Confidential
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28.03.2016

Senior School Certificate Examination

March 2016

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.

Question Paper Code 57/1/1

SECTION – A

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

1. According to de-Vries what is saltation ?

Ans. Single step (large) mutation

[1 mark]

2. Excessive nutrients in a fresh water body cause fish mortality. Give two reasons.

Ans. Excessive nutrients result in excessive algal growth / eutrophication / algal bloom / toxins produced by algal bloom , water quality becomes poor / BOD increases / oxygen level decreases = ½ + ½

[1 mark]

3. Suggest the breeding method most suitable for animals that are below average in milk productivity.

Ans. Outbreeding / Outcrossing / Cross-breeding / artificial insemination / hybridisation

[1 mark]

4. State a difference between a gene and an allele.

Ans. Gene - contains information that is required to express a particular trait // unit of inheritance // segment of DNA called cistron //

sequence of DNA coding for tRNA / rRNA / polypeptide / enzyme

Allele - Genes which code for a pair of contrasting traits / (slightly) different forms of the same gene / individual gene in a particular gene pair (for same character)

[1 mark]

5. Suggest a technique to a researcher who needs to separate fragments of DNA.

Ans. (Gel) eletrophoresis

[1 mark]

SECTION B

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

6. Explain the significance of meiocytes in a diploid organism.

Ans. Undergo meiosis / undergo gametogenesis / form haploid gametes , help to restore 2n (diploidy) through zygote formation or syngamy / help to restore chromosome number = 1 + 1

[2 marks]

7. Mention the kind of biodiversity of more than a thousand varieties of mangoes in India represent. How is it possible ?

Ans. Genetic diversity / single species show high diversity at genetic level = 1

Single species show high diversity at genetic level over its distributional range / different varieties grow in different geographical areas / climatic conditions / breeding / mutations = 1

[1 + 1 = 2 marks]

8. List the events that reduce the Biological Oxygen Demand (BOD) of a primary effluent during sewage treatment.

Ans. Effluent from the primary settling tank passed into aeration tank , agitated mechanically and air is pumped into it , vigorous growth of aerobic microbes into flocs , microbes consume major part of the organic matter in effluent = ½ × 4

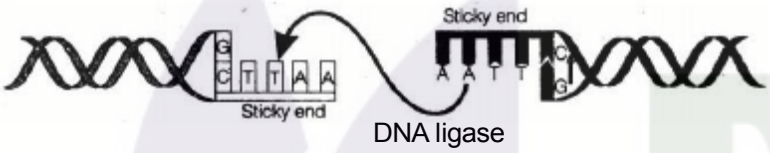
[2 marks]

9. Discuss the role the enzyme DNA ligase plays during DNA replication.

Ans. (Discontinuous) DNA fragments , are joined / sealed by them

// sticky ends of vector and foreign DNA , joined by them

The following diagram can be considered in lieu of explanation



= 1 + 1

[2 marks]

10. Name the causative organism of the disease amoebiasis. List three symptoms of the disease.

Ans. - *Entamoeba histolytica* = ½

- Constipation , abdominal pain , cramps , stool with excess mucous / blood clots

(Any three) = ½ × 3

[½ + 1½ = 2 marks]

OR

Identify 'A', 'B' 'C' and 'D' in the given table.

Crop	Variety	Resistance to disease
A	Himgiri	Leaf rust
Cauliflower	Pusa Shubhra	B
Brassica	Pusa Swarnim	C
Cowpea	D	Bacterial blight

Ans. A = Wheat = ½

B = Black rot / Curl blight black rot = ½

C = White rust = ½

D = Pusa Komal = ½

[2 marks]

SECTION-C

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

11. Why is breast-feeding recommended during the initial period of an infant's growth ? Give reasons.

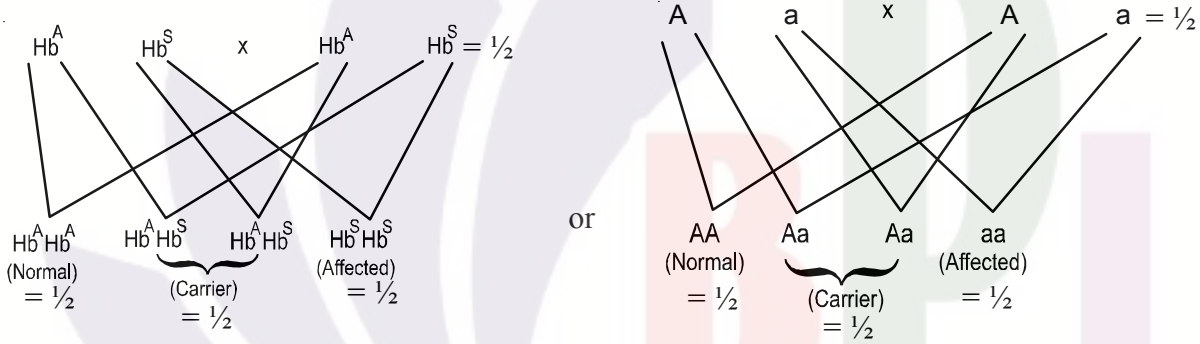
Ans. Colostrum , rich in nutrients , rich in antibodies / rich in IgA / provide passive immunity / provides immunity to new born / helps to develop resistance in new born / readily available for new born / hygenic / develops a bond between mother and child.

(Any three)

[3 marks]

12. Give an example of an autosomal recessive trait in humans. Explain its pattern of inheritance with the help of a cross.

Ans. Sickle cell anaemia / Phenylketonuria / Thalassemia / O Blood group / Non - rolling of tongue / Fused or attached ear lobes / Inability to taste PTC (phenyl thiocarbamide) =1



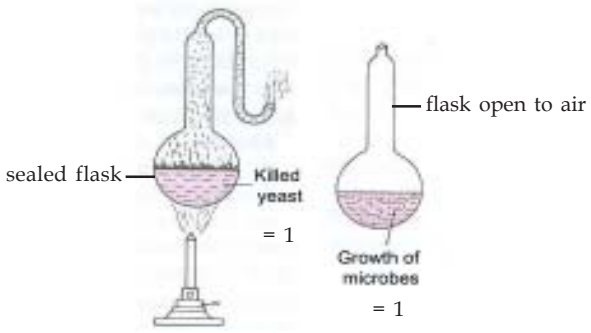
* Similar cross can be considered for any other trait mentioned above

[1 + 2 = 3 marks]

13. Describe the experiment that helped Louis Pasteur to dismiss the theory of spontaneous generation of life.

Ans. Two pre sterilised flasks with killed yeast , one sealed , other open to air , differential growth of life in two flasks / life was found only in open flask. = ½ × 4

// the following diagram can be considered in lieu of above explanation



life comes from pre-existing life (it came from air entering the flask) / proved the theory of biogenesis = 1

[2 + 1 = 3 marks]

14. Plant breeding technique has helped sugar industry in North India. Explain how.

Ans. Two species (*Saccharum barberi* and *Saccharum officinarum*) were crossed to get sugarcane varieties with high yield / thick stem / high sugar content / ability to grow in North India

(Any three points)

[3 marks]

15. Suggest and describe a technique to obtain multiple copies of a gene of interest *in vitro*.

Ans. PCR / polymerase chain reaction = 1

Separation / denaturation of two strands of two dsDNA , using two sets of primers / small chemically synthesised oligonucleotides complementary to regions of DNA and (thormostable) DNA polymerase / Taq polymerase , extension of the primers , by enzyme using nucleotides replicates the DNA and if the process of replication is repeated many times multiple copies of DNA are produced = ½ × 4

