis of globin leading to formation of abnormal haemeoglobin = ½
Sex linked recessive disorder = ½	Autosomal recessive disorder= ½
Blood does not clot = ½	Results in anaemia = ½

(Any two) =½×4

Mendelian disorder = 1

[3 Marks]

13. (a) List the two methodologies which were involved in human genome project. Mention how they were used.

(b) Expand 'YAC' and mention what was it used for.

Ans (a) Expressed Sequence Tags **,** Identifying all the genes that are expressed as RNA = ½ + ½

Sequence Annotation **,** sequencing the whole set of genome coding or non coding sequences and later assigning different region with functions = ½ + ½

(b) Yeast Artificial Chromosome , used as cloning vectors (cloning / amplification) = ½ + ½

[3 Marks]

14. Write the characteristics of *Ramapithecus* , *Dryopithecus* and Neanderthal man.

Ans *Ramapithecus*: hairy/ walked like gorillas and chimpanzees **,** more man like = ½ + ½

Dryopithecus: hairy/ walked like gorillas and chimpanzees **,** more ape- like = ½ + ½

Neanderthal man: brain size is 1400cc **,** used hides to protect their body / buried their dead

= ½ + ½

[3 Marks]

15. Name a human disease, its causal organism, symptoms (any three) and vector, spread by intake of water and food contaminated by human faecal- matter.

Ans Amoebiasis (Amoebic dysentery) **,** *Entamoeba histolytica* **,** constipation / abdominal pain / cramps / stools with excess mucus / blood clots **(Any three symptoms) ,** Housefly = ½ × 6

//

Ascariasis, *Ascaris* , internal bleeding / muscular pain / fever / anaemia / blockage of intestinal passage **(Any three symptoms)**, Housefly = ½ × 6

//

Typhoid, *Salmonella typhi*, high fever / weakness / stomach pain / constipation / headache / loss of appetite **(Any three symptoms)**, Housefly = ½ × 6

[3 Marks]

OR

(a) Why is there a fear amongst the guardians that their adolescent wards may get trapped in drug/alcohol abuse ?

(b) Explain 'addiction' and 'dependence' in respect of drug/alcohol abuse in youth.

Ans (a) Adolescents are easily affected by (vulnerable to) peer pressure /adventure /curiosity / excitement / experimentation / media **(Any two)** = ½ + ½

(b) Addiction -Psychological attachment to certain effects such as Euphoria / temporary feeling of well-being =l
Dependence-Tendency of the body to show withdrawal syndrome / symptoms if regular doses of drug / alcohol is abruptly discontinued = 1

[3 Marks]

16. (a) Write the desirable characters a farmer looks for in his sugarcane crop.

(b) How did plant breeding techniques help north Indian farmers to develop cane with desired characters ?

Ans (a) High yield , thick stem,high sugar content , ability to grow in their areas = ½ × 4

(b) By crossing *Saccharum officinarum* / south Indian variety having desired characteristics with *Saccharum barberi* / north Indian low yield variety = 1

[3 Marks]

17. Secondary treatment of the sewage is also called Biological treatment. Justify this statement and explain the process.

Ans Involves biological organism such as aerobic and anerobic microbes / bacteria and fungi to digest / consume organic waste = 1

Primary effluent is passed into aeration tank where vigorous growth of aerobic microbes (flocs) take place, BOD reduced (microbes consume major part of organic matter), effluent is passed to settling tank where flocs sediment to produce activated sludge , sludge is pumped to anerobic sludge digester to digest bacteria and fungi = ½ × 4

[3 Marks]

18. (a) Explain the significance of 'palindromic nucleotide sequence' in the formation of recombinant DNA.

(b) Write the use of restriction endonuclease in the above process.

Ans (a) Palindromic nucleotide sequence is the recognition (specific) sequence present both on the vector and on a desired / alien DNA for the action of the same(specific) restriction endonuclease to act upon = 1

(b) Same restriction endonuclease binds to both the vector and the foreign DNA , cut each of the two strands of the double helix at specific points in their sugar phosphate backbone of recognition sequence for restriction endonucleases / palindromic sequence of vector and foreign DNA , to cut strand a little away from the centre of the palindrome sites, creates overhanging stretches /sticky ends = ½ × 4

//

(b) If depicted diagramatically showing the above mentioned value points it can be accepted

[3 Marks]

19. Describe the roles of heat, primers and the bacterium *Thermus aquaticus* in the process of PCR.

Ans Heat - Denaturation / separation of DNA into two strands =1

Primer- Enzyme DNA Polymerase extend the primers using the nucleotides provided in the reaction and the genomic DNA as template =1

Thermus aquaticus - source of thermostable DNA polymerase / Taq polymerase = 1

[3 Marks]

20. Explain the various steps involved in the production of artificial insulin.

Ans Two DNA sequences corresponding to A and B polypeptide chains of human insulin were prepared , these were introduced into *E.coli* to produce A and B chains separately **,** these chains were extracted and combined by creating disulphide bonds =1+1+1

[3 Marks]

21. (a) "Organisms may be conformers or regulators." Explain this statement and give one example of each.

(b) Why are there more conformers than regulators in the animal world ?

Ans (a) Conformers- organisms which cannot maintain a constant internal environment under varying external environmental conditions // change body temperature and osmotic concentration with change in external enviornment eg. all plants / fishes / amphibians / reptiles **(Any one)** = ½ + ½
Regulators - organisms which can maintain homeostasis (by physiological means or behavioural means) // maintain constant body temperature and osmotic concentration eg. birds /mammals = ½ + ½
b) Thermoregulation is energetically expensive for animals = 1

[3 Marks]

22. Describe the inter-relationship between productivity, gross primary productivity and net productivity.

Ans Productivity is the rate of biomass production per unit area over a period of time ,
Gross primary productivity is the rate of production of organic matter during photosynthesis in an ecosystem ,
Net productivity is the gross primary productivity minus respiration losses (R) = 1+1+1

[3 Marks]

SECTION - D

Q No. 23 is of four mark

23 . It is commonly observed that parents feel embarrassed to discuss freely with their adolescent children about sexuality and reproduction. The result of this parental inhibition is that the children go astray sometimes.

