2015

LIST OF PARTICIPANTS

S.No.	Name of Participants	Coordinator/Expert	Office	Residence
1.	Mrs. Rachna Gupta Vice Principal Delhi Public School Sec. C, Pocket 5, Vasant Kunj	Coordinator		9811345797
2.	Mr. Y.P. Purang Retd. ADE- C-2/113, Janak Puri New Delhi-110058	Subject-Expert		9810529809
3.	MS. RITA TALWAR 54, Khan Market New Delhi - 110 003	Subject-Expert Retd. Principal		9810443125
4.	MRS. SHIVANI GOSWAMI 563, Golf Vista Apptt. Sector Alpha-II, Greater Noida Gautam Budh Nagar, U.P.-201 308	Subject Expert		9958477758
5.	MS. SHIPRA SARCAR Principal Air Force Golden Jublee Institute Subroto Park, New Delhi	Expert	011-25694353	9958456081
6.	MS. RIMA DEY B-905, Plot B9/1B Sharmdeep Aptts, Sec. - 62 Noida (UP)	Expert		9891120671
7.	MRS. SUSHIL MALHOTRA D-46B/13 1ST Floor, Single Storey Vijay Nagar Delhi -09	Expert		9711032234
8.	MR. VIRENDRA SRIVASTAVA B - 3B/95 B, Janakpuri New Delhi- 110058	Subject Expert		9810377435
9.	MRS. NEETA RASTOGI Principal Sadhu Vaswani Intl. School for Girls 2nd Street, Shanti Niketan New Delhi-110021	Representative Delhi		9811778593
10.	MS. Poonam. Khurana DAV Model School, Sector - 15A Chandigarh	Panchkula		09876421755
11.	DR. Manoj Kumar Das Principal Jawahar Navidaya Vidyalaya Konark, Puri Odisha-752111	Bhubaneshwar		9437429291
12.	SH. R SANKAR Principal Kendriya Vidyalaya No. 2, Uppal Hyderabad, Telangana -500039	Chennai		040-27202031 9491073600

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13	SH. VALSALA NAIR Principal Kendriya Vidyalaya SAP Camp, Peroorkada, Trivandrum, Kerala -695005	Thiruvananthapuram		09496388999
14.	MRS. TOOLIKA GOEL Vice Principal Silver Bells Public School Shamli (UP) - 247776	Shamli		98737050093
15.	MRS. RAJINI YADAV Mayoor School Alwar-Gate Ajmer	Ajmer		09001967576
16.	MR. RANVEER SINGH D.O.E. GSBV Timarpur Delhi			9891069977
17.	Mr. R P Singh D.O.E. GSBV Ranapratab Bagh Delhi			9990081661
18.	MRS. ANURADHA RAY HOD DPS Vasant Kunj New Delhi-110070	Delhi	011-43261200	9899707132 011-25096658

F15 - 57/2/1, 2, 3 DPSVK/2

Confidential
(For Restricted circulation)
25.03.2015

Senior School Certificate Examination

March 2015

Marking Scheme - Biology (Theory)

Expected Answers/Value Points

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 (✓) 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 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.

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Question Paper Code. 57/2/1

SECTION A

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

1.   Meiosis is an essential event in the sexual life cycle of any organism. Give two reasons.

Ans. (i)   Meiosis helps in formation of gametes by reductional division & maintains number of chromosomes constant / maintains ploidy = ½

(ii)   Recombination of genes in offsprings / brings variation = ½

[1 Mark]

2.   How does a degenerate code differ from an unambiguous one?

Ans. Degenerate Code : one amino acid coded by more than one codon = ½

Unambiguous code : One codon for one amino acid = ½

[1 Mark]

3.   Write the hypothetical proposals put forth by Oparin and Haldane.

Ans. Oparin & Haldane : First form of life could have (origin of life) come from pre existing non living organic molecules = ½

formation of diverse organic molecules from inorganic constituents/ formation of life was preceeded by chemical evolution = ½

[1 Mark]

4.   Write the function of RNA polymerase II.

Ans. RNA polymerase II **-** transcribes precursor of mRNA / hn RNA

[1 Mark]

5.   "Man can be a primary as well as a secondary consumer." Justify this statement.

Ans. Vegetarian diet - Primary consumer = ½

Non vegetarian diet - Secondary consumer = ½

[1 Mark]

SECTION B

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

6.   Suggest two advantages to a farmer for using apomictic seeds of hybrid varieties.

Ans. (i)   No segregation of characters in hybrid progeny = 1

(ii)   Apomictic hybrid seeds can be used to grow crop year after year /

economical as ordinary hybrid seeds are not used to grow crop year after year = 1

[2 Marks]

7.   When does a geneticist need to carry a test cross? How is it carried?

Ans. To know unknown genotype of the dominant trait (homozygous or heterozygous) = 1

by crossing the unknown genotype with corresponding recessive trait, = ½

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if progeny is 50% dominant -Heterozygous/

if all dominant - Homozygous $\left.\right\}$ ½

[2 Marks]

8. **Differentiate between outbreeding and outcrossing.**

Ans. Outbreeding -Breeding of unrelated animals (no common ancestor for 4 - 6 generations)

belonging to same breed or different breed or different species = 1

Outcrossing - breeding within the animals of same breed having no common ancestors for 4 - 6 generation on either side of their pedigree = 1

[2 Marks]

OR

Bottled fruit juices are clearer as compared to those made at home. Explain.

Ans. Enzyme Pectinase , protease are added for clearing them = 1 + 1

[2 Marks]

9. **When you go for a trek / trip to any high altitude places, you are advised to take it easy and rest for the first two days. Comment, giving reasons.**

Ans. Altitude sickness /

due to low O_2 availability $\left.\right\}$ = ½

Body compensates low oxygen availabilty during rest by increasing R.B.C production , decreasing the binding capacity of haemoglobin , increasing breathing rate = ½ + ½ + ½

[2 Marks]

10. **What is joint forest management? How can it help in conservation of forests?**
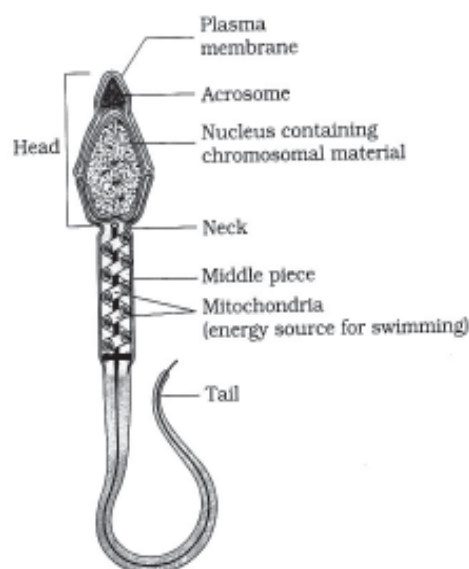
Ans. JFM - A programme (initiated by Govt. of India in 1980) where govt. works closely with local communities for protecting & managing forests = 1

Forests are conserved by locals in a sustainable manner as locals are also benefitted with forest products / (fruits / gum / rubber / medicines etc) = 1

[2 Marks]

SECTION C

Q. Nos. 11 - 22 are of three marks each

11. **Draw a labeled diagram of a human sperm.**

Ans.

Plasma membrane
Acrosome
Nucleus containing chromosomal material
Head
Neck
Middle piece
Mitochondria (energy source for swimming)
Tail

(any six labels = ½ × 6)

[3 Marks]

12. **What is amniocentesis? Justify the statutory ban on it.**

Ans. Study of chromosonal pattern in amniotic fluid of foetus ,

It is misused to detect the sex of the foetus ,

ban to check female foeticide

(= 1 × 3)

[3 Marks]

13. **(a)** **Name the kind of diseases/disorders that are likely to occur in humans if**

    (i) **Mutation in the gene that codes for an enzyme phenyl alanine hydrolase occurs,**

    (ii) **There is an extra copy of chromosome 21,**

    (iii) **the karyotype is XXY.**

  (b) **Mention any one symptom of the diseases/disorders named above.**

Ans. (a & b)

    (i) Phenylketonuria , mental retardation = ½ + ½

    (ii) Down' s syndrome , short statured / small round head / furrowed tongue / partially open mouth / broad palm with characteristics palm crease / retarded mental physical and psychomotor development = ½ + ½

    (iii) Klinefelter's Syndrome , Overall masculine development with feminine features (enlarged breast / Gynaecomastia) / sterile = ½ + ½

(any one symptom from each category , any other appropriate symptom)

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[3 Marks]

14. How was a heavy isotope of nitrogen used to provide experimental evidence to semi-conservative mode of DNA-replication?

Ans. E.coli were allowed to grow on medium containing ^{15}N for many generations so that ^{15}N was incorporated in newly synthesized DNA making it heavy DNA (Nitrogen is important constituent of DNA) = ½

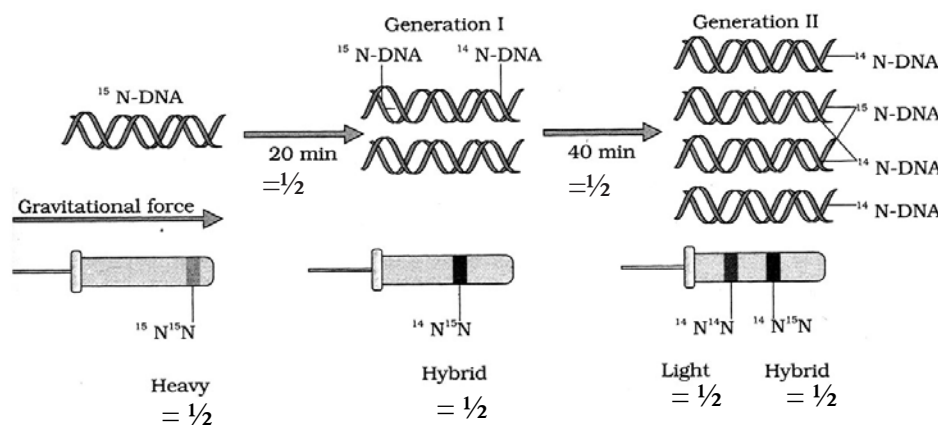The heavy DNA can be differentiated from light DNA by Caesium Chloride Density Gradient centrifugation , = ½

The above E.coli (with ^{15}N) were then transferred in medium containing ^{14}N and, samples were taken out after 20 minutes and after 40 minutes = ½