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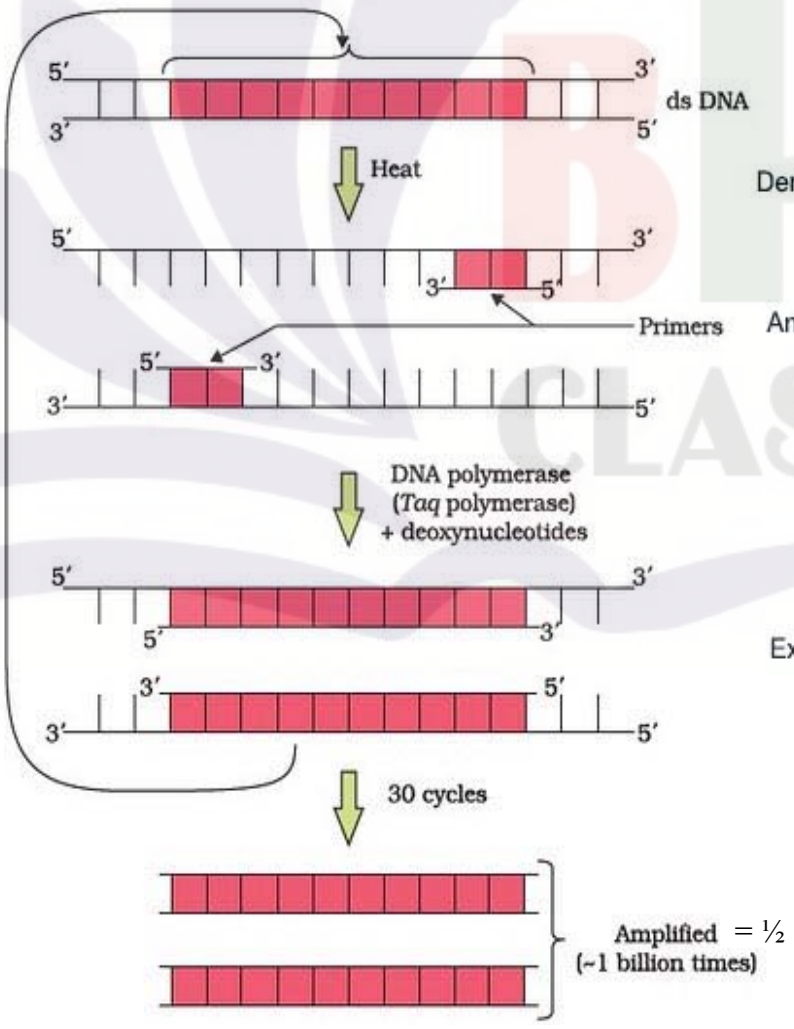


[1 + 2 = 3 marks]

16. What is GMO ? List any five possible advantages of a GMO to a farmer.

Ans. - Plants / bacteria / fungi / animals whose genes have been altered by manipulation = ½

- Tolerance to abiotic stresses / like cold / drought / salt / heat ,

reduced reliance on chemical pesticides / pest resistant crops ,

reduce post harvest losses ,

increased efficiency of mineral usage by plants ,

enhanced nutritional value ,

to create tailor made plant

(Any five) = ½ × 5

[3 marks]

17. During a school trip to 'Rohtang Pass', one of your classmate suddenly developed 'altitude sickness'. But, she recovered after sometime.

(a) Mention one symptom to diagnose the sickness.

(b) What caused the sickness ?

(c) How could she recover by herself after sometime ?

Ans. (a) Nausea / fatigue / heart palpitation = 1

(b) Low atmospheric pressure at high altitude , body deprived of O_2 = ½ + ½

(c) Increase in RBC , decreases binding capacity of haemoglobin , increased breathing rate , get acclimatised ***(Any two)*** = ½ + ½

[1 + 1+ 1 = 3 marks]

18. How has RNAi technique helped to prevent the infestation of roots in tobacco plants by a nematode *Meloidegyne incognitia* ?

Ans. Using *Agrobacterium* vectors , nematode specific genes introduced into host plant , produced sense - antisense RNA in host cells , ds RNA - initiated RNAi , silenced specific mRNA of nematode , parasite could not survive in transgenic host = ½ × 6

[3 marks]

19. *"In a food-chain, a trophic level represents a functional level, not a species." Explain.*

Ans. Position of a species in any trophic level is determined by the function performed by that mode of nutrition of species in a particular food chain / A given species may occupy more than one trophic level in the same ecosystem (in different food chains) at the given time , If the function of the mode of nutrition of species changes its position shall change in the trophic levels , same species can be at primary consumer level in one food chain and at secondary consumber level in another food chain in the same ecosystem at the given time = 1 × 3

Similar value points explained with the help of a suitable example = 3

[3 marks]

OR

(a) ***Name any two places where it is essential to install electrostatic precipitators. Why it is required to do so ?***

(b) **Mention one limitation of the electrostatic precipitator.**

Ans. (a) Thermal power plants / smelters / other particulate matter releasing industries = ½ + ½

(Any two)

To remove particulate matter = 1

(b) Very very small particulate matter / less than 2.5 micrometres are not removed / velocity of air between plates must be low enough to allow the dust to fall / cannot work without electricity = 1

[2 + 1 = 3 marks]

20. Prior to a sports event blood & urine samples of sportspersons are collected for drug tests.

(a) **Why is there a need to conduct such tests ?**

(b) **Name the drugs the authorities usually look for.**

(c) **Write the generic names of two plants from which these drugs are obtained.**

Ans. (a) To detect drug abuse / use of banned drugs / use of cannabinoids / anabolic steroids / narcotic analgesic / diuretics / hormones / drugs used to accelerate performance / increase muscle strength / bulk / promote aggressiveness / to ensure fair game

(b) Cannabinoids / cocaine / coca alkaloid / coke / crack / hashish / charas / ganja / hemp plant extract

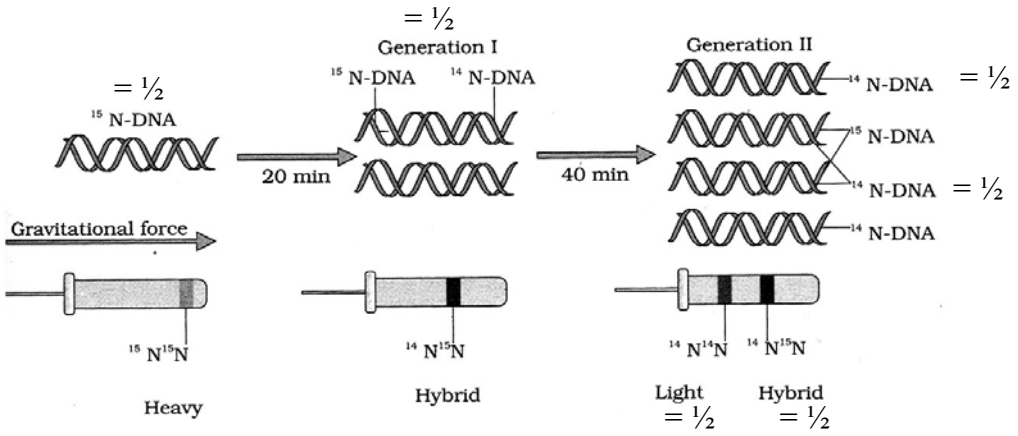
(c) *Cannabis / Atropa / Erythroxylum / Datura* ***(Any two)***

[1 × 3 = 3 marks]

21. Describe the experiment that helped demonstrate the semi-conservative mode of DNA replication.

Grown *E.coli* in $^{15}NH_4Cl$ for many generations to get ^{15}N incorporated into DNA , Then the cells are transferred into $^{14}NH_4Cl$, The extracted DNA are centrifuged in CsCl and measured to get their densities , DNA extracted from the culture after one generation (20 minutes) , showed intermediate hybrid density , DNA extracted after two generations (40 minutes) showed light DNA and hybrid DNA = ½ × 6 = 3 //

A correctly labelled diagramatic representation in lieu of the above explanation of experiment to be considered = 3



[3 marks]

22. Given below is a list of six micro-organisms. State their usefulness to humans.

(a) ***Nucleopolyhedrovirus***

(b) ***Saccharomyces cerevisiae***

(c) ***Monascus purpureus***

(d) ***Trichoderma polysporum***

(e) ***Penicillium notatum***

(f) ***Propionibacterium sharmanii***

Ans. (a) As bio control agents / species specific / narrow spectrum insecticidal application / no negative impacts on plants / mammals / birds / fish / non target insects / Integrated Pest Management

(b) Used in bread making / brewing industry / ethanol / CO_2 production

(c) Cholesterol lowering agent / competitively inhibiting the enzyme responsible for synthesis of cholesterol

(d) Produces Cyclosporin - A / immuno suppressive agent

(e) Produces antibiotic penicillin

(f) Produces large holes in Swiss cheese / produces large amount of CO_2 in swiss cheese

[½ × 6 = 3 marks]

SECTION - D

(Q. Nos. 23 is of four mark)

23. Reproductive and Child Healthcare (RCH) programmes are currently in operation. One of the major tasks of these programmes is to create awareness amongst people about the wide range of reproduction related aspects. As this is important and essential for building a reproductively healthy society.

(a) "Providing sex education in schools is one of the ways to meet this goal." Give four points in support of your opinion regarding this statement.

(b) List any two 'indicators' that indicate a reproductively healthy society.

Ans. (a) - Provide right information to the young so as to discourage children from believing in myths and misconception about sex related aspects.

- Proper information about reproductive organs
- Proper information about adolescence and related changes
- Safe hygienic practices
- STDs / AIDS
- Available birth control options
- Care of pregnant mothers
- Post natal care
- Importance of breast feeding
- Equal opportunities for male and female child
- awareness of problems due uncontrolled population growth
- Sex abuse
- Sex related crimes

(Any four) = ½ × 4

(b) Better awareness about sex related matters / increase number of assisted deliveries / better post natal care / decrease in IMR (Infant Mortality Rate) / decrease MMR (Maternal Mortality Rate) / increase number of couples with small families / better detection and cure of STDs / overall increased medical facilities for sex related problems / total well being in all aspects of reproduction / physical - behavioural - social / physically and functionally normal reproductive organs / normal emotional and behavioural interaction among all sex related aspects.