(a) Explain the reasons that you feel are behind such embarrassment amongst some parents to freely discuss such issues with their growing children.

(b) By taking one example of a local plant and animal, how would you help these parents to overcome such inhibitions about reproduction and sexuality ?

Ans: (a) Illiteracy / conservative attitude / misconceptions / social myths / any other relevant point **(Any two)** = 1 + 1

(b) If a student gives the clarity of the concept of reproduction and sexuality by taking any example of a plant and an animal with respect to reproductive organs, gamete formation, fertilization, sexual behaviour etc = 1 + 1

[4 Marks]

SECTION - E

Q Nos. 24-26 are of five marks each

24. (a) When a seed of an orange is squeezed, many embryos, instead of one are observed. Explain how it is possible.

(b) Are these embryos genetically similar or different ? Comment.

Ans: (a) Polyembryony , nucellar cells surrounding embryosac start dividing , protrude into the embryo sac and develop into many embryos = 1+ 1+ 1

(b) These embryos are genetically similar, as produced from nucellar cells by mitotic division / formed without fertilisation (but different from the embryo formed by fertilization) = 1 + 1

[5 Marks]

OR

(a) Explain the following phases in the menstrual cycle of" a human female:

(i) Menstrual phase

(ii) Follicular phase

(iii) Luteal phase

(b) A proper understanding of menstrual cycle can help immensely in family planning. Do you agree with the statement ? Provide reasons for your answer.

Ans: (a) (i) Menstrual phase - first 3-5 days of the cycle where menstrual flow occurs due to break down of endometrial lining of uterus, if the released ovum is not fertilised = ½ +½

(ii) Follicular phase - from 5^{th} to 14^{th} day of the cycle where the primary follicles grow to become a fully mature Graafian follicle , endometrium of uterus regenerates , Graafian follicle ruptures to release ova (ovulation on 14^{th} day) = ½ × 3

(iii) Luteal Phase - During 15^{th} to 28^{th} day remaining parts of graafian follicle transform into corpus luteum , secretion of progesterone (essential for maintenance of endometrium) = ½ × 2

All these phases are under the influence of varying concentrations of pituitary and ovarian hormone = ½

(b) Yes , can take appropriate precautions between 10^{th} to 17^{th} day of the menstrual cycle when the chances of fertilisation are high = ½ + ½

[5 Marks]

25. (a) Compare, giving reasons, the J-shaped and S-shaped models of population growth of a species.

(b) Explain "fitness of a species" as mentioned by Darwin.

Ans

J shaped - growth curve	S shaped- growth curve
Resources are unlimited	Resources are limited
Growth is exponential	Logistic Growth
As resources are unlimited all individuals survive and reproduce	Fittest individual will survive and reproduce
Growth Equation dN/dt=Rn (If explained)	Growth Equation dN/dt=rN (k-N/K) (If explained)

(Any three) = 1 + 1+ 1

Note - Marks to be awarded only if the corresponding difference is written.

(b) When resources are limited , Competition occurs between individuals , fittest will survive, who reproduce to leave more progeny = ½ × 4

[5 Marks]

OR

(a) What is an ecological pyramid ? Compare the pyramids of energy, biomass and numbers.

(b) Write any two limitations of ecological pyramids.

Ans: (a) Graphical representation of the relationship among the organisms at different trophic level =1

Pyramid of Energy	Pyramid of Bio Mass	Pyramid of Numbers
Shows transfer of Energy from one tropic level to other	Shows transfer of amount of food/ biomass from one tropic level to other	Pyramid of Numbers shows numbers of organism at each tropic level.
Always upright	Mostly upright but can be inverted	Mostly upright can be inverted

= ½ × 6

(b) It does not accomodate the food web / does not take into account the same species belonging to two or more tropic levels , Saprophytes are not given any place= ½ + ½

[5 Marks]

26. (a) Describe the structure and function of a t-RNA molecule. Why is it referred to as an adapter molecule?

(b) Explain the process of splicing of hn-RNA in a eukaryotic cell.

Ans: (a) Clover-leaf shaped / inverted L shaped molecules has an anti codon loop with bases complementary to specific codon , has an amino acid acceptor end = 1+1

As it reads the code on one hand and binds with the specific amino acid on the other hand.=1

(b) Introns are removed , exons are joined in a definite order = 1 + 1

//

Process of splicing shown diagramatically.

[5 Marks]

OR

Write the different components of a lac-operon in *E.coli*. Explain its expression while in an 'open' state.

Ans: It consists of one regulatory gene(i) , promotor gene , operator gene , and three structural genes(z,y,a) = ½× 4

Lactose/ inducer binds to the repressor protein , makes it inactive so it cannot bind with operator, allows RNA Polymerase access to the promotor and transcription proceeds , β -galactosidase , permease , transacetylase formed (by translation process for Lactose metabolism) = ½ × 6