Extracted DNA was centrifuged and measured to get their density , = ½

DNA extracted after 20 minutes (I^{st} Generation) showed an intermediate hybrid density / ^{14}N ^{15}N, = ½

DNA extracted after 40 minutes (2nd Generation) showed equal amount of Light DNA / ^{14}N and hybrid DNA / ^{14}N ^{15}N = ½

$= ½ \times 6$

//

[3 Marks]

15. Explain convergent evolution with the help of two examples.

Ans. Convergent Evolution

Presence of organs in different organisms that are not anatomically similar but they perform similar functions , and two or more group of unrelated animals come to resemble each other for similar mode of life or habitat = ½ + ½

eg. (i) Wings of butterfly and Wings of birds / Wings of bats

(ii) Potato (stem) - sweet potato (root)

(iii) Eye of octopus and eye of mammals

      (iv)   Flippers of Penguin and flippers of dolphins

(or any other example of Analogous organs)

       (any 2 examples) = 1 + 1

[3 Marks]

16. **How can sewage be used to generate biogas ? Explain.**

Ans. When BOD of sewage is reduced , effluent is passed into a settling tank for bacterial flocs to settle down (which is Activated sludge) = ½ + ½

Activated sludge is pumped into anaerobic sludge digesters , Bacteria grow anaerobically and digest bacteria & fungi in sludge = ½ + ½

During digestion bacteria produce a mixture of gases containing methane , hydrogen sulphide and CO_2 = ½ + ½
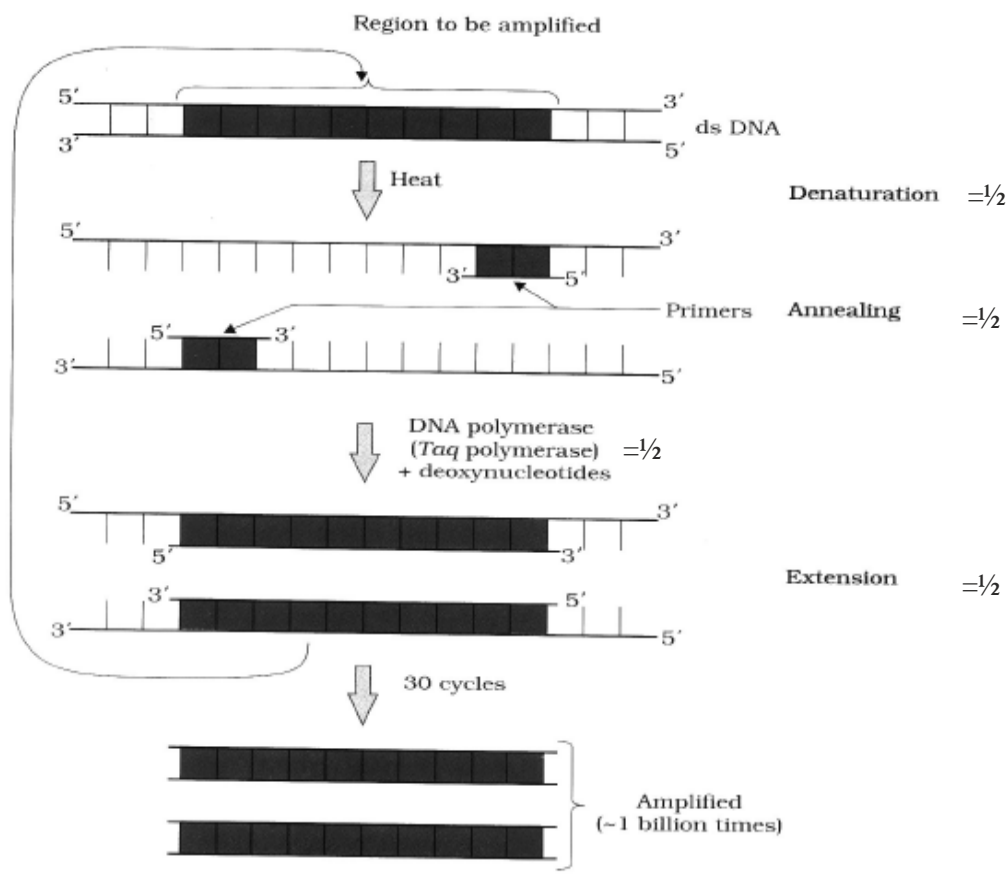
[3 Marks]

17. **Many copies of a specific gene of interest are required to study the detailed sequencing of bases in it. Name and explain the process that can help in developing large number of copies of this gene of interest.**

Ans. Polymerase Chain Reaction = 1

- Denaturation / Separation of ds DNA (by high temperature) = ½
- Annealing - Two sets of primers are added which anneal to 3' end of each separated strand as they act as initiator of replication = ½
- Extension - DNA Polymerase / Taq polymerase = ½ , extends primer by adding nucleotides using DNA as templates = ½

Region to be amplified

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

Primers Annealing $= \frac{1}{2}$

DNA polymerase
(*Taq* polymerase) $= \frac{1}{2}$
+ deoxynucleotides

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

30 cycles

Amplified
(~1 billion times)

[3 Marks]

18. Prepare a flow chart in formation of recombinant DNA by the action of restriction endonuclease enzyme EcoRI.

Ans. Restriction endonuclease (EcoRI) inspects the length of the DNA sequence of both vector and foreign DNA ,

↓

binds to the specific recognition sequence / palindromic sequence ,

↓

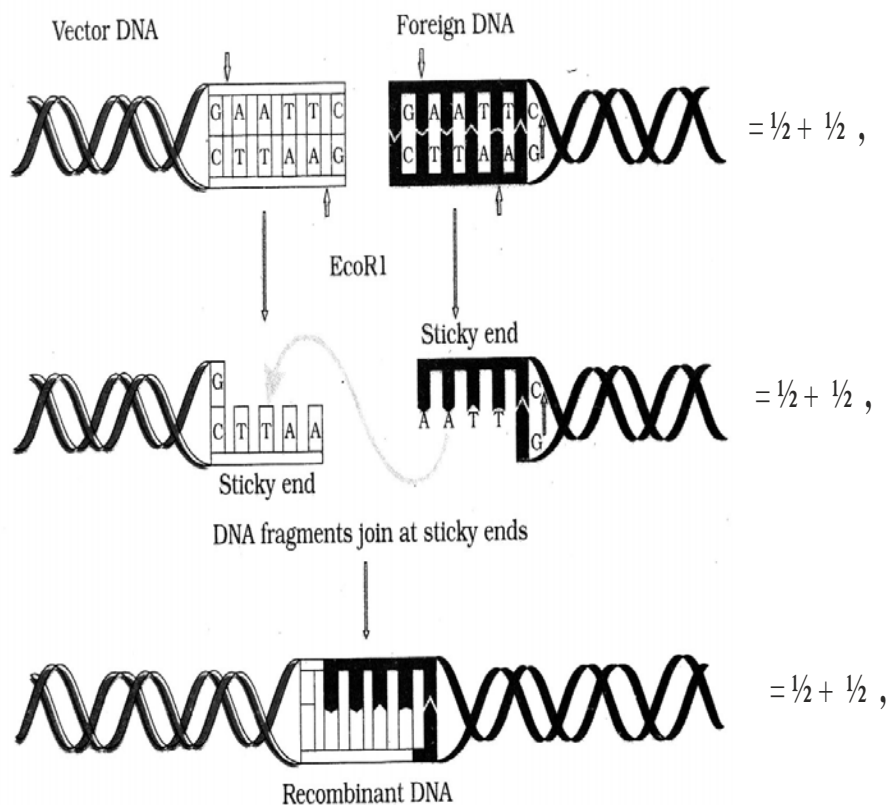cuts the strand of DNA between G and A ,

↓

only when the sequence GAATTC is present in the DNA ,

↓

leaving single stranded overhanging stretches called sticky ends ,

↓

Ligases joins host and foreign DNA strands at sticky ends to form recombinant DNA

$= \frac{1}{2} \times 6$

// diagram can also be accepted in lieu of flow chart

$= \frac{1}{2} + \frac{1}{2}$,

$= \frac{1}{2} + \frac{1}{2}$,

$= \frac{1}{2} + \frac{1}{2}$,

[3 Marks]

OR

Name and explain the technique used for separating DNA fragments and making them available for biotechnology experiments.

Ans. Gel electrophoresis $= 1$

- Negatively charged DNA fragments are forced to move towards the anode under electric field on agarose gel ,

- DNA fragments get separated according to their size / Small fragments cover large distance & large fragments cover small distances ,

- These fragments are visualised after staining with ethidium bromide followed by exposure under UV rays

- The separated bands of DNA are cut out from the gel & extracted (elution) $= \frac{1}{2} \times 4$

[3 Marks]

19. **One of the major contributions of biotechnology is to develop pest-resistant varieties of cotton plants. Explain how it has been made possible.**

Ans. (i) Introducing Bt toxin gene / cry gene from *Bacillus thuringiensis* , into cotton plant using r-DNA technology = ½ + ½

(ii) cry gene produces insecticidal protein in inactive stage (protoxin) which after ingestion is converted into active form in the gut of insect , due to alkaline pH there = ½ + ½

(iii) This toxin binds to surface of midgut epithelial cells , causes swelling and lysis leading to death of insect = ½ + ½

[3 Marks]

20. Justify the importance of decomposers in an ecosystem.

Ans.

- Natural cleansing agents / scavengers ,

- Help to breakdown dead and waste material into simple inorganic materials ,

- Help in recycling of nutrients = 1×3

[3 Marks]

21. Differentiate between mutualism, parasitism and commensalism. Provide one example for each of them.

Ans. <u>Mutualism</u> - Relationship between two organisms in which both organisms get benefitted = ½

Eg. Mycorrhizae (Roots of higher plants and fungi) / Lichen (algae and fungi) / any other suitable example = ½

<u>Parasitism</u> - Relationship / interaction in which only one species gets benefitted and other get harmed = ½

Eg. Round worm in human intestine // cuscuta and higher plants (angiosperms) // hedge plants or any other suitable example = ½

<u>Commensalism</u> - Interaction in which one species is benefitted & the other is neither harmed nor benefitted = ½

Eg. Orchid growing as an epiphyte on mango tree branch / any other suitable example = ½

$= ½ \times 6$

[3 Marks]

22. Compare narrowly utilitarian and broadly utilitarian approaches to conserve biodiversity, with the help of suitable examples.

