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
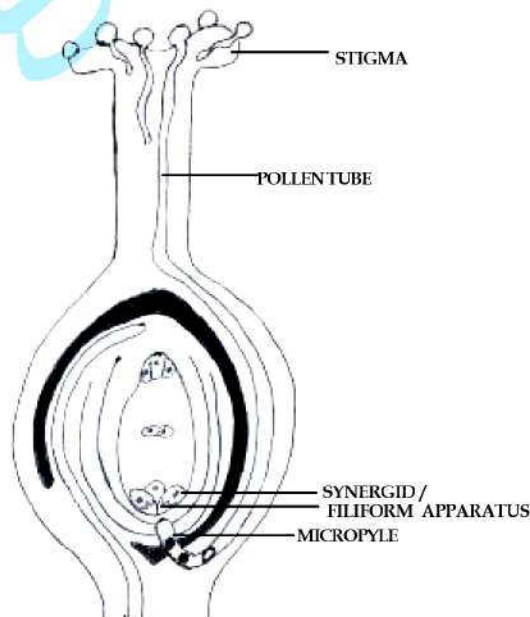
[2 Marks]

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 =1
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

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(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

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 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]

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
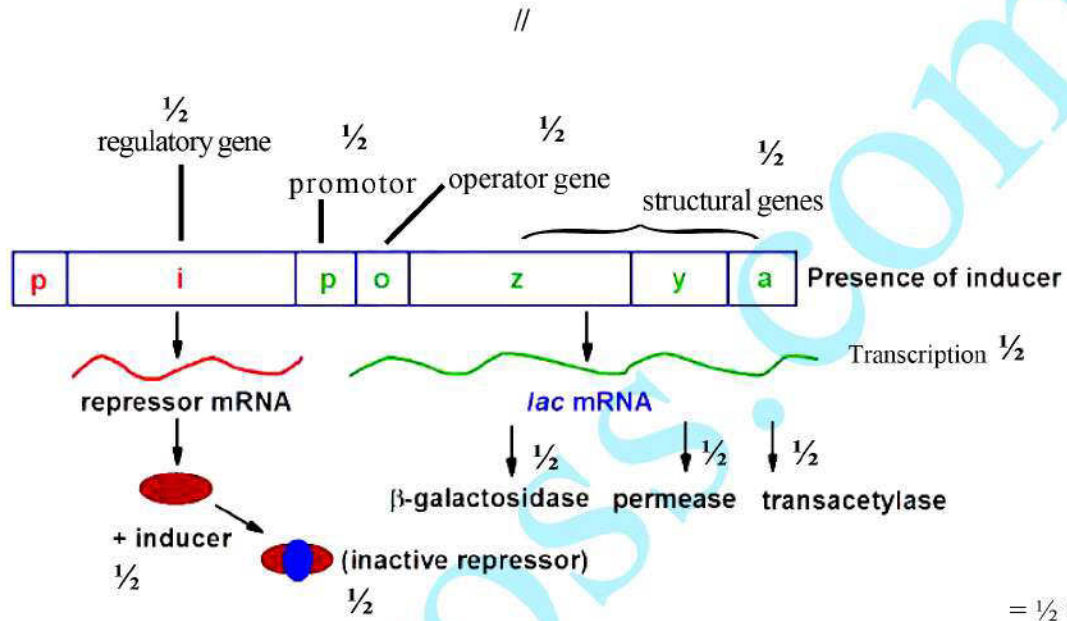
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Process of splicing shown diagramatically.

[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]