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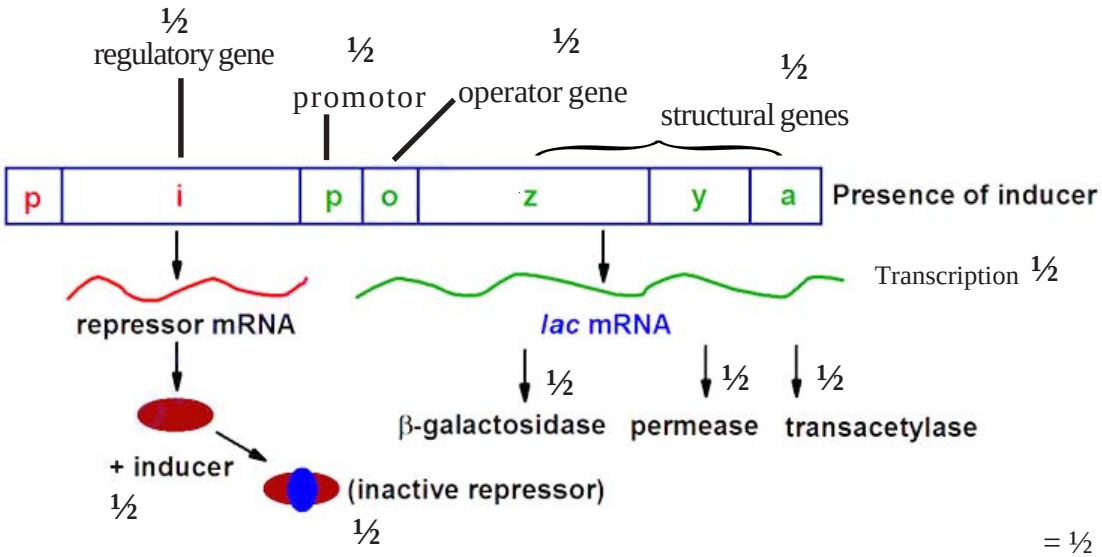


= ½ × 10

[5 Marks]

Question Paper Code 57/2

SECTION – A

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

1. A herd of cattle is showing reduced fertility and productivity. Provide one reason and one suggestion to overcome this problem.

Ans Reason: Inbreeding depression / continuous inbreeding = ½

Suggestion: Should be mated with unrelated superior cattle of the same breed / out - breeding / out - crossing = ½

[1 Mark]

2. An electrostatic precipitator in a thermal power plant is not able to generate high voltage of several thousands. Write the ecological implication because of it.

Ans Air Pollution //
particulate matter / dust particles released in the air.

[1 Mark]

3. Name the specific type of gene that is incorporated in a cotton plant to protect the plant against cotton boll worm infestation.

Ans cry I Ac / cry II Ab

[1 mark]

4. State two postulates of Oparin and Haldane with reference to origin of LIfe.

Ans (i) First form of life could have come from pre-existing non-living organic molecules / RNA & Protein = ½

(ii) Formation of life was preceded by chemical evolution / formation of diverse organic molecules from inorganic constituents = ½

[1 Mark]

5. Name the type of cross that would help to find the genotype of a pea plant — bearing violet flowers.

Ans Test cross =1 [1 Mark]

SECTION - B

Q Nos. 6-10 are of two marks each

6. Name the type of immunity the colostrum provides to a newborn baby. Write giving an example where this type of immunity should be provided to a person.

Ans Passive Immunity =1
In case of infection by deadly microbes(tetanus) / snake bite where quick immune response is required =1

[2Marks]

7. List four benefits to human life by eliminating the use of CFCs.

Ans (i) Delay in aging of skin

(ii) Prevent damage to skin cells

(iii) Prevent skin cancer

(iv) Prevent snow blindness / inflammation of cornea

(v) Prevent cataract

(vi) Prevents ozone depletion

(vii) Prevents global warming

(viii) Reduces greenhouse effect

(ix) Reduces odd climatic changes or El Nino effect

(Any Four) = ½ × 4

[2 Marks]

OR

Suggest two practices giving one example of each, that help protect rare or threatened species.

Ans: (1) In situ conservation **,** biodiversity hotspot / biosphere reserve / national parks /sanctuaries / Ramsar sites / sacred groves **(Any one)** = ½ + ½

(2) Ex situ conservation **,** Zoological parks / botanical garden / wild life safari parks / cryopreservation techniques / Tissue culture / seed bank / pollen banks **(Any one)** = ½ + ½

[2 Marks]

8. Write the binomials of two fungi and mention the products/bioactive molecules they help to produce.

Ans *Trichoderma polysporum* , cyclosporin A = ½ + ½

Aspergillus niger,citric acid = ½ + ½
Monascus purpureus , statin = ½ + ½
Saccharomyces cerevisiae, ethanol / alcohol = ½ + ½
Penicillium notatum , *Penicillin* = ½ + ½

(Any two)

[2 Marks]

9. Differentiate between the genetic codes given below :

(a) Unambiguous and Universal

(b) Degenerate and Initiator

Ans

(a) **Unambiguous**: One codon codes for only one amino acid = ½	**Universal**: Genetic code / codons are(nearly) same for all organisms / from bacteria to human = ½
(b)**Degenerate:** More than one codon coding for the same amino acid. = ½	**Initiator:** Start codon / AUG = ½

[2 Marks]

10. "Pollen grains in wheat are shed at 3-celled stage while in peas they are shed at 2-celled stage." Explain. Where are germ pores present in a pollen grain ?

Ans At the time of shedding wheat pollen consist of one vegetative and two male gametes (3 celled) , While pea pollen consists of one vegetative and one generative cell (2 celled) = ½ + ½

Germ pores are present on the exine (where sporopollenin is absent) = 1

[2 Marks]

SECTION - C

Q Nos. 11-22 are of three marks each

11. a. List the two methodologies which were involved in human genome project. Mention how they were used.

b. Expand 'YAC'and mention what was it used for.

Ans (a) Expressed Sequence Tags **,** Identifying all the genes that are expressed as RNA = ½ + ½

Sequence Annotation **,** sequencing the whole set of genome coding or non coding sequences and later assigning different region with functions = ½ + ½

(b) Yeast Artificial Chromosome , used as cloning vectors (cloning / amplification) = ½ + ½

[3 Marks]

12. Describe the inter-relationship between productivity, gross primary productivity and net productivity.

Ans Productivity is the rate of biomass production per unit area over a period of time ,
Gross primary productivity is the rate of production of organic matter during photosynthesis in an ecosystem ,
Net productivity is the gross primary productivity minus respiration losses (R) = 1+1+1

[3 Marks]

13. Explain the process of pollination in *Vallisneria.* How is it different in water-lily, which is also an aquatic plant ?