Ans. Narrowly Utilitarian - Humans derive countless direct economic benefits from nature = 1

eg. dyes / resin / food / wood etc (or any other suitable example) = ½

Broadly utilatarian - plays major role in many ecosystem services that nature provides = 1

eg. pollination / aesthetic pleasure / production of oxygen (or any other suitable example) = ½

[3 Marks]

SECTION D

Q. No. 23 is of four marks

23. **You have attended a birthday party hosted by one of your classmates. You found some guests at the party sitting in a corner making a lot of noise and consuming 'something'. After a while one of the boys from the group started screaming, behaving abnormally and sweating profusely. On enquiry you found that the group members were taking drugs.**

    (a) **Would you inform your parents/school authorities ? Yes / No. Give reasons in support of your answer.**

    (b) **Prepare a note to be circulated amongst the schoolmates about the sources and dangers of any two drugs.**

    (c) **Write any two ways that you will suggest to your school principal so as to promote awareness amongst the youth against the use of these drugs.**

Ans. (a)   Yes, so that it does not become a habit by repeated use / consumption of drugs may cause harmful effects / any other reason = 1

    (b) •   Drug : Cocaine - Source is plant Erythroxylum coca = ½

        Danger - effects central nervous system / interferes with transport of neurotransmitter (dopamine) = ½

      •   Drug : Opioids / heroin / smack - source is latex of Papaver somniferum / poppy plant = ½

        Danger - slows down body function = ½

      •   Drug : Cannabinoids source is Cannabis (sativa) = ½

        Danger - effects cardiovascular system = ½

                                  (Any two drugs and their danger) = 1 + 1

    (c) By organising : -

       Poster competitions / Street play / talk by experts / interviews / any other appropriate awareness campaign (any two) = ½ + ½

                                                          [4 Marks]

SECTION E

Q. Nos. 24 - 26 are of five marks each

24. (a) **Explain the events after pollination leading to the formation of a seed in angiosperms.**

    (b) **Mention the ploidy levels of the cells of different parts of an albuminous seed.**

Ans. (a) (i) Pistil accepts right type pollen , pollen grain germinates to produce pollen tube that grows and reaches the ovary , male gametes enter the ovule through micropyle , one male gamete fuses with nucleus of egg cell to form diploid zygote , other male gamete fuses with two polar nuclei forming primary endosperm cell which develops into endosperm , diploid zygote develops into embryo , followed by development of ovule into seed = ½ × 8

    (b) Embryo - 2n / diploid = ½

Endosperm - 3n / triploid = ½

[5 Marks]

OR

Explain the process of fertilization and implantation in humans.

Ans. Fertilisation : Sperm comes in contact with zona pellucida layer of ovum , and induces changes in the membrane that blocks the entry of additional sperms , this induces completion of second meiotic division to form second polar body and haploid ovum (ootid) , nucleus of sperm fuses with that of ovum to form diploid zygote = ½ × 4

Implantation : Repeated cleavage in zygote results in formation of blastocyst , whose outer layer is called trophoblast , and an inner group of cells called inner cell mass , trophoblast layer gets attached to endometrium , inner cell mass gets differentiated as embryo , uterine cells divide rapidly and covers the blastocyst that becomes embedded in the endometrium= ½ × 6

[5 Marks]

25. **(a)** **State and explain the law of segregation as proposed by Mendel in a monohybrid cross.**

(b) **Write the Mendelian F_2 Phenotypic ratio in a dihybrid cross. State the law that he proposed on the basis of this ratio. How is this law different from the law of segregation?**

Ans. **(a)** <u>Law of segregation</u> : Paired alleles get segregated during gamete formation , and a gamete receives only one of the two alleles = ½ + ½

cross   TT   ×   tt

gamete   Ⓣ Ⓣ   ⓣⓣ   = 1

(b) Phenotypic ratio → 9 : 3 : 3 : 1   = 1

Law of Independent Assortment , = ½

It states that when two pairs of traits are combined in a hybrid segregation of one pair of character is independent of other pair of characters = ½

In law of segregation two alleles of same trait (gene) get segregated , while in law of independent assortment two genes pairs of different traits get segregated   = ½ + ½

[5 Marks]

OR

(a) **Describe the experiment which demonstrated the existence of "transforming principle".**

(b) **How was the biochemical nature of this "transforming principle" determined by Avery, MacLeod and McCarty?**

Ans. **(a)** (Frederick Griffith) <u>Streptococcus pneumoniae</u> are grown on culture plate and found having two strains ,

R - Non Virulent (rough) ,

S - Virulent (smooth) ,

Mice infected with R-strain lived ,

Mice infected with S-strain died ,

Mice infected with heat killed S-strain - Lived ,

Mice infected with heat killed S + R - Died ,

He observed that R-strain has been transformed to S-strain $= \frac{1}{2} \times 8$

(b) They purified protein RNA & DNA from heat killed S - Strain , added these chemical to culture medium containing live R-cell separately and discovered that it was DNA only that transforms R strain to S strain $= \frac{1}{2} + \frac{1}{2}$

//

Added these chemicals in culture medium separately each containing protease RNAase and DNAase respectively extracted from heat killed S-strain and added live R-cells , Introduction of RNAases & proteases did not affect transformation but when DNAases was introduced it inhibited transformation $\frac{1}{2} + \frac{1}{2}$

[5 Marks]

26. **Under polio prevention programme, infants in India were given polio vaccines on a large scale at regular intervals to eradicate polio from the country.**

   (a) What is a vaccine? Explain how it imparts immunity to the child against the disease.

   (b) With the help of an example each, differentiate between active and passive immunity.

Ans. (a) <u>Vaccine</u> – It is inactivated or weakened pathogen that is inoculated into the body of the child = 1

   Vaccines generate memory - B & T - cells that recognize the pathogen quickly on subsequent exposure , produce specific antibodies against the pathogen / antigen $= \frac{1}{2} + \frac{1}{2}$

   (b) <u>Active</u> Immunity – Immunity that an organism develops due to direct exposure of pathogen by producing antibodies in the body = 1

   eg .vaccination / infections / hepatitis etc. $= \frac{1}{2}$

   <u>Passive</u> Immunity - readymade antibodies are directly given to protect the body from foreign pathogens = 1

   eg. Colostrum / tetanus / antitoxin for snake bite etc. $= \frac{1}{2}$

[5 Marks]

OR

What are bio fertilizers? Describe their role in agriculture. Why are they preferred to chemical fertilizers?

Ans. <u>Biofertilizers</u> – are organisms that enrich the nutrient quality of the soil = 1

   Role – (i) increase nutrient quality

   (ii) fix atmospheric nitrogen

          (iii)   resistant to root borne pathogens

          (iv)   tolerance to salinity and drought

          (v)   overall increase in plant growth and development (any four) $= \frac{1}{2} \times 4 = 2$

These are preferred to chemical fertilizers because

-     They do not pollute soil / air / water $= 1$

-     do not spoil soil texture or pH of the soil $= 1$

[5 Marks]

Question Paper Code 57/2/2

SECTION – A

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

1. **" Man can be a primary as well as a secondary consumer." Justify this statement.**

Ans. Vegetarian diet - Primary consumer = ½

Non vegetarian diet - Secondary consumer = ½

[1 Mark]

2. **Write the hypothetical proposals put forth by Oparin and Haldane.**

Ans. Oparin & Haldane : First form of life could have (origin of life) come from pre existing non living organic molecules = ½

formation of diverse organic molecules from inorganic constituents/ formation of life was preceeded by chemical evolution = ½

[1 Mark]

3. **Write the function of RNA polymerase II.**

Ans. RNA polymerase II **-** transcribes precursor of mRNA / hn RNA

[1 Mark]

4. **How does a degenerate code differ from an unambiguous one ?**

Ans. Degenerate Code : one amino acid coded by more than one codon = ½

Unambiguous code : One codon for one amino acid = ½

[1 Mark]

5. **Meiosis is an essential event in the sexual life cycle of any organism. Give two reasons.**

Ans. (i)   Meiosis helps in formation of gametes by reductional division & maintains number of chromosomes constant / maintains ploidy = ½

(ii)   Recombination of genes in offsprings / brings variation = ½

[1 Mark]

SECTION B

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

6. **What is joint forest management ? How can it help in conservation of forests?**

Ans. JFM - A programme (initiated by Govt. of India in 1980) where govt. works closely with local communities for protecting & managing forests = 1

Forests are conserved by locals in a sustainable manner as locals are also benefitted with forest products / (fruits / gum / rubber / medicines etc) = 1

[2 Marks]

7. **Differentiate between outbreeding and outcrossing.**

Ans. Outbreeding -Breeding of unrelated animals (no common ancestor for 4 - 6 generations)

belonging to same breed or different breed or different species $= 1$

Outcrossing - breeding within the animals of same breed having no common ancestors for 4 - 6 generation on either side of their pedigree $= 1$

[2 Marks]

OR

Bottled fruit juices are clearer as compared to those made at home. Explain.

Ans. Enzyme Pectinase , protease are added for clearing them $= 1 + 1$

[2 Marks]

8. **When you go for a trek/trip to any high altitude places, you are advised to take it easy and rest for the first two days. Comment, giving reasons.**

Ans. Altitude sickness /

due to low O_2 availability $\Big\} = \frac{1}{2}$

Body compensates low oxygen availabilty during rest by increasing R.B.C production , decreasing the binding capacity of haemoglobin , increasing breathing rate $= \frac{1}{2} + \frac{1}{2} + \frac{1}{2}$

[2 Marks]

9. **Give an example of a gene responsible for multiple phenotypic expressions. What are such genes called ? State the cause that is responsible for such an effect.**

Ans. Gene causing Phenylketonuria $= 1$

Pleiotropic genes $= \frac{1}{2}$

Single gene mutation $= \frac{1}{2}$

[2 Marks]

10. **What is apomixis ? How is the phenomenon useful to the farmer.**

Ans. - Mechanism to produce seeds without fertilization $= 1$

- Farmer can keep on using apomictic hybrid seeds year after year / economical $= 1$

[2 Marks]

SECTION C

Q. Nos. 11 - 22 are of three marks each

11. **What are analogous structures ? How are they different from homologous structures ? Provide one example for each.**

Ans. - Organs having anatomically dissimilar structure but perform similar functions $= 1$

- wings of birds and wings of butterfly / eye of octopus and of mammals /

  flippers of penguin and dolphins / sweet potato and potato / any other appropriate example $= \frac{1}{2}$

- Homologous organs have similar anatomical structure but different functions $= 1$

- Fore limbs of whales and cheetah / thorn of bougainvillea and tendril of Cucurbita / any other example $= \frac{1}{2}$

[3 Marks]

12. (a) Name the kind of diseases/ disorders that are likely to occur in humans if

    (i) Mutation in the gene that codes for an enzyme phenyl alanine hydrolase occurs,

    (ii) There is an extra copy of chromosome 21,

    (iii) The karyotype is XXX.