(Any two) = 1 + 1

[2 + 2 = 4 marks]

SECTION - E

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

24. (a) Explain the post-pollination events leading to seed production in angiosperms.

(b) List the different types of pollination depending upon the source of pollen grain.

Ans. (a) Pollen pistil interaction , germination of pollen tube that carries two male gametes , double fertilization / syngamy and triple fusion , development of endosperm , development of embryo , maturation of ovule into seed.= ½ × 6

(b) Autogamy / self pollination / Geitonogamy = 1

Xenogamy / cross pollination = 1

[3 + 2 = 5 marks]

OR

(a) Briefly explain the events of fertilization and implantation in an adult human female.

(b) Comment on the role of placenta as an endocrine gland.

(a) **Fertilization**

- Sperm comes in contact and enters the secondary oocyte
- activates / induces secondary oocyte to complete meiosis II leads to formation of ovum / ootid
- the haploid nucleus of sperm and that of ovum fused to form a diploid zygote completing the process of fertilization = ½ × 3

Implantation

- Trophoblast layer of blastocyst attaches to the endometrium (of the uterus)
- The uterine cells divide rapidly and cover the blastocyst ,
- The blastocyst becomes embedded in the endometrium and the implantation is completed = ½ × 3

(b)
- hCG (human chorionic gonadotropin)
- hPL (human placental lactogen)
- estrogen
- progestogens = ½ × 4

[3 + 2 = 5 marks]

25. (a) How are the following formed and involved in DNA packaging in a nucleus of a cell?

(i) Histone octamer

(ii) Nucleosome

(iii) Chromatin

(b) Differentiate between Euchromatin and Heterochromatin.

Ans. (a) (i) Eight molecules of (positively charged basic proteins called) histones are organised to form histone octamer

(ii) Negatively charged DNA wrapped around positively charged histone octamer to give rise to nucleosome

(iii) Nucleosome constitute the repeating unit of a structure called chromatin = 1 × 3

(b)

Euchromatin	**Heterochromatin**
- Loosely packed	- Densely packed
- Stains light	- Stains dark
- Transcriptionally active	- Transcriptionally inactive

(Any two differences) = 1 + 1

[3 + 2 = 5 marks]

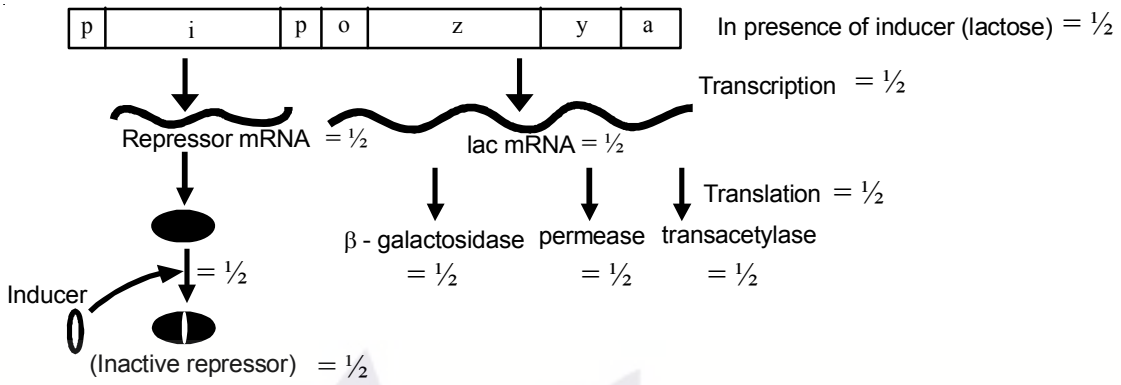
OR

Explain the role of lactose as an inducer in a *lac* operon.

Ans. Lactose / inducer binds with repressor protein , inactivates it , frees operator gene , RNA polymerase freely move over structural genes / RNA polymerase access to the promoter , transcribing to , lac

mRNA , which on translation , produce transacetylase , permease , β - galactosidase = ½ × 10 //

The following diagram to be considered in lieu of above explanation



= ½ × 10

[5 marks]

26. (a) Why should we conserve biodiversity ? How can we do it ?

(b) Explain the importance of biodiversity hot-spots and sacred groves.

Ans. (a) (i)

- Narrowly utilitarian - related examples like derive economic benefits from nature food (cereals, pulses, fruits) / firewood / fibre / construction materials / industrial products (tannins, lubricants, dice, resins, perfumes) / product of medicinal importance / drugs = ½
- Broadly utilitarian - 20% of total O_2 from Amazon forests / pollination / aesthetic pleasures = ½
- Ethical - millions of species (plants, animals, microbes) share this planet / we need to realise that every species has an intrinsic value (even if it may not current or any economic value to us) / we have a moral duty to care for their wellbeing and pass on our biological legacy to future generations = ½

(ii)

- In situ conservation / biosphere reserves / national parks / sanctuaries / sacred groves = ½ //
- Ex situ conservation / zoological parks / botanical gardens / wild life safari parks / cryopreservation / seed banks / tissue culture (eggs in vitro) = ½

(b) Hot spots - regions with high level of species richness , high degree of endemism = 1 + 1

Sacred groves - tracts of forest containing tree / wild life were venerated ,and given total protection // to protect last refuses for a large number of rare , and threatened plants = ½ + ½

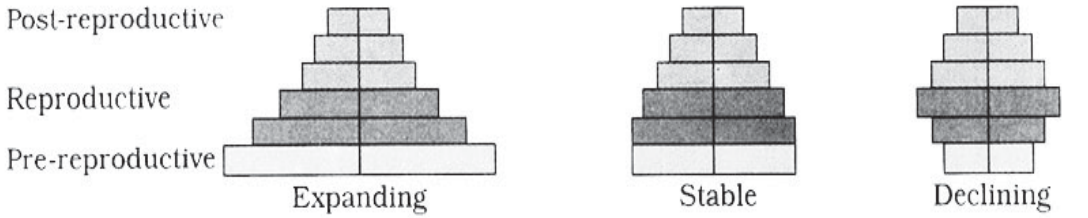
[2 + 3 = 5 marks]

OR

(a) Represent diagrammatically three kinds of age-pyramids for human populations.

(b) How does an age pyramid for human population at given point of time helps the policy-makers in planning for future.

Ans. (a)



= 1 = 1 = 1

Ans. (b) Planning of health / education / transport / infra-structure / finance / food / employment can depend on the age-pyramid analysis of a population / any other relevant point. (Any two explanation) = 1 + 1

[3 + 2 = 5 marks]

Question Paper Code 57/1/2

SECTION – A

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

1. Suggest a technique to a researcher who needs to separate fragments of DNA.

Ans. (Gel) eletrophoresis

[1 mark]

2. State a difference between a gene and an allele.

Ans. Gene - contains information that is required to express a particular trait // unit of inheritance // segment of DNA called cistron //

sequence of DNA coding for tRNA / rRNA / polypeptide / enzyme

Allele - Genes which code for a pair of contrasting traits / (slightly) different forms of the same gene / individual gene in a particular gene pair (for same character)

[1 mark]

3. Give an example of a human disorder that is caused due to a single gene mutation.

Ans. Sickle cell anaemia / Thalassemia / Phenyl ketonuria ***(Any one)***

[1 mark]

4. Suggest the breeding method most suitable for animals that are below average in milk productivity.

Ans. Outbreeding / Outcrossing / Cross-breeding / artificial insemination / hybridisation

[1 mark]

5. Excessive nutrients in a fresh water body cause fish mortality. Give two reasons.

Ans. Excessive nutrients result in excessive algal growth / eutrophication / algal bloom / toxins produced by algal bloom , water quality becomes poor / BOD increases / oxygen level decreases = ½ + ½

[1 mark]

SECTION B

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

6. Name the causative organism of the disease amoebiasis. List three symptoms of the disease.

Ans. - *Entamoeba histolytica* = ½

- Constipation , abdominal pain , cramps , stool with excess mucous / blood clots

(Any three) = ½ × 3

[½ + 1½ = 2 marks]

OR

Identify 'A', 'B' 'C' and 'D' in the given table.

