

Question Paper Code 57/2/1

SECTION A

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

1. What is pollen –pistil interaction and how is it mediated?

Ans. The ability of the pistil to recognize the pollen followed by its acceptance or rejection = $\frac{1}{2}$,
It is mediated by chemical components of pollen interacting with those of pistil. = $\frac{1}{2}$

[1 mark]

2. Why do normal red blood cells become elongated sickle shaped structures in a person suffering from sickle cell anaemia?

Ans. The mutant haemoglobin molecule (substitution of Glutamic acid by valine) undergoes polymerization, under low oxygen tension causing the change. = $\frac{1}{2} + \frac{1}{2}$

[1 mark]

3. What is an autoimmune disease? Give an example .

Ans. When body attacks self cells (damaging the body) , Rheumatoid arthritis(Any other suitable example)
= $\frac{1}{2} + \frac{1}{2}$

[1 mark]

4. Write the two components of the first artificial recombinant DNA molecule constructed by Cohen and Boyer.

Ans. Restriction enzyme , Vector = $\frac{1}{2} + \frac{1}{2}$

[1 mark]

5. Name the host cells in which micro –injection technique is used to introduce an alien DNA.

Ans. Animal cell

[1 mark]

6. Write the names of the enzymes that are used for isolation of DNA from bacterial and fungal cells respectively for Recombinant DNA Technology.

Ans. Lysozyme for bacterial cells , chitinase for fungal cells = $\frac{1}{2} + \frac{1}{2}$

[1 mark]

7. State the purpose of signing the Montreal Protocol .

Ans. To control the emission of ozone depleting substances.

[1 mark]

8. In spite of being non- polluting why are there great apprehensions in using nuclear energy for generating electricity?

Ans. Accidental leakages , safe disposal of radioactive waste = $\frac{1}{2} + \frac{1}{2}$

[1 mark]

SECTION B

9. Name any two organisms and the phenomenon involved where the female gamete undergoes development to form new organisms without fertilization .

Ans. Rotifers / honeybees / some lizards / turkey

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

[2 marks]

10. Explain pleiotropy with the help of an example.

Ans. Effect of single gene on multiple phenotypic expressions = 1

e.g. size of the starch grains produced and shape of the seeds in pea plant are controlled by a single gene // Phenyleketonuria characterised by mental retardation and reduction in hair and skin pigmentation = 1

[2 marks]

11. A template strand is give below. Write down the corresponding coding strand and the mRNA strand that can be formed along with their polarity

3' ATGCATGCATGCATGCATGC5'

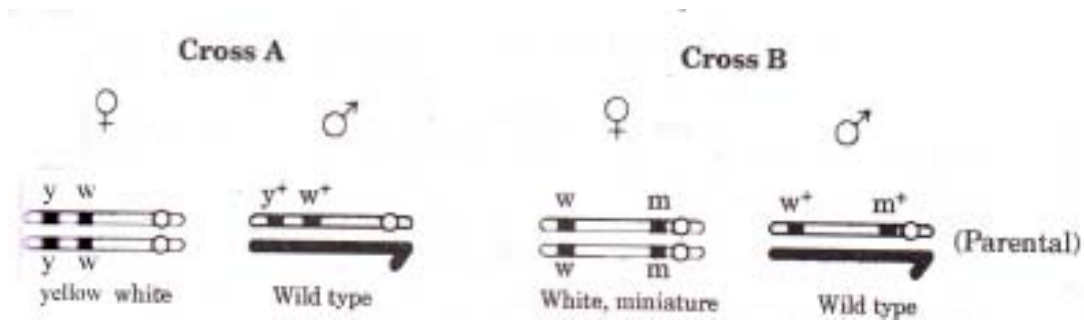
Ans. Coding strand-5' TACGTACGTACGTACGTACGTACG 3'

mRNA strand- 5' UACGUACGUACGUACGUACGUACG 3' = 1+1

[2 marks]

OR

Study the figures given below and answer the question.



Identify in which of the crosses is the strength of Linkage between the genes higher . Give reasons in support of your answer.