(b) Mention any one symptom of the diseases/disorders named above.

Ans. (a & b)

    (i) Phenylketonuria , mental retardation $= \frac{1}{2} + \frac{1}{2}$

    (ii) Down' s syndrome , short statured / small round head / furrowed tongue / partially open mouth / broad palm with characteristics palm crease / retarded mental physical and psychomotor development $= \frac{1}{2} + \frac{1}{2}$

    (iii) Klinefelter's Syndrome , Overall masculine development with feminine features (enlarged breast / Gynaecomastia) / sterile $= \frac{1}{2} + \frac{1}{2}$

(any one symptom from each category , any other appropriate symptom)

[3 Marks]

13. How was a heavy isotope of nitrogen used to provide experimental Evidence to semi-conservative mode of DNA- replication?

Ans. E.coli were allowed to grow on medium containing ^{15}N for many generations so that ^{15}N was incorporated in newly synthesized DNA making it heavy DNA (Nitrogen is important constituent of DNA) $= \frac{1}{2}$

The heavy DNA can be differentiated from light DNA by Caesium Chloride Density Gradient centrifugation , $= \frac{1}{2}$
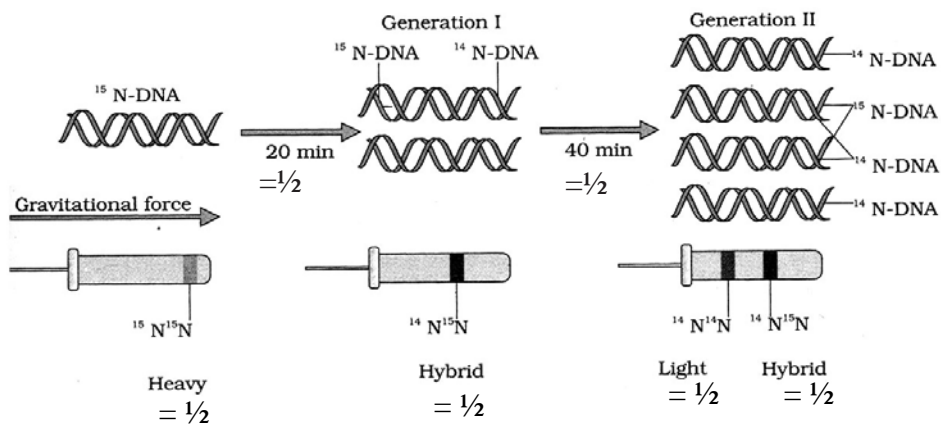
The above E.coli (with ^{15}N) were then transferred in medium containing ^{14}N and, samples were taken out after 20 minutes and after 40 minutes $= \frac{1}{2}$

Extracted DNA was centrifuged and measured to get their density , $= \frac{1}{2}$

DNA extracted after 20 minutes (Ist Generation) showed an intermediate hybrid density / ^{14}N ^{15}N, $= \frac{1}{2}$

DNA extracted after 40 minutes (2nd Generation) showed equal amount of Light DNA / ^{14}N and hybrid DNA / ^{14}N ^{15}N $= \frac{1}{2}$

$= \frac{1}{2} \times 6$

//

[3 Marks]

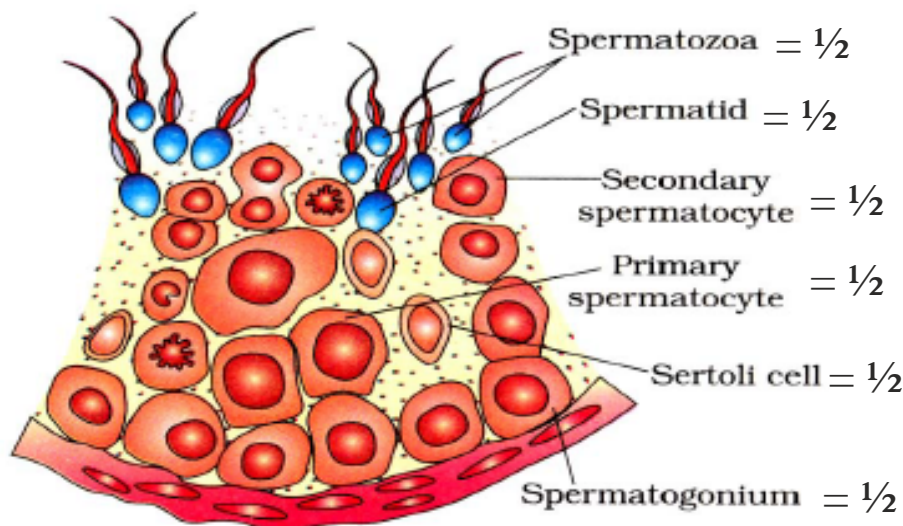**14.** **What is amniocentesis? Justify the statutory ban on it.**

Ans. Study of chromosonal pattern in amniotic fluid of foetus ,

It is misused to detect the sex of the foetus ,

ban to check female foeticide

$$(= 1 \times 3)$$

[3 Marks]

15. **Draw a labelled diagram of the sectional view of the seminiferous tubule of a human.**

Ans.

$$= \frac{1}{2} \times 6$$

[3 Marks]

F15 - 57/2/1, 2, 3 DPSVK/19

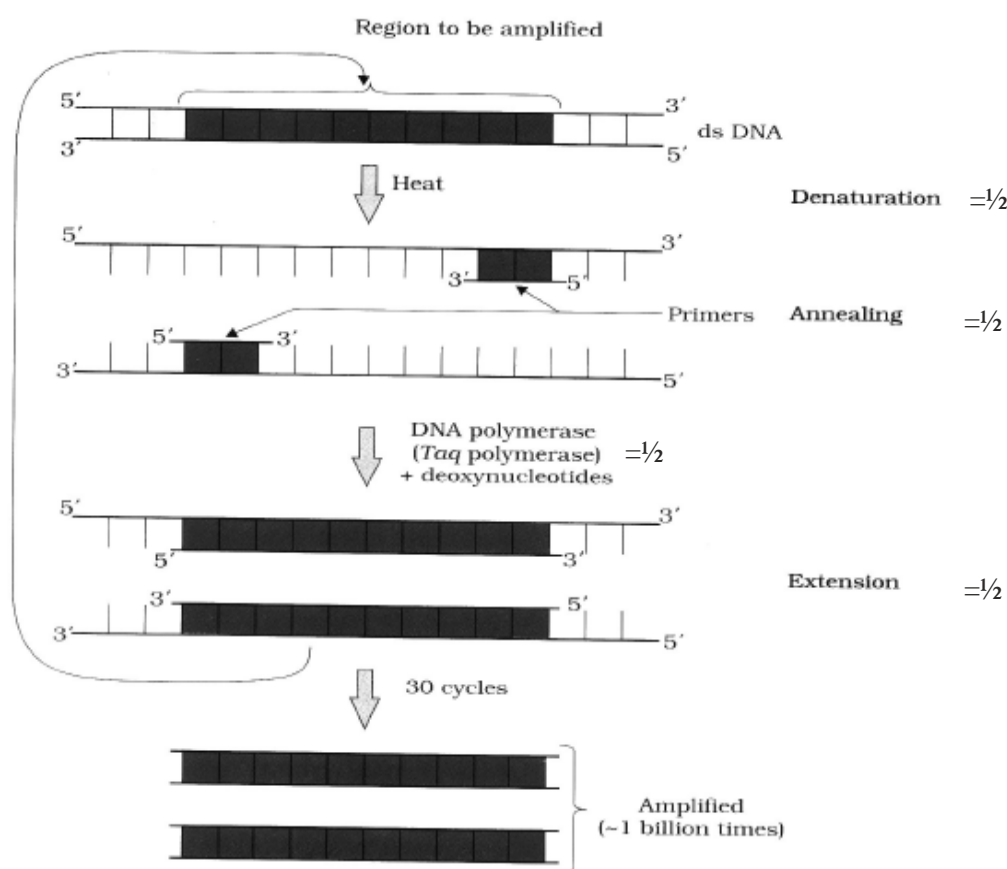**16.** **Many copies of a specific gene of interest are required to study the detailed Sequencing of bases in it. Name and explain the process that can help in developing large number of copies of this gene interest.**

Ans. Polymerase Chain Reaction = 1

- Denaturation / Separation of ds DNA (by high temperature) = ½
- Annealing - Two sets of primers are added which anneal to 3' end of each seperated strand as they act as initiator of replication = ½
- Extension - DNA Polymerase / Taq polymerase =½ , extends primer by adding nucleotides using DNA as templates = ½

[3 Marks]

17. **One of the major contributions of biotechnology is to develop pest-Resistant varieties of cotton plants. Explain how it has been made possible**

Ans. (i) Introducing Bt toxin cry gene from *Bacillus thuringiensis* , into cotton plant using r-DNA technology = ½ + ½

(ii) cry gene produces insecticidal protein in inactive stage (protoxin) which after ingestion is converted into active form in the gut of insect , due to alkaline pH there = ½ + ½

(iii) This toxin binds to surface of midgut epithelial cells , causes swelling and lysis leading to death of insect = ½ + ½

[3 Marks]

18. Why is earthworm considered a farmer's friend ? Explain humification and mineralization occurring in a decomposition cycle.

Ans. They help in breakdown of complex organic matter , as well as loosening of the soil = ½ + ½

Humification leads to humus formation , decompose slowly / reservoir of nutrients = ½ + ½

Humus is further degraded by microbes , releasing inorganic nutrients = ½ + ½

[3 Marks]

19. Differentiate between parasitism and competition, giving one example of each. State the common characteristic they share.

Ans.