Crop	Variety	Resistance to disease
A	Himgiri	Leaf rust
Cauliflower	Pusa Shubhra	B
Brassica	Pusa Swarnim	C
Cowpea	D	Bacterial blight

Ans. A = Wheat = ½

B = Black rot / Curl blight black rot = ½

C = White rust = ½

D = Pusa Komal = ½

[2 marks]

7. Discuss the role the enzyme DNA ligase plays during DNA replication.

Ans. (Discontinuous) DNA fragments , are joined / sealed by them

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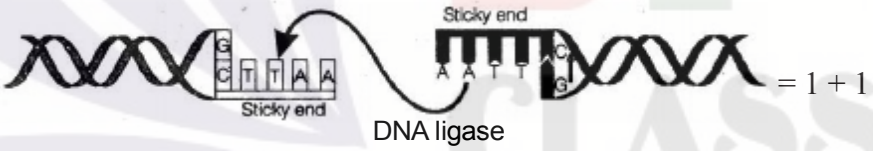

= 1 + 1

[2 marks]

8. Explain the importance of syngamy and meiosis in a sexual life cycle of an organism.

Ans. Syngamy - Restoration of (2n) chromosome number / diploidy / zygote formation / variations (due to syngamy) = 1

Meiosis - Gamete formation / reduction of (n) chromosome number / haploidy / variation (due to crossing over) = 1

[2 marks]

9. List the events that lead to biogas production from waste water whose BOD has been reduced significantly.

Ans. Sedimentation of flocs to form activated sludge , sludge pumped to anaerobic sludge digester , growth of anaerobic bacteria , digestion of sludge by bacteria to release biogas = ½ × 4

[2 marks]

10. Why the plants that inhabit a desert are not found in a mangrove ? Give reasons.

Ans. Desert plants are not adapted to survive in saline / aquatic conditions /

Plants are conformers / stenothermal / cannot maintain constant internal environment / temperature / osmotic concentration of the body fluids affects kinetics of enzymes through basal metabolism / activity and other physiological functions of the organisms

(Any <u>one</u>) = 2

[2 marks]

SECTION-C

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

11. Describe the experiment that helped Louis Pasteur to dismiss the theory of spontaneous generation of life.

Ans. Two pre sterilised flasks with killed yeast , one sealed , other open to air , differential growth of life in two flasks / life was found only in open flask. = ½ × 4

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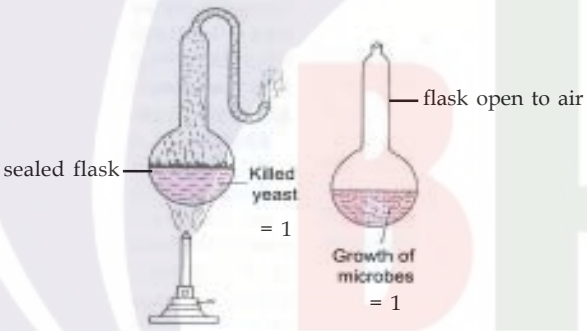

life comes from pre-existing life (it came from air entering the flask) / proved the theory of biogenesis = 1

[2 + 1 = 3 marks]

12. Differentiate between somaclones and somatic hybrids. Give one example of each.

Ans. Somaclones are produced through micropropagation / tissue culture , genetically identical = ½ + ½

e.g. apple / tomato / banana = ½

Somatic hybrids are produced by fusion of protoplast of two different plants , genetically dissimilar = ½ + ½

e.g. pomato / hybrids of potato and tomato = ½

[1½ + 1½ = 3 marks]

13. Why is breast-feeding recommended during the initial period of an infant's growth ? Give reasons.

Ans. Colostrum , rich in nutrients , rich in antibodies / rich in IgA / provide passive immunity / provides immunity to new born / helps to develop resistance in new born / readily available for new born / hygenic / develops a bond between mother and child.

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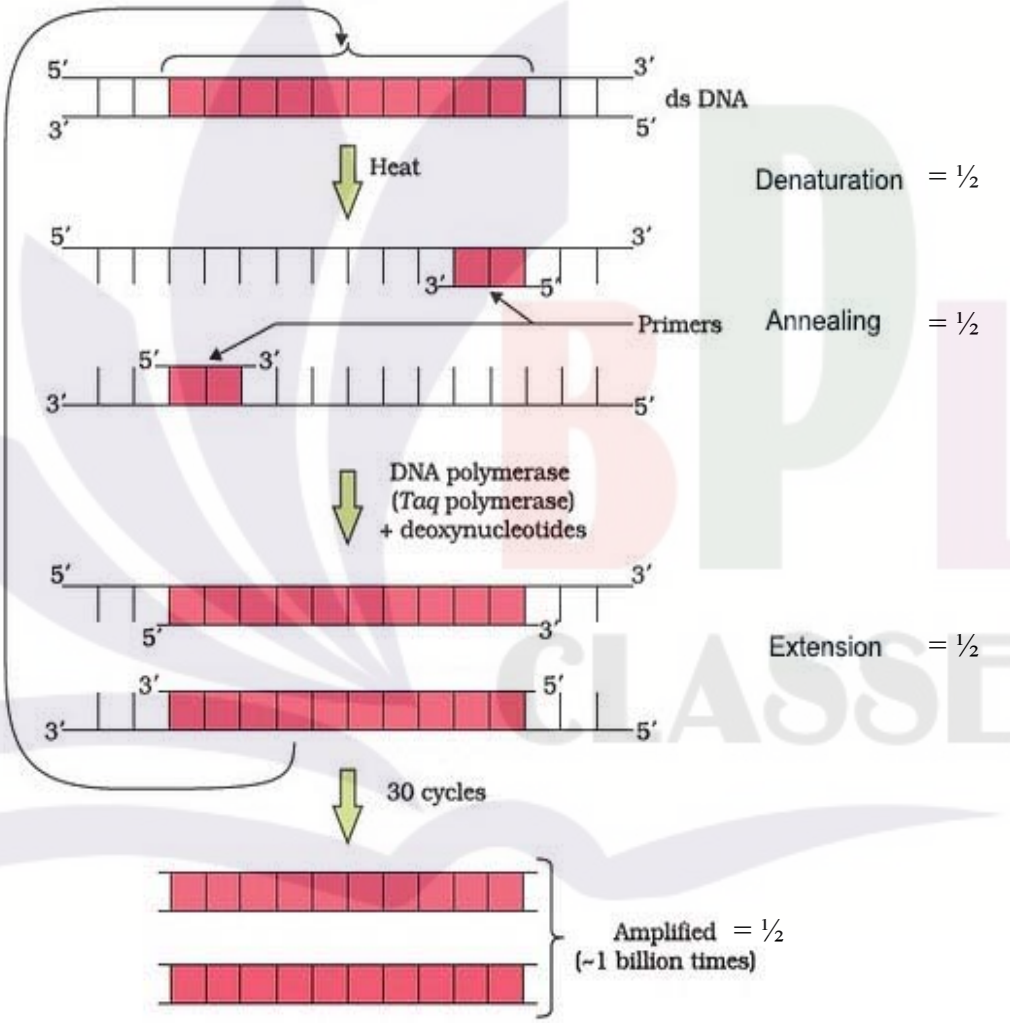

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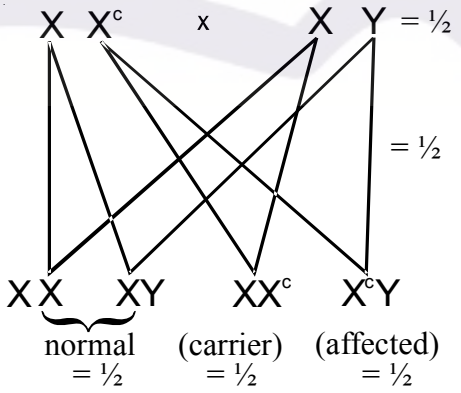
(e) Produces antibiotic penicillin

(f) Produces large holes in Swiss cheese / produces large amount of CO_2 in swiss cheese

[½ × 6 = 3 marks]

17. A couple with normal vision bear a colour blind child. Work out a cross to show how it is possible and mention the sex of the affected child.

Ans.



Affected child is male = ½

[3 marks]

18. ***Prior to a sports event blood & urine samples of sportspersons are collected for drug tests.***

(a) Why is there a need to conduct such tests ?

(b) Name the drugs the authorities usually look for.

(c) Write the generic names of two plants from which these drugs are obtained.

Ans. (a) To detect drug abuse / use of banned drugs / use of cannabinoids / anabolic steroids / narcotic analgesic / diuretics / hormones / drugs used to accelerate performance / increase muscle strength / bulk / promote aggressiveness / to ensure fair game

(b) Cannabinoids / cocaine / coca alkaloid / coke / crack / hashish / charas / ganja / hemp plant extract

(c) *Cannabis / Atropa / Erythroxylum / Datura* ***(Any two)***

[1 × 3 = 3 marks]

19. ***In certain seasons we sweat profusely while in some other season we shiver. Explain.***

Ans. To regulate body temperature = 1

In summer outside temperature is higher than body temperature , sweating causes cooling by evaporation of sweat = ½ + ½

In winter outside temperature is lower than body temperature , shivering is an (involuntary) exercise which produces heat = ½ + ½

[1 + 1 + 1 = 3 marks]

20. ***"In a food-chain, a trophic level represents a functional level, not a species." Explain.***

Ans. Position of a species in any trophic level is determined by the function performed by that mode of nutrition of species in a particular food chain / A given species may occupy more than one trophic level in the same ecosystem (in different food chains) at the given time , If the function of the mode of nutrition of species changes its position shall change in the trophic levels , same species can be at primary consumer level in one food chain and at secondary consumber level in another food chain in the same ecosystem at the given time = 1 × 3

Similar value points explained with the help of a suitable example = 3

[3 marks]

OR

(a) Name any two places where it is essential to install electrostatic precipitators. Why it is required to do so ?