Ans *In Vallisneria* pollination takes place through water , the female flower reach the surface of water by long stalk , male flowers / pollen grain released on to the surface of water , carried passively by water current reaching the female flowers / stigma = ½ × 4

In Water lily pollination takes place through wind or insect , female flower emerges above the surface of water and gets pollinated = ½ × 2

[3 Marks]

14. Both Haemophilia and Thalassemia are blood related disorders in humans. Write their causes and the difference between the two. Name the category of genetic disorder they both come under.

Ans

Haemophilia	**Thalassemia**
Single protein involved in the clotting of blood is affected = ½	Defects in the synthesis of globin leading to formation of abnormal haemeoglobin = ½
Sex linked recessive disorder = ½	Autosomal recessive disorder= ½
Blood does not clot = ½	Results in anaemia = ½

(Any two) =½×4

Mendelian disorder = 1

[3 Marks]

15. What is disturbance in Hardy-Weinberg genetic equilibrium indicative of ? Explain how it is caused.

Ans Disturbance in Hardy-Weinberg equilibrium is an indicator of change of frequency of alleles in a population , resulting in evolution = ½ + ½

It is caused by genetic drift / gene flow or gene migration / mutation / genetic recombination / natural selection **(Any four)** = ½ × 4

[3 Marks]

16. Name a human disease, its causal organism, symptoms (any three) and vector, spread by intake of water and food contaminated by human faecal matter.

Ans Amoebiasis (Amoebic dysentery) **,** *Entamoeba histolytica* **,** constipation **/** abdominal pain / cramps / stools with excess mucus **/** blood clots **(Any three symptoms) ,** Housefly = ½ × 6

//

Ascariasis, *Ascaris* , internal bleeding / muscular pain / fever / anaemia / blockage of intestinal passage **(Any three symptoms)**, Housefly = ½ × 6

//

Typhoid, *Salmonella typhi*, high fever / weakness / stomach pain / constipation / headache / loss of appetite **(Any three symptoms)**, Housefly = ½ × 6

[3 Marks]

OR

(a) Why is there a fear amongst the guardians that their adolescent wards may get trapped in drug/alcohol abuse ?

(b) Explain 'addiction' and 'dependence' in respect of drug/alcohol abuse in youth.

Ans (a) Adolescents are easily affected by (vulnerable to) peer pressure /adventure /curiosity / excitement / experimentation / media **(Any two)** = ½ + ½

(b) Addiction -Psychological attachment to certain effects such as Euphoria / temporary feeling of well-being =l
Dependence - Tendency of the body to show withdrawal syndrome / symptoms if regular doses of drug / alcohol is abruptly discontinued = 1

[3 Marks]

17. Describe the roles of heat, primers and the bacterium *Thermus aquaticus* in the process of PCR.

Ans Heat - Denaturation / separation of DNA into two strands =1

Primer- Enzyme DNA Polymerase extend the primers using the nucleotides provided in the reaction and the genomic DNA as template =1

Thermus aquaticus - source of thermostable DNA polymerase / Taq polymerase = 1

[3 Marks]

18. Different animals respond to changes in their surroundings in different ways. Taking one example each, explain "some animals undergo aestivation while some others hiberna-

tion". How do fungi respond to adverse climatic conditions ?

Ans Some animals go into aestivation to avoid summer related problems (heat and dessication) , eg. snails / fish (any other suitable eg.) = ½ + ½

Some animals go into hibernation to avoid winter related problem (extreme cold) eg. bear (any other suitable eg.) = ½ + ½

Fungi form thick walled spores and suspend their activities to respond to adverse climatic condition = 1

[3 Marks]

19. Explain the various steps involved in the production of artificial insulin.

Ans Two DNA sequences corresponding to A and B polypeptide chains of human insulin were prepared , these were introduced into *E.coli* to produce A and B chains separately **,** these chains were extracted and combined by creating disulphide bonds =1+1+1

[3 Marks]

20. (a) Explain the significance of 'palindromic nucleotide sequence' in the formation of recombinant DNA.

(b) Write the use of restriction endonuclease in the above process.

Ans (a) Palindromic nucleotide sequence is the recognition (specific) sequence present both on the vector and on a desired / alien DNA for the action of the same(specific) restriction endonuclease to act upon = 1

(b) Same restriction endonuclease binds to both the vector and the foreign DNA , cut each of the two strands of the double helix at specific points in their sugar phosphate backbone of recognition sequence for restriction endonucleases / palindromic sequence of vector and foreign DNA , to cut strand a little away from the centre of the palindrome sites, creates overhanging stretches /sticky ends = ½ × 4

//

(b) If depicted diagramatically showing the above mentioned value points it can be accepted

[3 Marks]

21. Secondary treatment of the sewage is also called Biological treatment. Justify this statement and explain the process.

Ans Involves biological organism such as aerobic and anerobic microbes / bacteria and fungi to digest / consume organic waste = 1

Primary effluent is passed into aeration tank where vigorous growth of aerobic microbes (flocs) take place, BOD reduced (microbes consume major part of organic matter), effluent is passed to settling tank where flocs sediment to produce activated sludge , sludge is pumped to anerobic sludge digester to digest bacteria and fungi = ½ × 4

[3 Marks]

22 . (a) Write the desirable characters a farmer looks for in his sugarcane crop.

(b) How did plant breeding techniques help north Indian farmers to develop cane with desired characters ?

Ans (a) High yield , thick stem,high sugar content , ability to grow in their areas = ½ × 4

(b) By crossing *Saccharum officinarum* / south Indian variety having desired characteristics with *Saccharum barberi* / north Indian low yield variety = 1

[3 Marks]

SECTION - D

Q No. 23 is of four mark

23. It is commonly observed that parents feel embarrassed to discuss freely with their adolescent children about sexuality and reproduction. The result of this parental inhibition is that the children go astray sometimes.