Parasitism	Competition
Interaction where one species is benefitted and the other is harmed = ½	Interaction where both species harmed = ½
eg. Tape worm in man / cuscuta on hedge plant / malarial parasite in human / lice on human / ticks on dogs / any other example = ½	eg. Herbivores and plants / = ½ any other example

Species facing competition might evolve mechanisms that promote co-existence = ½

In parasitism both host and parasite tend to co-evolve = ½

[3 Marks]

20. Prepare a flow chart in formation of recombinant DNA by the action of restriction endonuclease enzyme EcoRI.

Ans. Restriction endonuclease (EcoRI) inspects the length of the DNA sequence of both vector and foreign DNA ,
↓
binds to the specific recognition sequence / palindromic sequence ,
↓
cuts the strand of DNA between G and A ,
↓
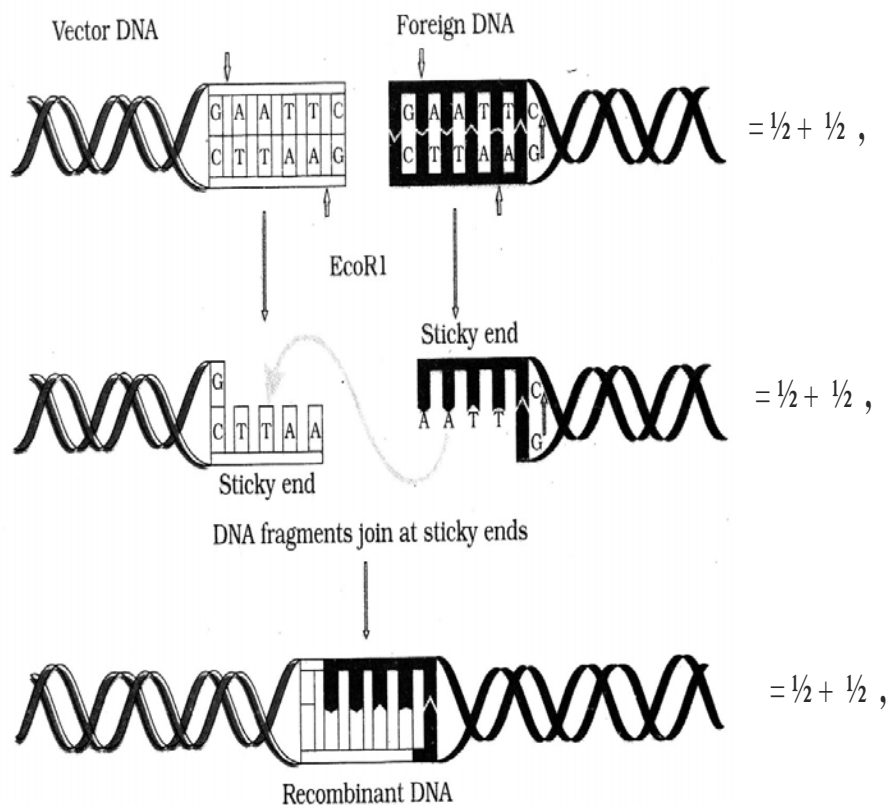only when the sequence GAATTC is present in the DNA ,
↓
leaving single stranded overhanging stretches called sticky ends ,
↓
Ligases joins host and foreign DNA strands at sticky ends to form recombinant DNA
$$= ½ × 6$$

// diagram can also be accepted in lieu of flow chart

$= ½ + ½ ,$

$= ½ + ½ ,$

$= ½ + ½ ,$

[3 Marks]

OR

Name and explain the formation of recombinant DNA fragments and making them available for biotechnology experiments.

Ans. Gel electrophoresis = 1

- Negatively charged DNA fragments are forced to move towards the anode under electric field on agarose gel ,

- DNA fragments get separated according to their size / Small fragments cover large distance & large fragments cover small distances ,

- These fragments are visualised after staining with ethidium bromide followed by exposure under UV rays

- The separated bands of DNA are cut out from the gel & extracted (elution) $= ½ × 4$

[3 Marks]

21. Compare narrowly utilitarian and broadly utilitarian approaches to conserve biodiversity, with the help of suitable examples.

Ans. Narrowly Utilitarian - Humans derive countless direct economic benefits from nature = 1

eg. dyes / resin / food / wood etc (or any other suitable example) = ½

Broadly utilatarian - plays major role in many ecosystem services that nature provides = 1

eg. pollination / aesthetic pleasure / production of oxygen (or any other suitable example) = ½

[3 Marks]

22.   How can sewage be used to generate biogas ? Explain.

Ans.   When BOD of sewage is reduced , effluent is passed into a settling tank for bacterial flocs to settle down (which is Activated sludge) = ½ + ½

Activated sludge is pumped into anaerobic sludge digesters , Bacteria grow anaerobically and digest bacteria & fungi in sludge = ½ + ½

During digestion bacteria produce a mixture of gases containing methane , hydrogen sulphide and CO_2 = ½ + ½

[3 Marks]

SECTION D

Q. No. 23 is of four marks

23.   You have attended a birthday party hosted by one of your classmates. You found some guests at the party sitting in a corner making a lot of Noise and consuming 'something'. After a while one of the boys from the group started screaming, behaving abnormally and sweating profusely. On enquiry you found that the group members were taking drugs.

(a)   Would you inform your parents/school authorities ? Yes/No . Give reasons in support of your answer.

(b)   Prepare a note to be circulated amongst the schoolmates about the sources and dangers of any two drugs.

(c)   Write any two ways that you will suggest to your school principal so as to promote awareness amongst the youth against the use of these drugs.

Ans. (a)   Yes, so that it does not become a habit by repeated use / consumption of drugs may cause harmful effects / any other reason = 1

(b)   •   Drug : <u>Cocaine</u> - Source is plant <u>Erythroxylum coca</u> = ½

Danger - effects central nervous system / interferes with transport of neurotransmitter (dopamine) = ½

•   Drug : <u>Opioids</u> / heroin / smack - source is latex of <u>Papaver somniferum</u> / poppy plant = ½

Danger - slows down body function = ½

•   Drug : Cannabinoids source is <u>Cannabis (sativa)</u> = ½

Danger - effects cardiovascular system = ½

(Any two drugs and their danger) = 1 + 1

(c)   By organising : -

Poster competitions / Street play / talk by experts / interviews / any other appropriate awareness campaign (any two) = ½ + ½

[4 Marks]

F15 - 57/2/1, 2, 3 DPSVK/**23**

SECTION E

Q. Nos. 24 - 26 are of five marks each

24. **Under Polio prevention programme, infants in India were given polio Vaccines on a large scale at regular intervals to eradicate polio from the country.**

   (a) **What is a vaccine ? Explain how does it impart immunity to the child against the disease.**

   (b) **With the help of an example each, differentiate between active and passive immunity.**

Ans. (a)   <u>Vaccine</u> – It is inactivated or weakened pathogen that is inoculated into the body of the child = 1

   Vaccines generate memory - B & T - cells that recognize the pathogen quickly on subsequent exposure , produce specific antibodies against the pathogen / antigen = ½ + ½

   (b)   <u>Active</u> Immunity – Immunity that an organism develops due to direct exposure of pathogen by producing antibodies in the body = 1

   eg .vaccination / infections / hepatitis etc. = ½

   <u>Passive</u> Immunity - readymade antibodies are directly given to protect the body from foreign pathogens = 1

   eg. Colostrum / tetanus / antitoxin for snake bite etc. = ½

   [5 Marks]

OR

What are biofertilizers ? Describe their role in agriculture. Why are they preferred to chemical fertilizers.

Ans.   <u>Biofertilizers</u> – are organisms that enrich the nutrient quality of the soil = 1

   Role –   (i)   increase nutrient quality

   (ii)   fix atmospheric nitrogen

   (iii)   resistant to root borne pathogens

   (iv)   tolerance to salinity and drought

   (v)   overall increase in plant growth and development (any four) = ½ × 4 = 2

   These are preferred to chemical fertilizers because

   -   They do not pollute soil / air / water = 1

   -   do not spoil soil texture or pH of the soil = 1

   [5 Marks]

25. **(a)** **Explain the events after pollination leading to the formation of a Seed in angiosperms.**

   (b) **Mention the ploidy levels of the cells of different parts of an aluminous seed.**

Ans. (a)   (i)   Pistil accepts right type pollen , pollen grain germinates to produce pollen tube that grows and reaches the ovary , male gametes enter the ovule through micropyle , one male gamete fuses with nucleus of egg cell to form diploid zygote , other male gamete

F15 - 57/2/1, 2, 3 DPSVK/24

fuses with two polar nuclei forming primary endosperm cell which develops into endosperm , diploid zygote develops into embryo , followed by development of ovule into seed $= \frac{1}{2} \times 8$

(b) Embryo - 2n / diploid $= \frac{1}{2}$

Endosperm - 3n / triploid $= \frac{1}{2}$

[5 Marks]

OR

Explain the process of fertilization and implantation in humans.

Ans. Fertilisation : Sperm comes in contact with zona pellucida layer of ovum , and induces changes in the membrane that blocks the entry of additional sperms , this induces completion of second meiotic division to form second polar body and haploid ovum (ootid) , nucleus of sperm fuses with that of ovum to form diploid zygote $= \frac{1}{2} \times 4$

Implantation : Repeated cleavage in zygote results in formation of blastocyst , whose outer layer is called trophoblast , and an inner group of cells called inner cell mass , trophoblast layer gets attached to endometrium , inner cell mass gets differentiated as embryo , uterine cells divide rapidly and covers the blastocyst that becomes embedded in the endometrium $= \frac{1}{2} \times 6$

[5 Marks]

26. (a) During a cross involving true breeding red flowered and true breeding white flowered snapdragon plants, the F1 progeny did not show any of the parental traits, while they reappeared in F2 progenies. Explain the mechanism using punnett Square.

(b) Explain polygenic inheritance with the help of an example.