Ans. Cross A, because they are tightly linked / due to close physical association / they are closely located = 1+1

[2 marks]

12. Where does peptide bond formation occur in a bacterial ribosome and how ?

Ans. Between the two amino acids (found on charged tRNA) , bound to the two sites of the large sub units of bacterial ribosomes , when two charged tRNAs are brought close enough , peptide bond is formed with the help of ribozyme = $\frac{1}{2} \times 4$

[2 marks]

13. What is “withdrawal syndrome”? List any two symptoms it is characterized by.

Ans. Manifestation of unpleasant characteristic when a regular dose of drugs / alcohol is abruptly discontinued = 1

Unpleasant feeling , Anxiety , shakiness , nausea , sweating = $1 + \frac{1}{2} + \frac{1}{2}$

(Any two)

[2 marks]

14. How is insertional inactivation of an enzyme used as a selectable marker to differentiate recombinants from non – recombinants?

Ans. The presence of chromogenic substrate gives blue coloured colonies , in presence of α -galactosidase. Presence of an insert (recombinant DNA) results into inactivation of the enzyme , colonies with inactivation of α -galactosidase do not produce any colour. = $\frac{1}{2} \times 4$

[2 marks]

15. Explain how Eli Lilly an American company produced insulin by recombinant DNA technology.

Ans. Prepared two DNA sequences corresponding to A and B chains of human insulin , introduced them in plasmid of E. coli to produce insulin chains , separately produced chains A and B extracted , combined by creating disulfide bonds = $\frac{1}{2} \times 4$

[2 marks]

16. Explain Verhulst – Pearl Logistic Growth of a population.

Ans. A population growing in a habitat with limited resources show initially a lag phase , = $\frac{1}{2}$ followed by phases of acceleration and deceleration , = $\frac{1}{2}$ finally an asymptote when the population density reaches the carrying capacity. = $\frac{1}{2}$

$$dN / dt = rN \left(\frac{K - N}{K} \right) = \frac{1}{2}$$

[$\frac{1}{2} \times 4 = 2$ marks]

17. Differentiate between commensalism and mutualism by taking one example each from plants only.

Ans. Commensalism - In this interaction one species is benefited and the other species is neither benefited nor harmed. = $\frac{1}{2}$

e.g. an orchid growing as an epiphyte on the branch of a mango. = $\frac{1}{2}$

Mutualism- In this interaction both the interacting species are benefited. = $\frac{1}{2}$

e.g. Lichens exhibit mutualistic relationship between a fungus that absorbs water and nutrients from soil and photosynthesizing algae / cyanobacteria. = $\frac{1}{2}$

[$\frac{1}{2} \times 4 = 2$ marks]

18. List the two steps that are essential for carrying out artificial hybridization in crop plants and why.

Ans. Hybridization of pure lines , artificial selection = $\frac{1}{2} + \frac{1}{2}$

to produce plants with desirable traits. (high yield , nutrition and resistance to diseases) = 1

[1 + 1 = 2 marks]

SECTION C

19. Write the differences between wind –pollinated and insect –pollinated flowers. Give an example of each type.

Ans. Wind pollinated – light and non sticky pollen grains / possess well exposed stamens / large and feathery stigma / not very colourful / do not produce nectar ,

eg.- Maize / wheat (Any other suitable example) = $\frac{1}{2}$

Insect pollinated- large colorful fragrant flowers / rich in nectar / clustered into inflorescence when flowers are small / secrete foul odour.

(Any two corresponding differences) = 1 + 1

eg. Pansy = $\frac{1}{2}$

(Any other suitable example)

[3 marks]