(a) Explain the reasons that you feel are behind such embarrassment amongst some parents to freely discuss such issues with their growing children.

(b) By taking one example of a local plant and animal, how would you help these parents to overcome such inhibitions about reproduction and sexuality ?

Ans: (a) Illiteracy / conservative attitude / misconceptions / social myths / any other relevant point **(Any two)** = 1 + 1

(b) If a student gives the clarity of the concept of reproduction and sexuality by taking any example of a plant and an animal with respect to reproductive organs, gamete formation, fertilization, sexual behaviour etc = l + 1

[4 Marks]

SECTION - E

Q Nos. 24-26 are of five marks each

24. (a) Compare, giving reason, the J-shaped and S-shaped models of population growth, of a species.

(b) Explain "fitness of a species" as mentioned by Darwin.

Ans

J shaped - growth curve	**S shaped- growth curve**
Resources are unlimited	Resources are limited
Growth is exponential	Logistic Growth
As resources are unlimited all individuals survive and reproduce	Fittest individual will survive and reproduce
Growth Equation dN/dt=Rn (If explained)	Growth Equation dN/dt=rN (k-N/K) (If explained)

(Any three) = 1 + 1+ 1

Note - Marks to be awarded only if the corresponding difference is written.

(b) When resources are limited , Competition occurs between individuals , fittest will survive, who reproduce to leave more progeny = ½ × 4

[5 Marks]

OR

(a) What is an ecological pyramid ? Compare the pyramids of energy, biomass and numbers.

(b) Write any two limitations of ecological pyramids.

Ans: (a) Graphical representation of the relationship among the organisms at different trophic level =1

Pyramid of Energy	Pyramid of Bio Mass	Pyramid of Numbers
Shows transfer of Energy from one tropic level to other	Shows transfer of amount of food/ biomass from one tropic level to other	Pyramid of Numbers shows numbers of organism at each tropic level.
Always upright	Mostly upright but can be inverted	Mostly upright can be inverted

= ½ × 6

(b) It does not accomodate the food web / does not take into account the same species belonging to two or more tropic levels , Saprophytes are not given any place= ½ + ½

[5 Marks]

25. (a) Explain Polygenic inheritance and Multiple allelism with the help of suitable examples.

(b) "Phenylketonuria is a good example that explains Pleiotropy." Justify.

Ans (a) Traits that are generally controlled by three or more genes , the phenotype reflects the contribution of each allele / effect of each allele is additive = ½ + ½

eg. Human skin colour , controlled by three genes (A , B, C) = ½ + ½

In multiple allelism more than two alleles , govern the same character / phenotype = ½ + ½
eg . Human blood group (ABO system) , controlled by three different alleles (I^A , I^B , i) = ½ + ½

(b) In pleiotropy a single gene can exhibit multiple phenotypic expressions , in phenyl ketonuria single mutated gene express mental retardation and reduction in hair and skin pigmentation = ½ + ½

[5 Marks]

OR

(a) What is an operon ?

(b) Explain how a polycistronic structural gene is regulated by a common promoter and a combination of regulatory genes in a lac-operon.

Ans (a) An operon is a polycistronic structural gene which is regulated by a common promoter and regulator gene / transcriptonally regulated system in which polycistronic structure gene is controlled by a common promoter and regulator gene = 1

(b)
- Lac operon consist of one regulatory gene i which codes for the repressor protein , promoter (P) and operator (o) are adjacent to gene i = ½ + ½
- Structural genes z, y, a code for enzymes (â-galactosidase , permease and transacetylase respectively) = ½
- The regulator gene i synthesizes the repressor protein (all the time) , in absence of inducer , the repressor protein binds to the operator region of the operon , prevents transcription (by RNA polymerase) = ½ + ½ + ½

- The repressor is inactivated in the presence of an inducer (lactose) that binds with it , this allows RNA polymerase access to promoter and transcription proceeds = ½ + ½

[5 Marks]

26. (a) When a seed of an orange is squeezed, many embryos, instead of one are observed. Explain how it is possible.

(b) Are these embryos genetically similar or different ? Comment.

Ans (a) Polyembryony , nucellar cells surrounding embryosac start dividing , protrude into the embryo sac and develop into many embryos = 1+ 1+ 1

(b) These embryos are genetically similar, as produced from nucellar cells by mitotic division / formed without fertilisation (but different from the embryo formed by fertilization) = 1 + 1

[5 Marks]

OR

(a) Explain the following phases in the menstrual cycle of a human female:

(i) Menstrual phase

(ii) Follicular phase

(iii) Luteal phase

(b) A proper understanding of menstrual cycle can help immensely in family planning. Do you agree with the statement ? Provide reasons for your answer.

Ans: (a) (i) Menstrual phase - first 3-5 days of the cycle where menstrual flow occurs due to break down of endometrial lining of uterus, if the released ovum is not fertilised = ½ +½

(ii) Follicular phase - from 5^{th} to 14^{th} day of the cycle where the primary follicles grow to become a fully mature Graafian follicle , endometrium of uterus regenerates , Graafian follicle ruptures to release ova (ovulation on 14^{th} day) = ½ × 3

(iii) Luteal Phase - During 15^{th} to 28^{th} day remaining parts of graafian follicle transform into corpus luteum , secretion of progesterone (essential for maintenance of endometrium) = ½ × 2

All these phases are under the influence of varying concentrations of pituitary and ovarian hormone = ½

(b) Yes , can take appropriate precautions between 10^{th} to 17^{th} day of the menstrual cycle when the chances of fertilisation are high = ½ + ½

[5 Marks]

Question Paper Code 57/3

SECTION – A

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

1. An electrostatic precipitator in a thermal power plant is not able to generate high voltage of several thousands. Write the ecological implication because of it.

Ans Air Pollution //
particulate matter / dust particles released in the air.

[1 Mark]

2. Bt -toxins are released as inactive crystals in the bacterial body. What happens to it in the cotton boll worm body that it kills the boll worm.