(a)
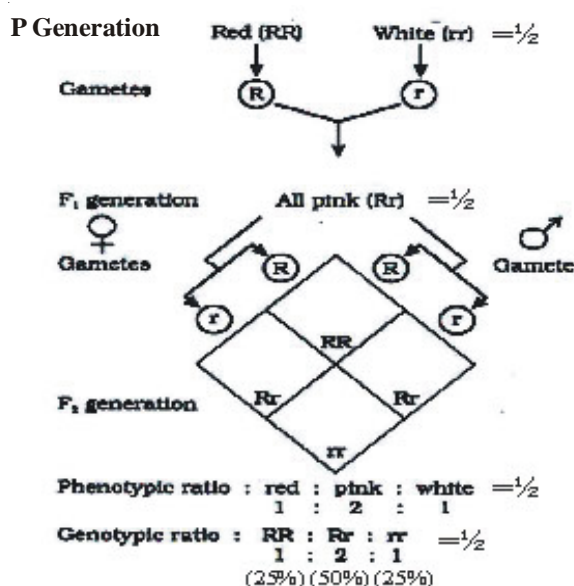
$= \frac{1}{2} \times 6$

(b) Inherited traits which are controlled by three or more genes are called polygenic traits $= \frac{1}{2}$

Three genes A B C control skin colour in human. The genotypes with all dominant alleles (AABBCC) will be the darkest skin colour, AaBbCc will have intermediate skin colour, all recessive have lightest skin colour . = ½ + ½ + ½ /

(any other example) = 1½

[3 + 2 = 5 Marks]

OR

How did Alfred Hershey and Martha Chase conclusively establish that DNA is the genetic material? Explain.

Ans. • Some bacteriophage were grown in a medium that contained ^{32}P radioactive phosphorus, while some were grown in a medium that contained ^{35}S with radioactive sulphur $= ½ \times 2$

• the labelled bacteriophage from both media were allowed to infect *E.coli* = 1

• In both the cases viral coats were removed from the bacteria by agitating them in a blender = 1

• The virus particles were separated from the bacteria by spinning them in a centrifuge = 1

• No radioactivity was detected in cells (*E.coli*) but detected in supernatant in case where bacteriophage were labelled with radioactive sulphur = ½

• Radioactivity detected in cells (*E.coli*) while no radioactivity detected in supernatant in another case where bacteriophage were labelled with radioactive phosphorus = ½

(Phosphorus being a constituent of DNA indicates that DNA is the genetic material that is passed from virus to bacteria)

[5 Marks]

// **The following diagrammatic representation can be considered in lieu of the above explanation.**

(½)   Bacterlophage
       Radioactive[³⁵S] labelled
       protein capsule   Radioactive[³²P]
                                          labelled DNA   (½)

(½)   1. Infection   (½)

(½)   2. Blending   (½)

(½)   3. Centrifugation   (½)

       No Radioactive[³⁵S]   Radioactive[³²P]
       detected in cells   detected in cells
              +   +
(½)   Radioactive[³⁵S]   No Radioactivity   (½)
       detected in supernatant   detected in supernatant
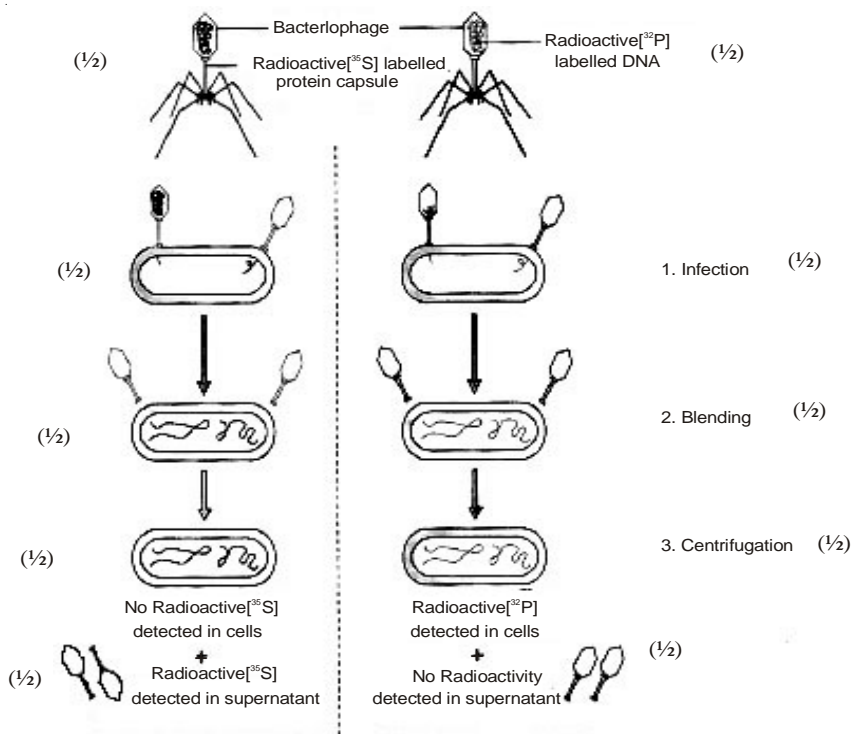
$$= \tfrac{1}{2} \times 10$$

[5 Marks]

Question Paper Code 57/2/3

SECTION – A

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

1. How does a degenerate code differ from an unambiguous one ?

Ans. Degenerate Code : one amino acid coded by more than one codon = ½

Unambiguous code : One codon for one amino acid = ½

[1 Mark]

2. Meiosis is an essential event in the sexual life cycle of any organism. Give two reasons.

Ans. (i) Meiosis helps in formation of gametes by reductional division & maintains number of chromosomes constant / maintains ploidy = ½

(ii) Recombination of genes in offsprings / brings variation = ½

[1 Mark]

3. " Man can be a primary as well as a secondary consumer." Justify this statement.

Ans. Vegetarian diet - Primary consumer = ½

Non vegetarian diet - Secondary consumer = ½

[1 Mark]

4. Write the hypothetical proposals put forth by Oparin and Haldane.

Ans. Oparin & Haldane : First form of life could have (origin of life) come from pre existing non living organic molecules = ½

formation of diverse organic molecules from inorganic constituents/ formation of life was preceeded by chemical evolution = ½

[1 Mark]

5. Write the function of RNA polymerase II.

Ans. RNA polymerase II **-** transcribes precursor of mRNA / hn RNA

[1 Mark]

SECTION B

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

6. Suggest two advantages to a farmer for using apomictic seeds of hybrid varieties.

Ans. (i) No segregation of characters in hybrid progeny = 1

(ii) Apomictic hybrid seeds can be used to grow crop year after year /

economical as ordinary hybrid seeds are not used to grow crop year after year = 1

[2 Marks]

7. Why did T.H. Morgan select Drosophila melanogaster to study sex Linked genes for his lab experiments ?

Ans. (i)   Can be grown in simple synthetic medium in the laboratory

(ii)   Complete life cycle in two weeks

(iii) Large no. of progeny

(iv)   Differentiation of sexes

(v)   Many hereditary variations (any four) ½ × 4

[2 Marks]

8.   What is joint forest management ? How can it help in conservation of forests ?

Ans. JFM - A programme (initiated by Govt. of India in 1980) where govt. works closely with local communities for protecting & managing forests = 1

Forests are conserved by locals in a sustainable manner as locals are also benefitted with forest products / (fruits / gum / rubber / medicines etc) = 1

[2 Marks]

9.   Differentiate between outbreeding and outcrossing.

Ans. Outbreeding -Breeding of unrelated animals (no common ancestor for 4 - 6 generations)

belonging to same breed or different breed or different species = 1

Outcrossing - breeding within the animals of same breed having no common ancestors for 4 - 6 generation on either side of their pedigree = 1

[2 Marks]

OR

Bottled fruit juices are clearer as compared to those made at home. Explain.

Ans. Enzyme Pectinase , protease are added for clearing them = 1 + 1

[2 Marks]

10.   How does a desert plant adapt to the dry, warmer environmental condition ?

Ans. (i)   thick cuticle on leaf surface,

(ii)   stomata in deep pits

(iii) CAM pathway

(iv)   leaves modified to spines (Opuntia)

(v)   stem flattened and perform photosynthesis / phylloclade

(Any two) 1 x 2

[2 Marks]

SECTION C

Q. Nos. 11 - 22 are of three marks each

11.   What is amniocentesis ? Justify the statutory ban on it.

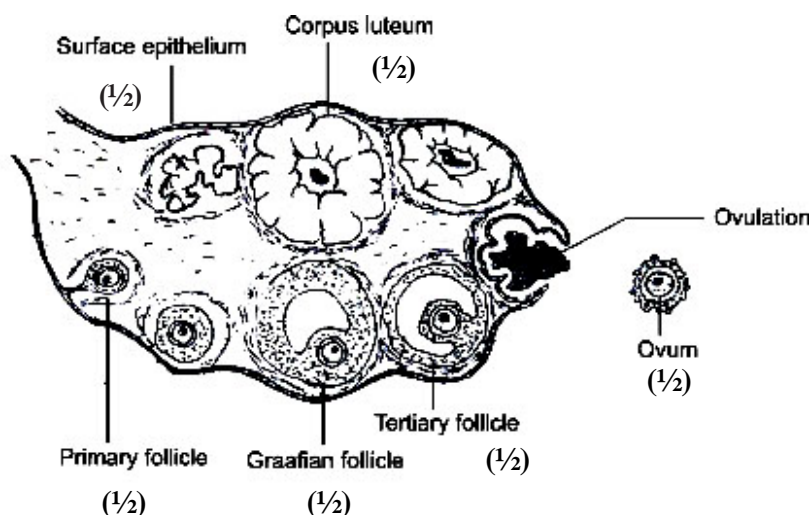Ans. Study of chromosomal pattern in amniotic fluid of foetus ,

It is misused to detect the sex of the foetus ,

ban to check female foeticide

$$(= 1 \times 3)$$

[3 Marks]

12. Draw a diagrammatic, Labelled sketch of a sectional view of human ovary.

Ans.

$$= \frac{1}{2} \times 6$$

[3 Marks]

13. Explain divergent evolution with two examples.

Ans. Same structure developed along different directions due to adaptations , (to different needs) performing different functions = 1

- forelimb of whales bats cheetah and human have similar pattern of bones in forelimbs = 1

- thorns and Bougainvillea and tendrils of Cucurbita - stem in both examples = 1

[3 Marks]

14. (a) Name the kind of diseases/disorders that are likely to occur in humans if

   (i) Mutation in the gene that codes for an enzyme phenyl alanine hydrolase occurs,

   (ii) There is an extra copy of chromosome 21,

   (iii) The karyotype is XXY.

   (b) Mention any one symptom of the diseases/disorders named above.