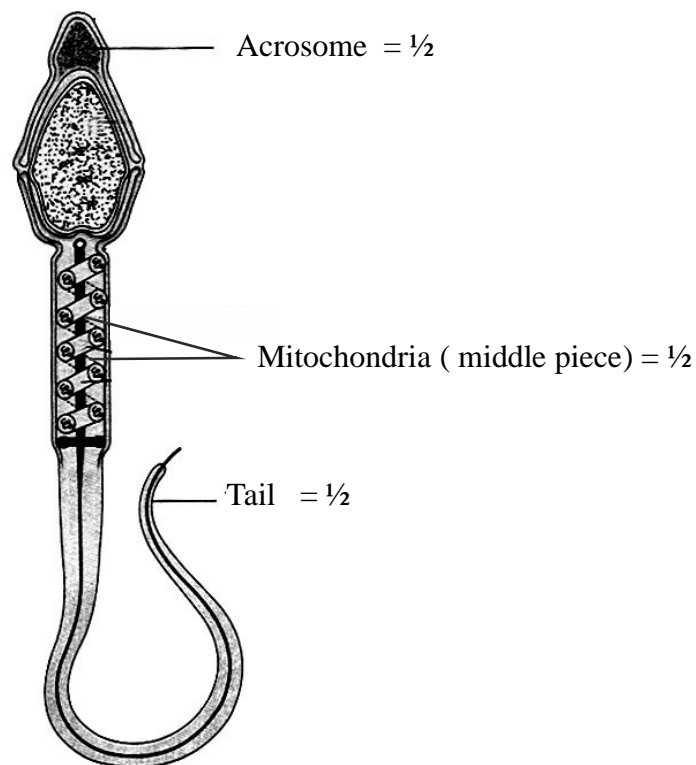
20. (a) How is placenta formed in the human female?
(b) Name any two hormones which are secreted by it and are also present in a non – pregnant woman.

Ans. (a) After implantation, the chorionic villi that appear on trophoblast, interdigitate with the uterine tissue, jointly form placenta = $\frac{1}{2} \times 4$
(b) Estrogen, progesterone = $\frac{1}{2} + \frac{1}{2}$

[2 + 1 = 3 marks]

21. Draw a diagram of a human sperm. Label only those parts along with their functions that assist the sperm to reach and gain entry into the female gamete.

Ans.



Functions :

- Acrosome : filled with enzymes that help enter the ovum = $\frac{1}{2}$
- Mitochondria (middle piece) : energy source for movement of tail to reach ovum = $\frac{1}{2}$
- Tail : for motility = $\frac{1}{2}$

[3 marks]

22. (a) Write the conclusions Mendel arrived at on dominance of traits on the basis of monohybrid crosses that he carried out in pea plants.
(b) Explain why a recessive allele is unable to express itself in a heterozygous state.

- Ans.** (a) (i) Characters are controlled by discrete unit called factors, = $\frac{1}{2}$
(ii) Factors occur in pair = $\frac{1}{2}$
(iii) In a dissimilar pair of factors one member of the pair dominates / only one of the parental character is expressed in a monohybrid cross in the F_1 and both are expressed in the $F_2 = 1$
- (b) Due to non functional enzyme / less efficient enzyme / no enzyme at all = 1

[3 marks]

23. Name the form of *Plasmodium* that gains entry into the human body .Explain the different stages of its life –cycle in the human body.

Ans. Sporozoites , Sporozoites reach the liver through blood, the parasite reproduces asexually in liver cells , the parasite reproduces asexually in red blood cells , bursting the RBCs and releasing into the blood, Gametocytes develop in RBCs = $\frac{1}{2} \times 6 = 3$

OR

- (a) **Name and explain giving reasons the type of immunity provided to the newborn by colostrums and vaccinations.**
- (b) **Name the type of antibody**
- I. Present in colostrums**
- II. Produced in response to allergens in human body .**

Ans. (a) passive immunity , when readymade antibodies are directly given to protect the body against foreign agents = $\frac{1}{2} + \frac{1}{2}$

Active immunity , when a host is exposed to antigens which may be forms of living or dead microbes or other proteins antibodies are produced in the host body. = $\frac{1}{2} + \frac{1}{2}$

- (b) (i) IgA = $\frac{1}{2}$
(ii) IgE = $\frac{1}{2}$

24. Identify a, b,c,d , e and f in the table given below:

Scientific Name of the organism	Product produced	Use in human welfare
<i>Streptococcus</i>	Streptokinase that was later modified	a
b	Cyclosporin A	c
<i>Monascus purpureus</i>	d	e
<i>Lactobacillus</i>	f	Sets milk into curd