Ans: It is converted into an active protein (due to alkaline pH of the gut of the boll worm) , the toxin binds to midgut cells / create pores / causes cell swelling and lysis that kills the bollworm = ½ + ½

[1 Mark]

3. State two postulates of Oparin and Haldane with reference to origin of life.

Ans (i) First form of life could have come from pre-existing non-living organic molecules / RNA & Protein = ½

(ii) Formation of life was preceded by chemical evolution / formation of diverse organic molecules from inorganic constituents = ½

[1 Mark]

4. Name the type of cross that would help to find the genotype of a pea plant bearing Violet flowers.

Ans. Test cross =1

[1 Mark]

5. A herd of cattle is showing reduced fertility and productivity. Provide one reason and one suggestion to overcome this problem.

Ans Reason: Inbreeding depression / continuous inbreeding = ½
Suggestion: Should be mated with unrelated superior cattle of the same breed / out - breeding / out - crossing = ½

[1 Mark]

SECTION B

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

6. List four benefits to human life by eliminating the use of CFCs.

Ans (i) Delay in aging of skin

(ii) Prevent damage to skin cells

(iii) Prevent skin cancer

(iv) Prevent snow blindness / inflammation of cornea

(v) Prevent cataract

(vi) Prevents ozone depletion

(vii) Prevents global warming

(viii) Reduces greenhouse effect

(ix) Reduces odd climatic changes or El Nino effect

(Any Four) = ½ × 4

[2 Marks]

OR

Suggest two practices giving one example of each, that help protect rare or threatened species.

Ans: (1) In situ conservation **,** biodiversity hotspot / biosphere reserve / national parks /sanctuaries / Ramsar sites / sacred groves **(Any one)** = ½ + ½

(2) Ex situ conservation **,** Zoological parks / botanical garden / wild life safari parks / cryopreservation techniques / Tissue culture / seed bank / pollen banks **(Any one)** = ½ + ½

[2 Marks]

7. Give the binomials of two types of yeast and the commercial bioactive products they help to produce.

Ans: *Saccharomyces cerevisiae*- ethanol / alcohol

Monascus purpureus- statin = 1 + 1

[2 Marks]

8. Differentiate between the genetic codes given below:

(a) **Unambiguous and Universal**

(b) **Degenerate and Initiator**

Ans:

(a) **Unambiguous**: One codon codes for only one amino acid = ½ (b)**Degenerate:** More than one codon coding for the same amino acid. = ½	**Universal**: Genetic code / codons are(nearly) same for all organisms / from bacteria to human = ½ **Initiator:** Start codon / AUG = ½

[2 Marks]

9. How many cells are present in the pollen grains at the time of their release from anther ? Name the cells.

Ans Pollen grain may be released at

2-celled stage , one vegetative and one generative cell ,

3-celled stage , one vegetative cell and two male gametes =½×4

[2 marks]

10. Name the group of cells the HIV enters after getting into the human body. What happens in these cells and what are these cells subsequently referred to as ? Name the next group of cells the HIV attacks from here.

Ans Macrophages , Reverse transcription , HIV Factory , helper T-lymphocytes (T_H) = ½ × 4

[2 marks]

SECTION – C

Q Nos. 11-22 are of three marks each

11. Rearrange *Ramapithecus, Australopithecus* and *Homo habilis* in the order of thein evolution on the Earth. Comment on their evolutionary characteristics.

Ans *Ramapithecus* $\rightarrow$ *Australopithecus* $\rightarrow$ *Homo habilis* = (1½ mark for correct sequence only)
Ramapithecus - hairy / walked like gorilla and chimpanzees / more man like = ½
Australopithecus - Hunted with stone weapons / ate fruit = ½
Homo habilis -Brain capacity 650- 800 cc / probably did not eat meat = ½

[3 Marks]

12. (a) Explain the significance of 'palindromic nucleotide sequence' in the formation of recombinant DNA.

(b) Write the use of restriction endonuclease in the above process.

Ans (a) Palindromic nucleotide sequence is the recognition (specific) sequence present both on the vector and on a desired / alien DNA for the action of the same(specific) restriction endonuclease to act upon = 1

(b) Same restriction endonuclease binds to both the vector and the foreign DNA , cut each of the two strands of the double helix at specific points in their sugar phosphate backbone of recognition sequence for restriction endonucleases / palindromic sequence of vector and foreign DNA , to cut strand a little away from the centre of the palindrome sites, creates overhanging stretches /sticky ends = ½ × 4

//

(b) If depicted diagramatically showing the above mentioned value points it can be accepted

[3 Marks]

13. Name a human disease, its causal organism, symptoms (any three) and vector, spread by intake of water and food contaminated by human faecal matter.

Ans Amoebiasis (Amoebic dysentery) **,** *Entamoeba histolytica* **,** constipation / abdominal pain / cramps / stools with excess mucus / blood clots **(Any three symptoms) ,** Housefly = ½ × 6

//

Ascariasis, *Ascaris* , internal bleeding / muscular pain / fever / anaemia / blockage of intestinal passage **(Any three symptoms)**, Housefly = ½ × 6

//

Typhoid, *Salmonella typhi*, high fever / weakness / stomach pain / constipation / headache / loss of appetite **(Any three symptoms)**, Housefly = ½ × 6

[3 Marks]

OR

(a) Why is there a fear amongst the guardians that their adolescent wards may get trapped in drug/alcohol abuse ?

(b) Explain 'addiction' and 'dependence' in respect of drug/alcohol abuse in youth.

Ans (a) Adolescents are easily affected by (vulnerable to) peer pressure /adventure /curiosity / excitement / experimentation / media **(Any two)** = ½ + ½

(b) Addiction -Psychological attachment to certain effects such as Euphoria / temporary feeling of well-being =l
Dependence:- Tendency of the body to show withdrawal syndrome / symptoms if regular doses of drug / alcohol is abruptly discontinued = 1

[3 Marks]

14. (a) List the two methodologies which were involved in human genome project. Mention how they were used.