(b) Mention one limitation of the electrostatic precipitator.

Ans. (a) Thermal power plants / smelters / other particulate matter releasing industries = ½ + ½

(Any two)

To remove particulate matter = 1

(b) Very very small particulate matter / less than 2.5 micrometres are not removed / velocity of air between plates must be low enough to allow the dust to fall / cannot work without electricity = 1

[2 + 1 = 3 marks]

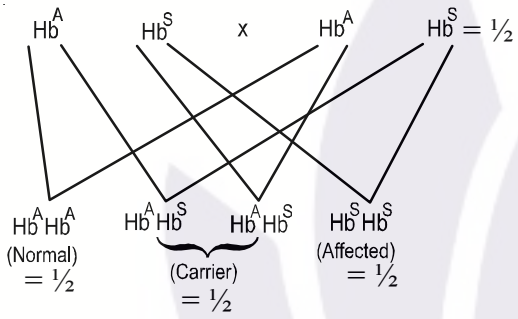
21. How has RNAi technique helped to prevent the infestation of roots in tobacco plants by a nematode Meloidegyne incognitia ?

Ans. Using *Agrobacterium* vectors , nematode specific genes introduced into host plant , produced sense - antisense RNA in host cells , ds RNA - initiated RNAi , silenced specific mRNA of nematode , parasite could not survive in transgenic host = ½ × 6

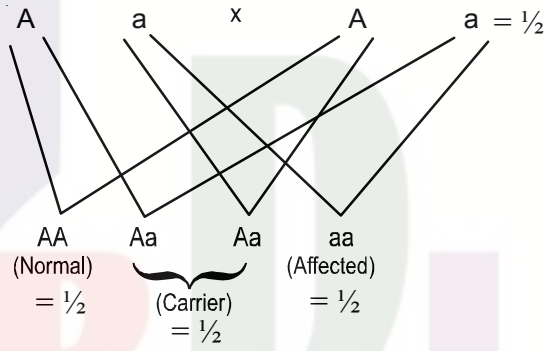
[3 marks]

22. Give an example of an autosomal recessive trait in humans. Explain its pattern of inheritance with the help of a cross.

Ans. Sickle cell anaemia / Phenylketonuria / Thalassemia / O Blood group / Non - rolling of tongue / Fused or attached ear lobes / Inability to taste PTC (phenyl thiocarbamide) =1



or



* Similar cross can be considered for any other trait mentioned above

[1 + 2 = 3 marks]

SECTION - D

(Q. Nos. 23 is of four marks)

23. Reproductive and Child Healthcare (RCH) programmes are currently in operation. One of the major tasks of these programmes is to create awareness amongst people about the wide range of reproduction related aspects. As this is important and essential for building a reproductively healthy society.

(a) "Providing sex education in schools is one of the ways to meet this goal." Give four points in support of your opinion regarding this statement.

(b) List any two 'indicators' that indicate a reproductively healthy society.

Ans. (a)
- Provide right information to the young so as to discourage children from believing in myths and misconception about sex related aspects.
- Proper information about reproductive organs
- Proper information about adolescence and related changes
- Safe hygienic practices
- STDs / AIDS
- Available birth control options
- Care of pregnant mothers

- Post natal care
- Importance of breast feeding
- Equal opportunities for male and female child
- awareness of problems due uncontrolled population growth
- Sex abuse
- Sex related crimes

(Any four) = ½ × 4

(b) Better awareness about sex related matters / increase number of assisted deliveries / better post natal care / decrease in IMR (Infant Mortality Rate) / decrease MMR (Maternal Mortality Rate) / increase number of couples with small families / better detection and cure of STDs / overall increased medical facilities for sex related problems / total well being in all aspects of reproduction / physical - behavioural - social / physically and functionally normal reproductive organs / normal emotional and behavioural interaction among all sex related aspects.

(Any two) = 1 + 1

[2 + 2 = 4 marks]

SECTION - E

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

24. (a) Why should we conserve biodiversity ? How can we do it ?

(b) Explain the importance of biodiversity hot-spots and sacred groves.

Ans. (a) (i)
- Narrowly utilitarian - related examples like derive economic benefits from nature food (cereals, pulses, fruits) / firewood / fibre / construction materials / industrial products (tannins, lubricants, dice, resins, perfumes) / product of medicinal importance / drugs = ½
- Broadly utilitarian - 20% of total O_2 from Amazon forests / pollination / aesthetic pleasures = ½
- Ethical - millions of species (plants, animals, microbes) share this planet / we need to realise that every species has an intrinsic value (even if it may not current or any economic value to us) / we have a moral duty to care for their wellbeing and pass on our biological legacy to future generations = ½

(ii)
- In situ conservation / biosphere reserves / national parks / sanctuaries / sacred groves = ½ //
- Ex situ conservation / zoological parks / botanical gardens / wild life safari parks / cryopreservation / seed banks / tissue culture (eggs in vitro) = ½

(b) Hot spots - regions with high level of species richness , high degree of endemism = 1 + 1

Sacred groves - tracts of forest containing tree / wild life were venerated ,and given total protection // to protect last refuses for a large number of rare , and threatened plants = ½ + ½

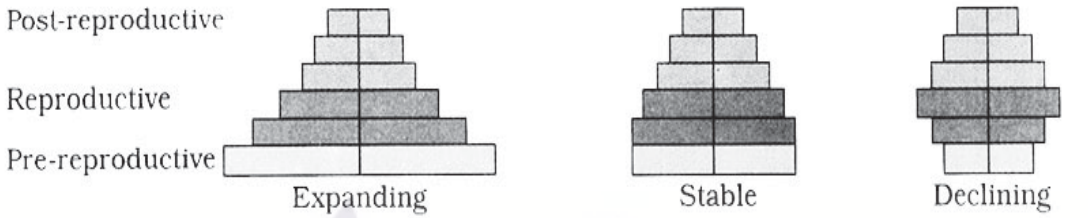
[2 + 3 = 5 marks]

OR

(a) Represent diagrammatically three kinds of age-pyramids for human populations.

(b) How does an age pyramid for human population at given point of time helps the policy-makers in planning for future.

Ans. (a)



= 1 = 1 = 1

Ans. (b) Planning of health / education / transport / infra-structure / finance / food / employment can depend on the age-pyramid analysis of a population / any other relevant point. (Any two explanation) = 1 + 1

[3 + 2 = 5 marks]

25. (a) Explain the post-pollination events leading to seed production in angiosperms.

(b) List the different types of pollination depending upon the source of pollen grain.

Ans. (a) Pollen pistil interaction , germination of pollen tube that carries two male gametes , double fertilization / syngamy and triple fusion , development of endosperm , development of embryo , maturation of ovule into seed.= ½ × 6

(b) Autogamy / self pollination / Geitonogamy = 1

Xenogamy / cross pollination = 1

[3 + 2 = 5 marks]

OR

(a) Briefly explain the events of fertilization and implantation in an adult human female.

(b) Comment on the role of placenta as an endocrine gland.

(a) **Fertilization**

- Sperm comes in contact and enters the secondary oocyte
- activates / induces secondary oocyte to complete meiosis II leads to formation of ovum / ootid
- the haploid nucleus of sperm and that of ovum fused to form a diploid zygote completing the process of fertilization = ½ × 3

Implantation

- Trophoblast layer of blastocyst attaches to the endometrium (of the uterus)
- The uterine cells divide rapidly and cover the blastocyst ,
- The blastocyst becomes embedded in the endometrium and the implantation is

completed = ½ × 3

(b) - hCG (human chorionic gonadotropin)

- hPL (human placental lactogen)
- estrogen
- progestogens = ½ × 4

[3 + 2 = 5 marks]

26. List the criteria a molecule that can act as genetic material must fulfill. Which one of the criteria are best fulfilled by DNA or by RNA thus making one of them a better genetic material than the other ? Explain.