- Ans.** a - clot buster for removing clots from blood vessels
b - *Trichoderma polysporum*
c - Immunosuppressive agent in organ transplant

- d - Statins
- e - Blood cholesterol lowering agent
- f - Lactic acid = $\frac{1}{2} \times 6$

[3 marks]

25. (a) **List the three steps involved in Polymerase Chain reaction (PCR).**
 (b) **Name the source organism of Taq polymerase. Explain the specific role of this enzyme in PCR.**
- (a) (i) Denaturation (ii) annealing (iii) Extension = $\frac{1}{2} \times 3$
 (b) *Thermus aquaticus*, it remains active during the high temperature, (induced to denature double stranded DNA) and catalyses polymerisation of DNA = $\frac{1}{2} \times 3$

[$1\frac{1}{2} + 1\frac{1}{2} = 3$ marks]

26. **What is “biofortification”? write its importance. Mention the contribution of Indian Agricultural Research Institute towards it with the help of two examples.**

Ans. Breeding crops with higher level of vitamins and minerals, higher proteins, healthier fats, to improve public health, = $\frac{1}{2} \times 4$

IARI has released several vegetable crops that are rich in vitamins and minerals e.g. Vitamin A enriched carrots, spinach, pumpkin, vitamin C enriched bitter melon, bathua, mustard, tomato, iron and calcium enriched spinach and bathua, protein enriched beans, lablab, French and garden pea

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

[2 + 1 = 3 marks]

27. **Presently, air quality of Delhi has significantly improved in comparison to what existed before 1997. This is result of conscious human efforts. You are being asked to conduct an awareness programme in your locality wherein you will comment on the steps taken by Delhi Government to improve the air quality.**

- (a) **Write any two of your comments.**
 (b) **List any two ways that you would include in your programme so as to ensure the maintenance of good quality of air.**
 (c) **State any two values your programme will inculcate in the people of your locality.**

Ans. (a) (i) Use of CNG as fuel encouraged in vehicles
 (ii) Improved public transport system like new fleet of DTC buses, Introduced Metro
 (iii) Pollution check of vehicles was made mandatory
 (iv) Availability of sulphur free fuel (Euro II norms)

(*Any other suitable value*) (*Any two*) = $\frac{1}{2} + \frac{1}{2}$

- (b) (i) Car pool essential
 (ii) Use of bicycle
 (iii) Get your car pollution checked regularly
 (*Any other suitable example*) (*Any two*) = $\frac{1}{2} + \frac{1}{2}$

- (c) (i) Consciousness about the environment
 (ii) Concern for others

- (iii) Improving social skills
 - (iv) Leadership quality
- (Any other suitable example) (Any two) = $\frac{1}{2} + \frac{1}{2}$

[3 marks]

SECTION D

28. (a) What was proposed by oparin and Haldane on origin of life? How did S.L.Miller is experiment support their proposal?
- (b) Which human chromosome has (1) maximum number of genes , and which one has (2) fewest genes?
- (c) Write the scientific importance of single nucleotide polymorphism identified in human genome.

- Ans. (a) First form of life could have come from pre - existing non-organic molecules , S.L. Miller created electric discharge in a closed flask containing CH_4 , H_2 , NH_3 and water vapour at 800°C , and observed formation of amino acids. = $\frac{1}{2} \times 6$
- (b) Chromosome 1, Y = $\frac{1}{2} + \frac{1}{2}$
- (c) It helps to find chromosomal locations for disease – associated sequences , and tracing human history = $\frac{1}{2} + \frac{1}{2}$

[5 marks]

OR

A cross was carried out between a pea plant heterozygous for round and yellow seeds with a pea plant having wrinkled and green seeds.

- (a) Show the cross in Punnett square.
- (b) Write the phenotype of the progeny of this cross.
- (c) What is this cross known as? State the purpose of conducting such a cross.