(b) Expand 'YAC' and mention what was it used for.

Ans (a) Expressed Sequence Tags **,** Identifying all the genes that are expressed as RNA = ½ + ½

Sequence Annotation **,** sequencing the whole set of genome coding or non coding sequences and later assigning different region with functions = ½ + ½

(b) Yeast Artificial Chromosome , used as cloning vectors (cloning / amplification) = ½ + ½

[3 Marks]

15. Both Haemophilia and Thalassemia are blood related disorders in humans. Write their causes and the difference between the two. Name the category of genetic disorder they both come under.

Ans

Haemophilia	**Thalassemia**
Single protein involved in the clotting of blood is affected = ½	Defects in the synthesis of globin leading to formation of abnormal haemeoglobin = ½
Sex linked recessive disorder = ½	Autosomal recessive disorder= ½
Blood does not clot = ½	Results in anaemia = ½

(Any two) =½×4

Mendelian disorder = 1

[3 Marks]

16. (a) Trace the development of an endosperm after fertilisation with reference to coconut. Mention the importance of endosperm development.

(b) Write the importance of 'pollen bank'.

Ans (a) In coconut Primary Endosperm Nucleus (PEN-3n) undergoes successive nuclear divisions , give rise to free- nuclear endosperm known as coconut water , white kernel is the cellular endosperm , provides nourishment to the growing embryo.

=½ ×4

(b) Storage / cryopreservation (storage in liquid nitrogen at - 196 ^{o}C) , to use in crop breeding programmes =½ + ½

[3 Marks]

17. Describe the roles of heat, primers and the bacterium *Thermus aquaticus* in the process of PCR.

Ans Heat - Denaturation / separation of DNA into two strands =1

Primer- Enzyme DNA Polymerase extend the primers using the nucleotides provided in the reaction and the genomic DNA as template =1

Thermus aquaticus - source of thermostable DNA polymerase / Taq polymerase = 1

[3 Marks]

18. Secondary treatment of the sewage is also called Biological treatment. Justify this statement and explain the process.

Ans Involves biological organism such as aerobic and anerobic microbes / bacteria and fungi to digest / consume organic waste = 1

Primary effluent is passed into aeration tank where vigorous growth of aerobic microbes (flocs) take place, BOD reduced (microbes consume major part of organic matter), effluent is passed to settling tank where flocs sediment to produce activated sludge , sludge is pumped to anerobic sludge digester to digest bacteria and fungi = ½ × 4

[3 Marks]

19. Explain the various steps involved in the production of artificial insulin.

Ans Two DNA sequences corresponding to A and B polypeptide chains of human insulin were prepared , these were introduced into *E.coli* to produce A and B chains separately **,** these chains were extracted and combined by creating disulphide bonds =1+1+1

[3 Marks]

20 . Describe the inter-relationship , between productivity, gross primary productivity and net productivity.

Ans Productivity is the rate of biomass production per unit area over a period of time ,

Gross primary productivity is the rate of production of organic matter during photosynthesis in an ecosystem ,

Net productivity is the gross primary productivity minus respiration losses (R) = 1+1+1

[3 Marks]

21. Write the desirable characters a farmer looks for in his sugarcane crop.

(b) How did plant breeding techniques help north Indian farmers to develop cane witbrdesired characters ?

Ans (a) High yield , thick stem,high sugar content , ability to grow in their areas = ½ × 4

(b) By crossing *Saccharum officinarum* / south Indian variety having desired characteristics with *Saccharum barberi* / north Indian low yield variety = 1

[3 Marks]

22. How do kangaroo rats and desert plants adapt themselves to survive in their extreme habitat ? Explain.

Ans Kangaroo rats- internal fat oxidation where water is a byproduct , excretes concentrated urine =½+½

Desert Plants -thick cuticle / sunken stomata / leaves reduced to spines / deep roots /

Special photosynthetic pathway / CAM **(Any four)** = ½ × 4

[3 Marks]

SECTION - D

Q No. 23 is of four mark

23. It is commonly observed that parents feel embarrassed to discuss freely with their adolescent children about sexuality and reproduction. The result of this parental inhibition is that the children go astray sometimes.

(a) Explain the reasons that you feel are behind such embarrassment amongst some parents to freely discuss such issues with then- growing children.

(b) By taking one example of a local plant and animal, how would you help these parents to overcome such inhibitions about reproduction and sexuality ?

Ans: (a) Illiteracy / conservative attitude / misconceptions / social myths / any other relevant point **(Any two)** = 1 + 1

(b) If a student gives the clarity of the concept of reproduction and sexuality by taking any example of a plant and an animal with respect to reproductive organs, gamete formation, fertilization, sexual behaviour etc = l + 1 [4 Marks]