Ans. (i) Generate replica / carry out replication

(ii) Should be chemicaly & structurally stable

(iii) Provide scope for slow mutation

(iv) Able to express itself as characters = ½ × 4

DNA is more stable = 1

because of presence of H and not OH at 2'/ presence of thiamine instead of uracil / it is less reactive / double stranded structure with hydrogen bonding (structurally more stable) / DNA is slower to mutations than RNA / DNA can replicate and RNA cannot / complementary strands of DNA further resist changes by evolving a process of repair ***(Any two)*** = 1 + 1

[2 + 1 + 2 = 5 marks]

OR

***(a)* Differentiate between analogy and homology giving one example each of plant and animal respectively.**

(b) How are they considered as an evidence in support of evolution ?

Ans. (a) Homology - Same origin different function = ½

eg - Forelimbs of mammals (flipper of whale , forelimbs of cheetah , forelimb of man , wings of bat) / heart of vertebrates / brain of vertebrates = ½

- Thorns of Bougainvillea and tendrils of cucurbits = ½

Analogy - Different origin same function = ½

e.g. - wings of bat and wings of birds / flippers of penguin and dolphin / eye of octopus and mammals = ½

- Sweet potato root and potato tuber = ½

(b) Homology shows common ancestry / divergent evolution = 1

Analogy does not show common ancestry / shows convergent evolution = 1

[3 + 2 = 5 marks]

Question Paper Code 57/1/3

SECTION – A

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

1. State a difference between a gene and an allele.

Ans. Gene - contains information that is required to express a particular trait // unit of inheritance // segment of DNA called cistron //

sequence of DNA coding for tRNA / rRNA / polypeptide / enzyme

Allele - Genes which code for a pair of contrasting traits / (slightly) different forms of the same gene / individual gene in a particular gene pair (for same character)

[1 mark]

2. Suggest the breeding method most suitable for animals that are below average in milk productivity.

Ans. Outbreeding / Outcrossing / Cross-breeding / artificial insemination / hybridisation

[1 mark]

3. Suggest a technique to a researcher who needs to separate fragments of DNA.

Ans. (Gel) eletrophoresis

[1 mark]

4. Excessive nutrients in a fresh water body cause fish mortality. Give two reasons.

Ans. Excessive nutrients result in excessive algal growth / eutrophication / algal bloom / toxins produced by algal bloom , water quality becomes poor / BOD increases / oxygen level decreases = ½ + ½

[1 mark]

5. Give an example of a codon having dual function.

Ans. AUG

SECTION-B

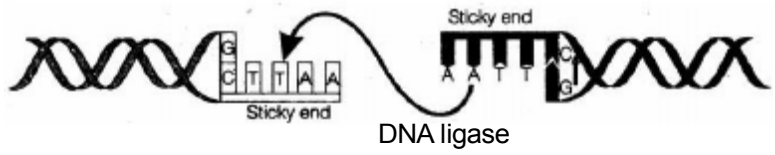
(Q. Nos. 6 - 10 are of two marks each)

6. Discuss the role the enzyme DNA ligase plays during DNA replication.

Ans. (Discontinuous) DNA fragments , are joined / sealed by them

// sticky ends of vector and foreign DNA , joined by them

The following diagram can be considered in lieu of explanation



= 1 + 1

[2 marks]

7. Distinguish between the roles of flocks and anaerobic sludge digesters in sewage treatments.

Flocs	**Anaerobic Sludge Digester**
- Breakdown organic matter aerobically	- Breakdown organic matter anaerobically
- Breakdown organic matter present in primary effluent.	- Breakdown organic matter in secondary effluent.
- They do not produce biogas.	- They produce biogas (mixture of methane ,H_2S and CO_2)

(Any two) 1 + 1

[2 marks]

8. Name the causative organism of the disease amoebiasis. List three symptoms of the disease.

Ans. - *Entamoeba histolytica* = ½

- Constipation , abdominal pain , cramps , stool with excess mucous / blood clots

(Any three) = ½ × 3

[½ + 1½ = 2 marks]

OR

Identify 'A', 'B' 'C' and 'D' in the given table.

Crop	**Variety**	**Resistance to disease**
A	Himgiri	Leaf rust
Cauliflower	Pusa Shubhra	B
Brassica	Pusa Swarnim	C
Cowpea	D	Bacterial blight

Ans. A = Wheat = ½

B = Black rot / Curl blight black rot = ½

C = White rust = ½

D = Pusa Komal = ½

[2 marks]

9. Plants that inhabit a rain-forest are not found in a wetland. Explain.

Ans. Plants that inhabit a rain forest are not adapted to survive in aquatic conditions / wetlands /

Plants are conformers / stenothermal / cannot maintain constant internal environment / temperature / osmotic concentration of the body fluids affects kinetics of enzymes through basal metabolism /

activity and other physiological functions of the organisms

(Any <u>one</u>) = 2

[2 marks]

10. Angiosperms bearing unisexual flowers are said to be either monoecious or dioecious. Explain with the help of one example each.

Ans. <u>Monoecious Angiosperms</u>

Plants bear both male and female unisexual flowers on the same plant = ½

e.g. Cucurbits /coconut / maize ***(any one) = ½***

<u>Dioecious Angisperms</u> - plants bear either male or female unisexual flowers on different plants = ½

e.g Papaya /date palms ***(any one)*** = ½

[½ × 4 = 2 marks]

SECTION-C

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

11. What is a GMO ? List any five possible advantages of a GMO to a farmer.

Ans. - Plants / bacteria / fungi / animals whose genes have been altered by manipulation = ½

- Tolerance to abiotic stresses / like cold / drought / salt / heat ,

reduced reliance on chemical pesticides / pest resistant crops ,

reduce post harvest losses ,

increased efficiency of mineral usage by plants ,

enhanced nutritional value ,

to create tailor made plant

(Any five) = ½ × 5

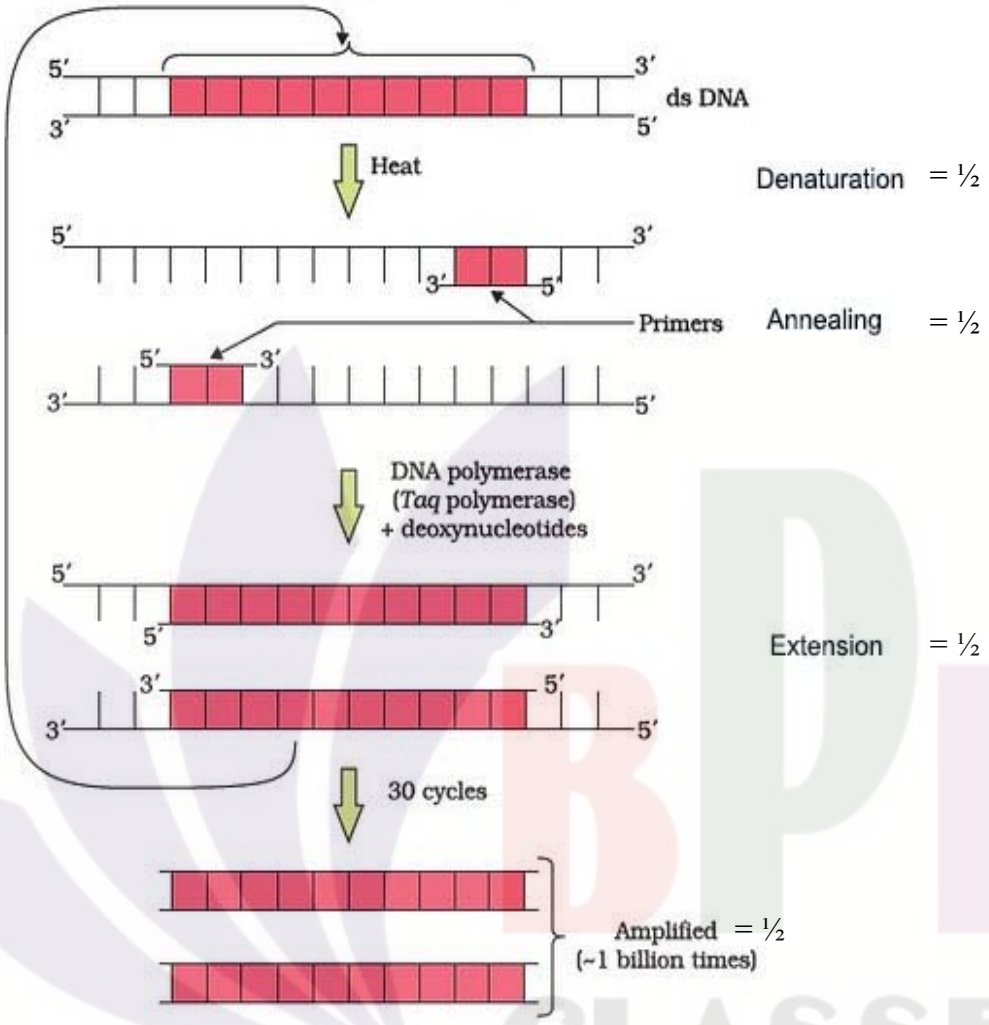
[3 marks]

12. Suggest and describe a technique to obtain multiple copies of a gene of interest in vitro.

Ans. PCR / polymerase chain reaction = 1

Separation / denaturation of two strands of two dsDNA , using two sets of primers / small chemically synthesised oligonucleotides complementary to regions of DNA and (thormostable) DNA polymerase / Taq polymerase , extension of the primers , by enzyme using nucleotides replicates the DNA and if the process of replication is repeated many times multiple copies of DNA are produced = ½ × 4

The following diagram can be considered in lieu of the explanation



[1 + 2 = 3 marks]

13. (a) Name any two fowls other than chicken reared in a poultry farm

(b) Enlist four important components of poultry farm management.