Ans. $\text{RrYy} \times \text{rryy} = \frac{1}{2}$

Round Yellow Wrinkled Green

RY	rY	Ry	ry	= $\frac{1}{2}$
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ry	RrYy	rrYy	Rryy	rryy	= $\frac{1}{2} + \frac{1}{2}$
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- (b) Round and yellow = $\frac{1}{2}$
- Wrinkled and yellow = $\frac{1}{2}$
- Round and green = $\frac{1}{2}$
- Wrinkled and green = $\frac{1}{2}$
- (c) Test cross, to identify the genotype of unknown if it is homozygous dominant or heterozygous dominant = $\frac{1}{2} + \frac{1}{2}$

[5 marks]

29. (a) Name the category of microbes occurring naturally in sewage and making it less polluted during the treatment.
- (b) Explain the different steps involved in the secondary treatment of sewage.

Ans. (a) Aerobic microbes = $\frac{1}{2}$

- (b) Primary effluent passed into large aeration tank with air pumped into it allowing useful aerobic microbes to form flocs, these microbes consume major part of organic matter, and reduce BOD, once BOD reduced effluent is passed into settling tank, to allow flocs to sediment and form activated sludge, some of the activated sludge is sent to aeration tank as inoculum, and remaining is pumped to anaerobic sludge digesters, where bio gas is produced as a result of anaerobic digestion, the effluents from secondary treatment are released into natural water bodies. = $\frac{1}{2} \times 9$

[$\frac{1}{2} + 4\frac{1}{2} = 5$ marks]

OR

- (a) Name and explain any four lymphoid organs present in humans.
(b) Categorise the named Lymphoid organs as primary or secondary lymphoid organs, giving reasons.

Ans. Bone marrow - blood cells - lymphocytes are produced and mature

Thymus - large at the time of birth but keep reducing in size with age. Lymphocytes are produced and mature

Spleen - Acts as a filter for microorganisms in blood and reservoir for RBCs

Lymph nodes - trap micro organisms or other antigens and activate lymphocytes and initiate immune system

(Name and explanation together = $\frac{1}{2}$)

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

- (b) Primary lymphoid organs - bone marrow and thymus = $\frac{1}{2}$

Immature lymphocytes differentiate into antigen sensitive lymphocytes = 1

Secondary lymphoid organ - spleen and lymph nodes = $\frac{1}{2}$

Provide the site for interaction of lymphocytes with antigen, which proliferate to become effector cell = $\frac{1}{2} + \frac{1}{2}$

[2 + 3 = 5 marks]

30. (a) Differentiate between primary and secondary ecological succession.

- (b) Explain the different steps of xerarch succession occurring in nature.

Ans. (a) Primary Succession

- starts where no living organism existed previously
- new biotic communities are formed on bare rock / lava and so it is slow

Secondary Succession

- starts where life existed earlier and got lost
- some soil sediments with propagules present and so it is faster

1 mark each difference = 2

- (b) - Takes place in dry area hence progress from xeric to mesic condition = $\frac{1}{2}$

- Pioneer species such as lichens secrete acids to break rocks, initiate rock formation = $\frac{1}{2} + \frac{1}{2}$

- lichens pave way to bryophytes = $\frac{1}{2}$

- which are succeeded by bigger plants ultimately , stable meric community is formed
= $\frac{1}{2} + \frac{1}{2}$

[2 + 3 = 5 marks]

OR

(a) Why is there a need to conserve biodiversity?

(b) Name and explain any two ways that are responsible for the loss of biodiversity.

- Ans.** (a) 1. to continue to get the products of human consumption
2. plays a major role in many eco system services that nature provides and that is invaluable
3. moral duty to pass on biological legacy in good order to future generations

(Any two) = $(1 \times 2 = 2)$

- (b) 1. Habitat loss and fragmentation- large habitats when broken lead to loss of habitat for animals needing large territories (are badly affected) – population decline
2. Overexploitation- leading to extinction of many, especially commercially important species
3. Alien species invasion - alien species when introduced may turn invasive causing decline and extinction of indigenous species // explain with an example.
4. Coextinction- when one species become extinct , any other organism intimately associated also becomes extinct.

(any two) $(1\frac{1}{2} \times 2)$

[2 + 3 = 5 marks]