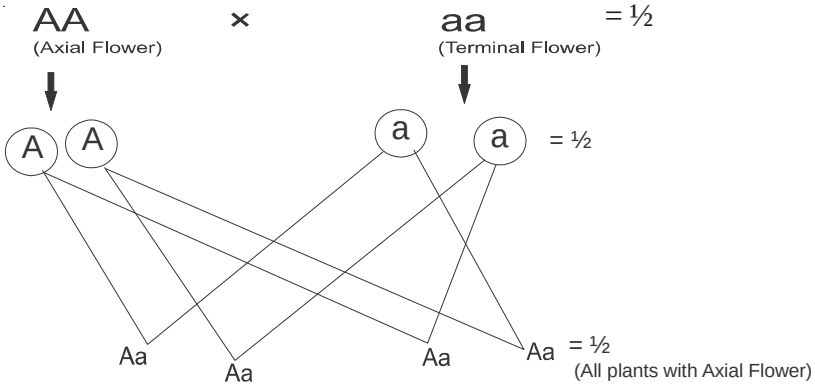
SECTION - E

Q Nos. 24-26 are of five marks each

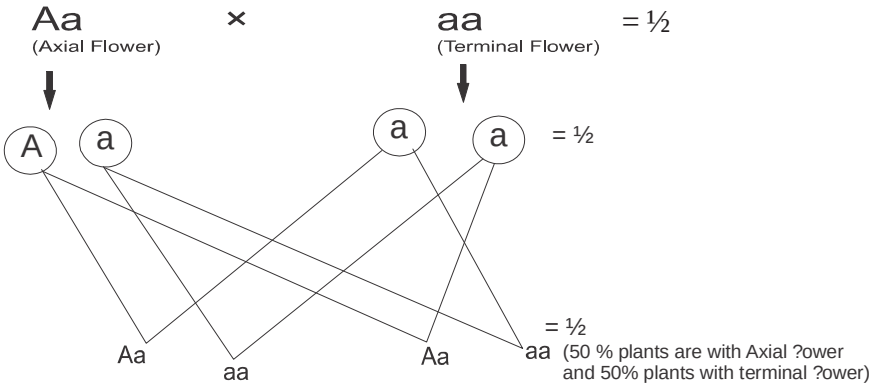
24. (a) A pea plant bearing axial flowers is crossed with a pea plant bearing terminal flowers. The cross is carried out to find the genotype of the pea plant bearing axial flowers. Work out the cross to show the conclusions you arrive at.

(b) State the Mendel's law of inheritance that is universally acceptable.

Ans (i) If the plants is homozygous for the dominant trait



(ii) If the plants is heterozygous for the dominant trait



Conclusion : If all progeny show axial flowers (dominant) the plant is homozygous (AA) **,**
If 50 % of Progeny show Axial flower (Dominant) and 50% Terminal flower (Recessive) the plant is heterozygous = ½ + ½

(b) Law of Segregation , allelic pair segregate (separates) during gamete formation (do not loose their identity) = ½ + ½

[5 Marks]

OR

(a) Absence of lactose in the culture medium affects the expression of a Lac-operon in *E. coli.* Why and how ? Explain.

(b) Write any two ways in which the gene expression is regulated in eukaryotes.

Ans (a)
- Lactose acts as inducer thus absence of lactose switches off the operon
- Repressor protein produced by regulatory gene (i-gene) is free (in the absence of inducer) ,
- Repressor protein binds with the operator gene (o-gene) ,
- Preventing RNA polymerase to transcribe the structural gene and operon is switched off

= 1+ 1+1 +1

//

If the above mentioned points are properly represented with help of schematic diagram.

(b)
- Transcriptional level (formation of primary transcripts)
- Processing level (regulation of splicing)
- Transport of messengar RNA from nucleus to the cytoplasm
- Translational level **(Any two)** = ½+½

[5 Marks]

25. (a) When a seed of an orange is squeezed, many embryos, instead of one are observed. Explain how it is possible.

(b) Are these embryos genetically similar or different ? Comment.

Ans: (a) Polyembryony **,** nucellar cells surrounding embryosac start dividing **,** protrude into the embryo sac and develop into many embryos = 1+ 1+ 1

(b) These embryos are genetically similar, as produced from nucellar cells by mitotic division / formed without fertilisation (but different from the embryo formed by fertilization) = 1 + 1

[5 Marks]

OR

(a) Explain the following phases in the menstrual cycle of" a human female:

(i) Menstrual phase

(ii) Follicular phase

(iii) Luteal phase

(b) A proper understanding of menstrual cycle can help immensely in family planning. Do you agree with the statement ? Provide reasons for your answer.

Ans: (a) (i) Menstrual phase - first 3-5 days of the cycle where menstrual flow occurs due to break down of endometrial lining of uterus, if the released ovum is not fertilised = ½ +½

(ii) Follicular phase - from 5th to 14th day of the cycle where the primary follicles grow to become a fully mature Graafian follicle , endometrium of uterus regenerates , Graafian follicle ruptures to release ova (ovulation on 14th day) = ½ × 3

(iii) Luteal Phase - During 15th to 28th day remaining parts of graafian follicle transform into corpus luteum , secretion of progesterone (essential for maintenance of endometrium) = ½ × 2

All these phases are under the influence of varying concentrations of pituitary and ovarian hormone = ½

(b) Yes , can take appropriate precautions between 10th to 17th day of the menstrual cycle when the chances of fertilisation are high = ½ + ½

[5 Marks]

26. (a) Compare, giving reasons, the J-shaped and S-shaped models of population growth of a species.

(b) Explain "fitness of a species" as mentioned by Darwin.

Ans

J shaped - growth curve	**S shaped- growth curve**
Resources are unlimited	Resources are limited
Growth is exponential	Logistic Growth
As resources are unlimited all individuals survive and reproduce	Fittest individual will survive and reproduce
Growth Equation dN/dt=Rn (If explained)	Growth Equation dN/dt=rN (k-N/K) (If explained)

(Any three) = 1 + 1+ 1

Note - Marks to be awarded only if the corresponding difference is written.

(b) When resources are limited , Competition occurs between individuals , fittest will survive, who reproduce to leave more progeny = ½ × 4

[5 Marks]

OR

(a) What is an ecological pyramid ? Compare the pyramids of energy, biomass and numbers.

(b) Write any two limitations of ecological pyramids.

Ans: (a) Graphical representation of the relationship among the organisms at different trophic level =1

Pyramid of Energy	Pyramid of Bio Mass	Pyramid of Numbers
Shows transfer of Energy from one tropic level to other	Shows transfer of amount of food/ biomass from one tropic level to other	Pyramid of Numbers shows numbers of organism at each tropic level.
Always upright	Mostly upright but can be inverted	Mostly upright can be inverted

$= ½ \times 6$

(b) It does not accomodate the food web / does not take into account the same species belonging to two or more tropic levels , Saprophytes are not given any place= ½ + ½

[5 Marks]