Ans. a) Ducks/ turkey / geese ***(any two)*** = ½ + ½

(b) Selection of disease free and suitable breeds ,

- proper and safe farm conditions
- proper food and water
- hygiene and health care (½ x 4)

14. Why is breast-feeding recommended during the initial period of an infant's growth ? Give reasons.

Ans. Colostrum , rich in nutrients , rich in antibodies / rich in IgA / provide passive immunity / provides immunity to new born / helps to develop resistance in new born / readily available for new born /

hygenic / develops a bond between mother and child.

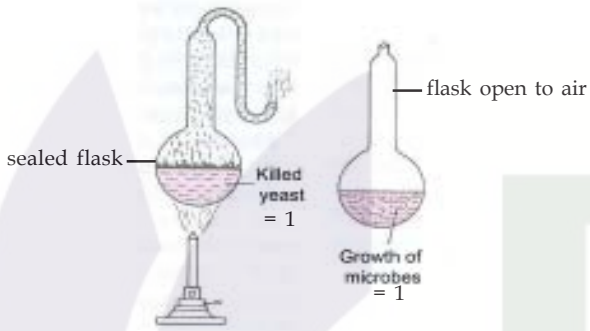
(Any three)

[3 marks]

15. Describe the experiment that helped Louis Pasteur to dismiss the theory of spontaneous generation of life.

Ans. Two pre sterilised flasks with killed yeast , one sealed , other open to air , differential growth of life in two flasks / life was found only in open flask. = ½ × 4

// **the following diagram can be considered in lieu of above explanation**



life comes from pre-existing life (it came from air entering the flask) / proved the theory of biogenesis = 1

[2 + 1 = 3 marks]

16. Prior to a sports event blood & urine samples of sportspersons are collected for drug tests.

(a) Why is there a need to conduct such tests ?

(b) Name the drugs the authorities usually look for.

(c) Write the generic names of two plants from which these drugs are obtained.

Ans. (a) To detect drug abuse / use of banned drugs / use of cannabinoids / anabolic steroids / narcotic analgesic / diuretics / hormones / drugs used to accelerate performance / increase muscle strength / bulk / promote aggressiveness / to ensure fair game

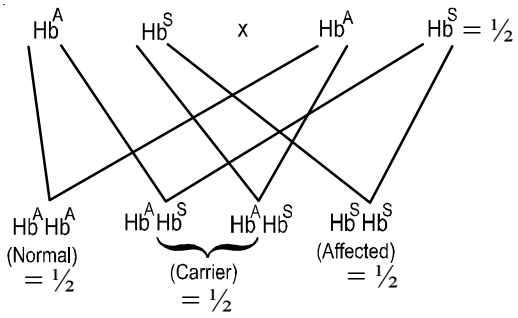
(b) Cannabinoids / cocaine / coca alkaloid / coke / crack / hashish / charas / ganja / hemp plant extract

(c) *Cannabis / Atropa / Erythroxylum / Datura* ***(Any two)***

[1 × 3 = 3 marks]

17. Give an example of an autosomal recessive trait in humans. Explain its pattern of inheritance with the help of a cross.

Ans. Sickle cell anaemia / Phenylketonuria / Thalassemia / O Blood group / Non - rolling of tongue / Fused or attached ear lobes / Inability to taste PTC (phenyl thiocarbamide) =1



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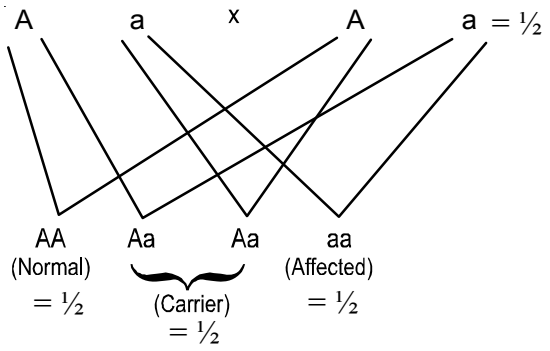


* **Similar cross can be considered for any other trait mentioned above**

[1 + 2 = 3 marks]

18. Explain with the help of suitable examples the three different ways by which organisms overcome their stressful conditions lasting for short duration.

Ans. Migration- The organisms (animals) can move away temporarily from stressful habitat to a more hospitable area and return when stressful period is over = ½

e.g – humans moving from Delhi to Shimla during summer / many animals or birds undertake long distance migration to hospitable area any one e.g = ½

- spore formation – various kind of thick walled spores are formed which germinate on availability of suitable enviornment. = ½

e.g – bacteria / fungi / lower plants ***(Any one)*** = ½

//

Dormancy – seeds or vegetative reproductive structures help to tide over stress by reducing their metabolic activity. =½

e.g seeds or vegetative reproductive structures of higher plants = ½

//

Hibernation – It takes place during winter = ½

e.g bears or any other correct relevant example = ½

//

Aestivation – It takes place during summer to avoid heat and dessication (in animals) = ½

e.g snails / fish or any other correct relevant example = ½

Diapause :- under unfavourable conditions zooplanktons enter a stage of suspended metabolic activity = ½

e.g zooplankton = ½

(***any two*** after migration = 1+1)

19. How has RNAi technique helped to prevent the infestation of roots in tobacco plants by a nematode *Meloidegyne incognitia* ?

Ans. Using *Agrobacterium* vectors , nematode specific genes introduced into host plant , produced sense - antisense RNA in host cells , ds RNA - initiated RNAi , silenced specific mRNA of nematode , parasite could not survive in transgenic host = ½ × 6

[3 marks]

20. Given beiow is a list of six micro-organisms. State their usefulness to humans.

(a) Nucleopolyhedrovirus

(b) Saccharomyces cerevisiae

(c) Monascus purpureus

(d) Trichoderma polysporum

(e) Penicillium notatum

(f) Propionibacterium sharmanii

Ans. (a) As bio control agents / species specific / narrow spectrum insecticidal application / no negative impacts on plants / mammals / birds / fish / non target insects / Integrated Pest Management

(b) Used in bread making / brewing industry / ethanol / CO_2 production

(c) Cholesterol lowering agent / competitively inhibiting the enzyme responsible for synthesis of cholesterol

(d) Produces Cyclosporin - A / immuno suppressive agent

(e) Produces antibiotic penicillin

(f) Produces large holes in Swiss cheese / produces large amount of CO_2 in swiss cheese

[½ × 6 = 3 marks]

21. "In a food-chain, a trophic level represents a functional level, not a species." Explain.

Ans. Position of a species in any trophic level is determined by the function performed by that mode of nutrition of species in a particular food chain / A given species may occupy more than one trophic level in the same ecosystem (in different food chains) at the given time , If the function of the mode of nutrition of species changes its position shall change in the trophic levels , same species can be at primary consumer level in one food chain and at secondary consumber level in another food chain in the same ecosystem at the given time = 1 × 3

Similar value points explained with the help of a suitable example = 3

[3 marks]

OR

(a) Name any two places where it is essential to install electrostatic precipitators. Why it is required to do so ?

(b) Mention one limitation of the electrostatic precipitator.