Ans. (a & b)

   (i) Phenylketonuria , mental retardation = ½ + ½

   (ii) Down' s syndrome , short statured / small round head / furrowed tongue / partially open mouth / broad palm with characteristics palm crease / retarded mental physical and psychomotor development = ½ + ½

(iii) Klinefelter's Syndrome , Overall masculine development with feminine features (enlarged breast / Gynaecomastia) / sterile $= \frac{1}{2} + \frac{1}{2}$

(any one symptom from each category , any other appropriate symptom)

[3 Marks]

15. How was a heavy isotope of nitrogen used to provide experimental evidence to semi-conservative mode of DNA-replication ?

Ans. E.coli were allowed to grow on medium containing ^{15}N for many generations so that ^{15}N was incorporated in newly synthesized DNA making it heavy DNA (Nitrogen is important constituent of DNA) $= \frac{1}{2}$

The heavy DNA can be differentiated from light DNA by Caesium Chloride Density Gradient centrifugation , $= \frac{1}{2}$
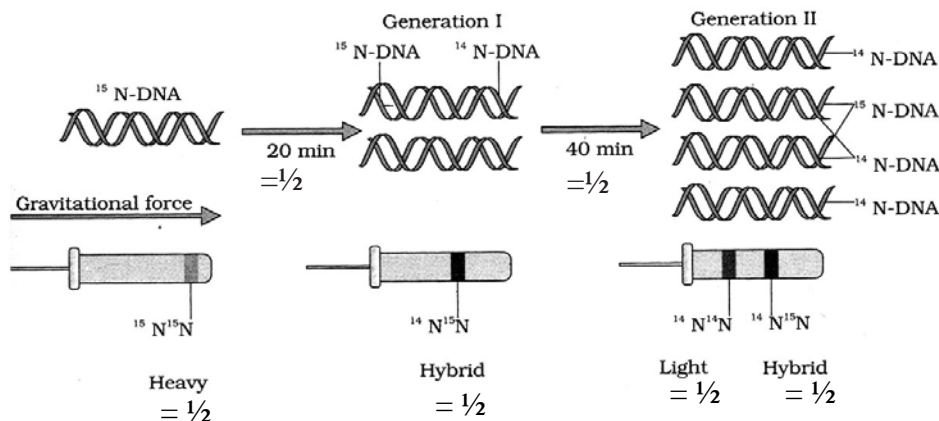
The above E.coli (with ^{15}N) were then transferred in medium containing ^{14}N and, samples were taken out after 20 minutes and after 40 minutes $= \frac{1}{2}$

Extracted DNA was centrifuged and measured to get their density , $= \frac{1}{2}$

DNA extracted after 20 minutes (I^{st} Generation) showed an intermediate hybrid density / $^{14}N \, ^{15}N$, $= \frac{1}{2}$

DNA extracted after 40 minutes (2nd Generation) showed equal amount of Light DNA / ^{14}N and hybrid DNA / $^{14}N \, ^{15}N$ $= \frac{1}{2}$

$$= \frac{1}{2} \times 6$$

[3 Marks]

16. One of the major contributions of biotechnology is to develop pest-resistant varieties of cotton plants. Explain how it has been made possible.

Ans. (i) Introducing Bt toxin gene / cry gene from *Bacillus thuringiensis* , into cotton plant using r-DNA technology $= \frac{1}{2} + \frac{1}{2}$

(ii) cry gene produces insecticidal protein in inactive stage (protoxin) which after ingestion is converted into active form in the gut of insect , due to alkaline pH there $= \frac{1}{2} + \frac{1}{2}$

(iii) This toxin binds to surface of midgut epithelial cells , causes swelling and lysis leading to death of insect = ½ + ½

[3 Marks]

17. (a) State any two differences between phosphorus and carbon cycles in nature.

(b) Write the importance of phosphorus in living organisms.

Ans. (a)

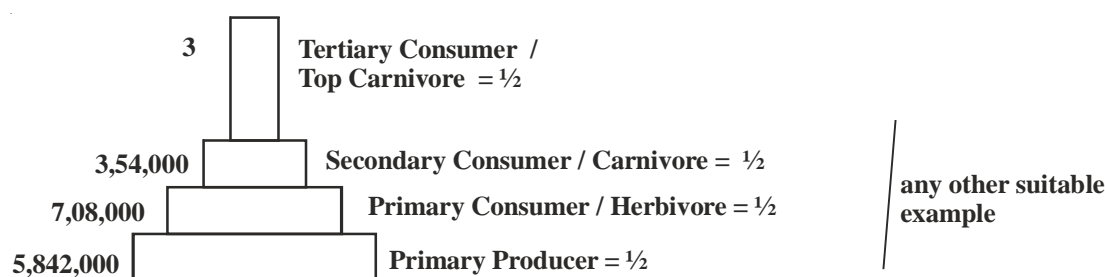| <u>Phosphorus Cycle</u>	<u>Carbon Cycle</u>
- Sedimentary cycle	- Gaseous cycle
- atmospheric inputs through rainfall are much smaller	- Atmospheric inputs through rainfall is more
- Gaseous exchange of phosphorus between organism and environment is nil	- Gaseous exchange of carbon between organism and environment is much more

(any two differences) = 1 × 2

(b) Phosphorus is a major constituent of biological membranes / nucleic acids / cellular energy transfer system / Required for shells bone and teeth (any two) = ½ + ½

[3 Marks]

18. (a) Construct a pyramid of numbers by taking suitable examples for each trophic level in an ecosystem.

(b) Explain why a progressive decline is seen in the population size from the first to the fourth trophic level in the above pyramid.

Ans.

3   **Tertiary Consumer / Top Carnivore = ½**

3,54,000   **Secondary Consumer / Carnivore = ½**

7,08,000   **Primary Consumer / Herbivore = ½**

5,842,000   **Primary Producer = ½**

any other suitable example

Note : In an upright pyramid of number of producers are always more than that of the consumers

Amount of energy decreased at successive trophic levels resulting into decreasing in number of organisms = 1

* (Any other relevant example to be accepted) = 1

½ × 6

[3 Marks]

19. **How can sewage be used to generate biogas ? Explain.**

Ans. When BOD of sewage is reduced , effluent is passed into a settling tank for bacterial flocs to settle down (which is Activated sludge) = ½ + ½

Activated sludge is pumped into anaerobic sludge digesters , Bacteria grow anaerobically and digest bacteria & fungi in sludge = ½ + ½

During digestion bacteria produce a mixture of gases containing methane , hydrogen sulphide and CO_2 = ½ + ½

[3 Marks]

20. **Compare narrowly utilitarian and broadly utilitarian approaches to conserve biodiversity, with the help of suitable examples.**

Ans. Narrowly Utilitarian - Humans derive countless direct economic benefits from nature = 1

eg. dyes / resin / food / wood etc (or any other suitable example) = ½

Broadly utilatarian - plays major role in many ecosystem services that nature provides = 1

eg. pollination / aesthetic pleasure / production of oxygen (or any other suitable example) = ½
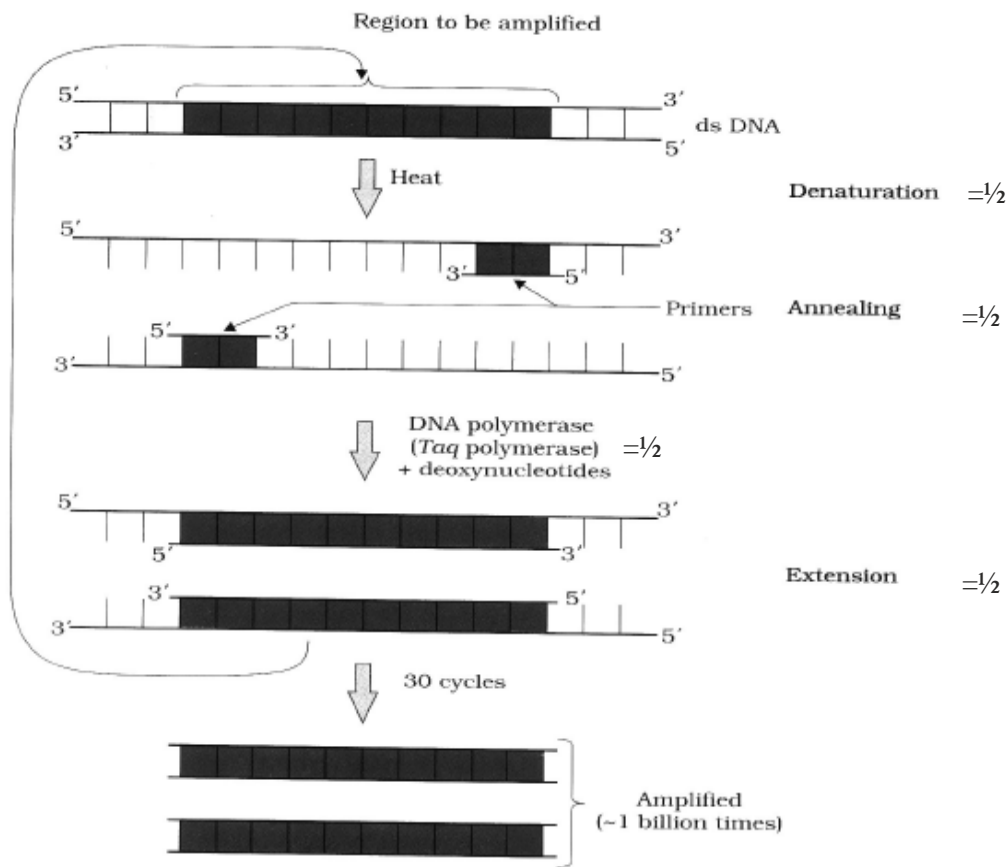
[3 Marks]

21. **Many copies of a specific gene of interest are required to study the detailed sequencing of bases in it. Name and explain the process that can help in developing large number of copies of this gene of interest.**

Ans. Polymerase Chain Reaction = 1

- Denaturation / Separation of ds DNA (by high temperature) = ½
- Annealing - Two sets of primers are added which anneal to 3' end of each seperated strand as they act as initiator of replication = ½
- Extension - DNA Polymerase / Taq polymerase =½ , extends primer by adding nucleotides using DNA as templates = ½

} //

Region to be amplified

Denaturation =½

Annealing =½

DNA polymerase (*Taq* polymerase) =½ + deoxynucleotides

Extension =½

[3 Marks]