Ans. (a) Thermal power plants / smelters / other particulate matter releasing industries = ½ + ½

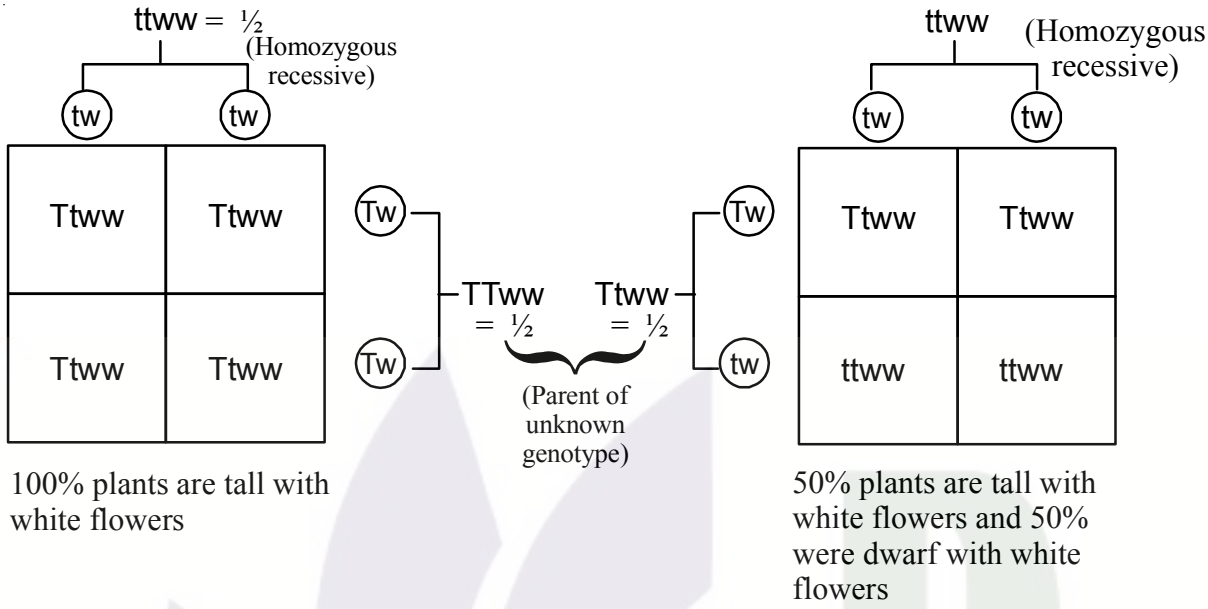
(Any two)

To remove particulate matter = 1

(b) Very very small particulate matter / less than 2.5 micrometres are not removed / velocity of air between plates must be low enough to allow the dust to fall / cannot work without electricity = 1

[2 + 1 = 3 marks]

22. How would you find genotype of a tall pea plant bearing white flowers ? Explain with the help of a cross. Name the type of cross you would use.



Test cross = ½

Both crosses = ½

Both interpretations = ½

[3 marks]

SECTION - D

(Q. Nos. 23 is of four mark)

23. Reproductive and Child Healthcare (RCH) programmes are currently in operation. One of the major tasks of these programmes is to create awareness amongst people about the wide range of reproduction related aspects. As this is important and essential for building a reproductively healthy society.

(a) "Providing sex education in schools is one of the ways to meet this goal." Give four points in support of your opinion regarding this statement.

(b) List any two 'indicators' that indicate a reproductively healthy society.

Ans. (a)
- Provide right information to the young so as to discourage children from believing in myths and misconception about sex related aspects.
- Proper information about reproductive organs
- Proper information about adolescence and related changes
- Safe hygienic practices
- STDs / AIDS
- Available birth control options
- Care of pregnant mothers

- Post natal care
- Importance of breast feeding
- Equal opportunities for male and female child
- awareness of problems due uncontrolled population growth
- Sex abuse
- Sex related crimes

(Any four) = ½ × 4

(b) Better awareness about sex related matters / increase number of assisted deliveries / better post natal care / decrease in IMR (Infant Mortality Rate) / decrease MMR (Maternal Mortality Rate) / increase number of couples with small families / better detection and cure of STDs / overall increased medical facilities for sex related problems / total well being in all aspects of reproduction / physical - behavioural - social / physically and functionally normal reproductive organs / normal emotional and behavioural interaction among all sex related aspects.

(Any two) = 1 + 1

[2 + 2 = 4 marks]

SECTION - E

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

24. Answer the following questions based on Hershey and Chases's experiments :

(a) Name the kind of virus they worked with and why ?

(b) Why did they use two types of culture media to grow viruses in ? Explain.

(c) What was the need for using a blender and later a centrifuge during their experiments?

(d) State the conclusion drawn by them after the experiments.

Ans. (a) Bacteriophage , they infect bacteria = ½ + ½

(b) Two types of culture media were used in order to make protein of viruses (with the help of ^{35}S) radioactive in one case , and DNA molecule in virus (with the help of ^{32}P radioactive in other case , = ½ × 2

so as to identify which one of the two had entered into the bacteria during viral infection = 1

(c) Blender - to separate the viral protein coats that are still attached to the surface of bacteria = ½

Centrifuge - to separate lighter supernatant (containing viral protein coats) from denser residue (containing bacteria) = ½

(d) DNA is the genetic material i.e passed from virus to bacteria = 1

OR

(a) How did Darwin explain adaptive radiation ? Give another example exhibiting adaptive radiation.

(b) Name the scientist who influenced Darwin and how ?

Ans. (a) Darwin observed that from original seed eating features in finches altered beaks arose enabling them to become insectivorous and vegetarian finches = 1

Adaptive radiation - the process of evolution of different species in a given geographical area starting from a point and literally radiating to another areas of geography (habitats) = 1

Another example is Australian marsupials / placental mammals in Australia = 1

(b) Thomas Malthus = 1

Population size grows exponentially (due to maximum reproduction) , however population size remains limited due to limited natural resources / leading to competition = ½ + ½

[3 + 2 = 5 marks]

25. (a) Why should we conserve biodiversity ? How can we do it ?

(b) Explain the importance of biodiversity hot-spots and sacred groves.

Ans. (a) (i)
- Narrowly utilitarian - related examples like derive economic benefits from nature food (cereals, pulses, fruits) / firewood / fibre / construction materials / industrial products (tannins, lubricants, dice, resins, perfumes) / product of medicinal importance / drugs = ½
- Broadly utilitarian - 20% of total O_2 from Amazon forests / pollination / aesthetic pleasures = ½
- Ethical - millions of species (plants, animals, microbes) share this planet / we need to realise that every species has an intrinsic value (even if it may not current or any economic value to us) / we have a moral duty to care for their wellbeing and pass on our biological legacy to future generations = ½

(ii)
- In situ conservation / biosphere reserves / national parks / sanctuaries / sacred groves = ½ //
- Ex situ conservation / zoological parks / botanical gardens / wild life safari parks / cryopreservation / seed banks / tissue culture (eggs in vitro) = ½

(b) Hot spots - regions with high level of species richness , high degree of endemism = 1 + 1

Sacred groves - tracts of forest containing tree / wild life were venerated ,and given total protection // to protect last refuses for a large number of rare , and threatened plants = ½ + ½

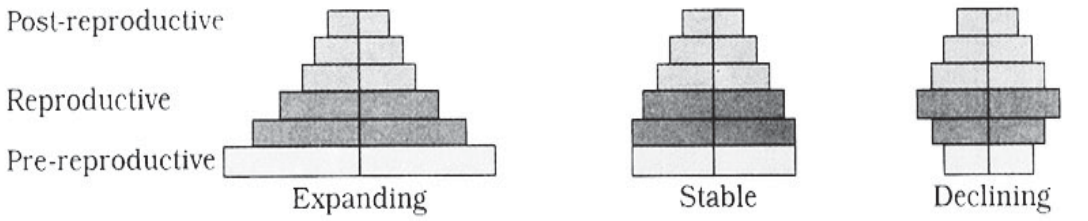
[2 + 3 = 5 marks]

OR

(a) Represent diagrammatically three kinds of age-pyramids for human populations.

(b) How does an age pyramid for human population at given point of time helps the policy-makers in planning for future.

Ans. (a)



= 1 = 1 = 1

Ans. (b) Planning of health / education / transport / infra-structure / finance / food / employment can depend on the age-pyramid analysis of a population / any other relevant point. (Any two explanation) = 1 + 1

[3 + 2 = 5 marks]

26. (a) Explain the post-pollination events leading to seed production in angiosperms.

(b) List the different types of pollination depending upon the source of pollen grain.

Ans. (a) Pollen pistil interaction , germination of pollen tube that carries two male gametes , double fertilization / syngamy and triple fusion , development of endosperm , development of embryo , maturation of ovule into seed.= ½ × 6

(b) Autogamy / self pollination / Geitonogamy = 1

Xenogamy / cross pollination = 1

[3 + 2 = 5 marks]

OR

(a) Briefly explain the events of fertilization and implantation in an adult human female.

(b) Comment on the role of placenta as an endocrine gland.

(a) **Fertilization**

- Sperm comes in contact and enters the secondary oocyte
- activates / induces secondary oocyte to complete meiosis II leads to formation of ovum / ootid
- the haploid nucleus of sperm and that of ovum fused to form a diploid zygote completing the process of fertilization = ½ × 3

Implantation

- Trophoblast layer of blastocyst attaches to the endometrium (of the uterus)
- The uterine cells divide rapidly and cover the blastocyst ,
- The blastocyst becomes embedded in the endometrium and the implantation is completed = ½ × 3

(b)
- hCG (human chorionic gonadotropin)
- hPL (human placental lactogen)
- estrogen
- progestogens = ½ × 4

[3 + 2 = 5 marks]