22. **Prepare a flow chart in formation of recombinant DNA by the action of restriction endonuclease enzyme EcoRI.**

Ans. Restriction endonuclease (EcoRI) inspects the length of the DNA sequence of both vector and foreign DNA ,

↓

binds to the specific recognition sequence / palindromic sequence ,
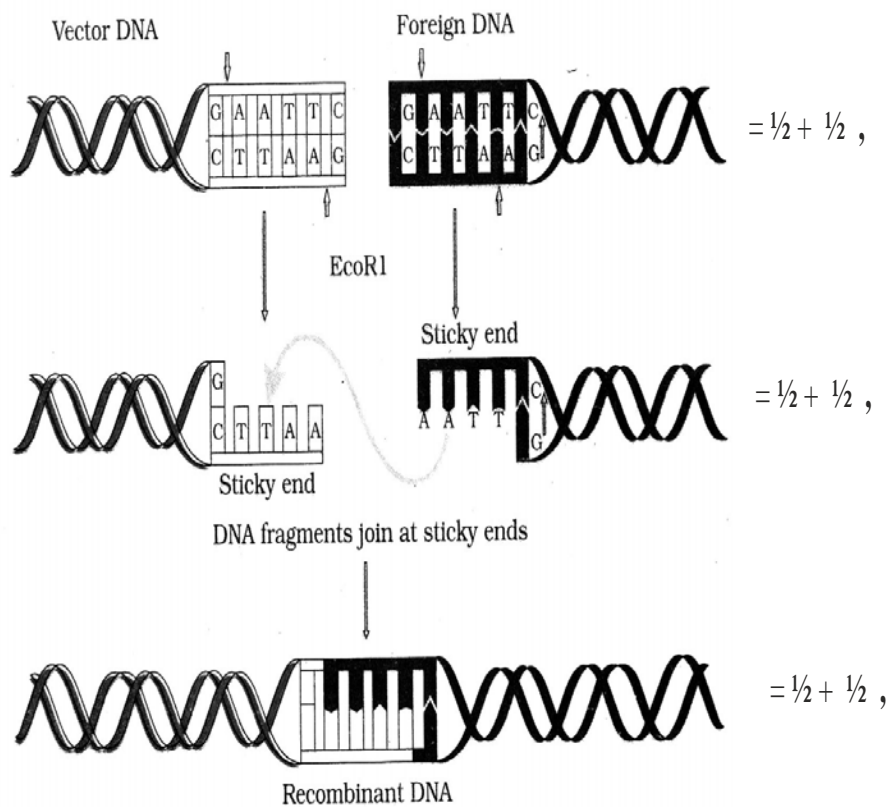
↓

cuts the strand of DNA between G and A ,

↓

only when the sequence GAATTC is present in the DNA ,

↓

leaving single stranded overhanging stretches called sticky ends ,

↓

Ligases joins host and foreign DNA strands at sticky ends to form recombinant DNA

$$= ½ \times 6$$

// diagram can also be accepted in lieu of flow chart

Vector DNA   Foreign DNA

EcoR1

Sticky end

Sticky end

DNA fragments join at sticky ends

Recombinant DNA

$= \frac{1}{2} + \frac{1}{2}$,

$= \frac{1}{2} + \frac{1}{2}$,

$= \frac{1}{2} + \frac{1}{2}$,

[3 Marks]

OR

Name and explain the technique used for separating DNA fragments and making them available for biotechnology experiments.

Ans. Gel electrophoresis $= 1$

- Negatively charged DNA fragments are forced to move towards the anode under electric field on agarose gel ,

- DNA fragments get separated according to their size / Small fragments cover large distance & large fragments cover small distances ,

- These fragments are visualised after staining with ethidium bromide followed by exposure under UV rays

- The separated bands of DNA are cut out from the gel & extracted (elution) $= \frac{1}{2} \times 4$

[3 Marks]

SECTION D

Q. No. 23 is of four marks

23. **You have attended a birthday party hosted by one of your classmates. You found some guests at the party sitting in a corner making a lot of noise and consuming 'something'. After a while one of the boys from the group started screaming, behaving abnormally and sweating profusely. On enquiry you found that the group members were taking drugs.**

    (a) **Would you inform your parents/school authorities ? Yes/No. Give reasons in support of your answer.**

    (b) **Prepare a note to be circulated amongst the schoolmates about the source and dangers of any two druge.**

    (c) **Write any two ways that you will suggest to your school principal so as to promote awareness amongst the youth against the use of these drugs .**

Ans. (a) Yes, so that it does not become a habit by repeated use / consumption of drugs may cause harmful effects / any other reason = 1

    (b) • Drug : <u>Cocaine</u> - Source is plant <u>Erythroxylum</u> <u>coca</u> = ½

        Danger - effects central nervous system / interferes with transport of neurotransmitter (dopamine) = ½

        • Drug : <u>Opioids</u> / heroin / smack - source is latex of <u>Papaver</u> <u>somniferum</u> / poppy plant = ½

        Danger - slows down body function = ½

        • Drug : Cannabinoids source is <u>Cannabis (sativa)</u> = ½

        Danger - effects cardiovascular system = ½

                                (Any two drugs and their danger) = 1 + 1

    (c) By organising : -

        Poster competitions / Street play / talk by experts / interviews / any other appropriate awareness campaign (any two) = ½ + ½

                                                [4 Marks]

SECTION E

Q. Nos. 24 - 26 are of five marks each

24.   (a) **State and explain the law of dominance as proposed by Mendel.**

    (b) **How would Phenotypes of monohybrid F1 and F2 progeny showing incomplete dominance in Snapdragon and co-dominance in human blood group be different from Mendelian monohybrid F1 and F2 progeny ? Explain.**

Ans. (a)

    (i) Characters are controlled by discrete units called factors = 1

    (ii) Factors occur in pairs = 1

(iii) In a dissimilar pair of factors one member of the pair dominates (dominant) the other (recessive) = 1

(b)

Mendelian Monhybrid Cross		Incomplete dominance	Co-dominance	
F1	All members resemble the parent with dominant trait	All members do not resemble either of the two parents but show an intermediate trait	Blood group of all members resemble combination of dominant traits of both the parents	= 1
F2	Both parental traits reappear	Both the parental traits and an intermediate trait appears	Both the parental traits as well as the co-dominant trait appears	= 1

[5 Marks]

OR

Explain the process of transcription in Eukaryotes.

Ans. • Transcription in Eukaryotes is catalysed by DNA dependent RNA polymerase (I , II , III) ,

• RNA polymerase binds to promoter and initiates transcription ,

• It uses nucleoside triphosphates and polymerises to continue elongation ,

• Results in termination of transcription ,

• RNA polymerase I transcribes rRNAs (28S, 18S and 5.8S) ,

• RNA polymerase III is responsible for transcription of tRNA (5s rRNA and snRNAs) ,

• RNA polymerase II transcribes precursor of mRNA - the hn RNA ,

• Splicing removes introns and exons that are joined in a defined order ,

• hn RNA undergoes capping (methyl guanosine triphosphate added to 5'- end) ,

• and tailing (adenylate residues are added to 3'- end in template) ,

(It is the fully processed hnRNA is now called mRNA transported out of nucleus for translation)

$= ½ \times 10$

[5 Marks]

25. **Under polio prevention programme, infants in India were given polio vaccines on a large scale at regular intervals to eradicate polio from the country.**

(a) **What is a vaccine ? Explain how does it impart immunity to the child against the disease.**

(b) **With the help of an example each, differentiale between active and passive immunity.**

Ans. (a) <u>Vaccine</u> – It is inactivated or weakened pathogen that is inoculated into the body of the child = 1

Vaccines generate memory - B & T - cells that recognize the pathogen quickly on subsequent exposure , produce specific antibodies against the pathogen / antigen $= \frac{1}{2} + \frac{1}{2}$

(b) <u>Active</u> Immunity – Immunity that an organism develops due to direct exposure of pathogen by producing antibodies in the body $= 1$

eg .vaccination / infections / hepatitis etc. $= \frac{1}{2}$

<u>Passive</u> Immunity - readymade antibodies are directly given to protect the body from foreign pathogens $= 1$

eg. Colostrum / tetanus / antitoxin for snake bite etc. $= \frac{1}{2}$

[5 Marks]

OR

What are biofertilizers ? Describe their role in agriculture. Why are they preferred to chemical fertilizers?

Ans. <u>Biofertilizers</u> – are organisms that enrich the nutrient quality of the soil $= 1$

Role –
(i)   increase nutrient quality
(ii) fix atmospheric nitrogen
(iii) resistant to root borne pathogens
(iv) tolerance to salinity and drought
(v)   overall increase in plant growth and development (any four) $= \frac{1}{2} \times 4 = 2$

These are preferred to chemical fertilizers because

- They do not pollute soil / air / water $= 1$
- do not spoil soil texture or pH of the soil $= 1$

[5 Marks]

26. (a) Explain the events after pollination leading to the formation of a seed in angiosperms.

(b) Mention the ploidy levels of the cells of different parts of an albuminous seed.

Ans. (a) (i) Pistil accepts right type pollen , pollen grain germinates to produce pollen tube that grows and reaches the ovary , male gametes enter the ovule through micropyle , one male gamete fuses with nucleus of egg cell to form diploid zygote , other male gamete fuses with two polar nuclei forming primary endosperm cell which develops into endosperm , diploid zygote develops into embryo , followed by development of ovule into seed $= \frac{1}{2} \times 8$

(b) Embryo - 2n / diploid $= \frac{1}{2}$

Endosperm - 3n / triploid $= \frac{1}{2}$

[5 Marks]

OR

Explain the process of fertilization and implantation in humans.

Ans. Fertilisation : Sperm comes in contact with zona pellucida layer of ovum , and induces changes in the membrane that blocks the entry of additional sperms , this induces completion of second meiotic division to form second polar body and haploid ovum (ootid) , nucleus of sperm fuses with that of ovum to form diploid zygote $= \frac{1}{2} \times 4$

Implantation : Repeated cleavage in zygote results in formation of blastocyst , whose outer layer is called trophoblast , and an inner group of cells called inner cell mass , trophoblast layer gets attached to endometrium , inner cell mass gets differentiated as embryo , uterine cells divide rapidly and covers the blastocyst that becomes embedded in the endometrium$= \frac{1}{2} \times 6$

[5 Marks]