Confidential
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21.07.2017

Senior School Certificate Examination

April 2017

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

SECTION – A

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

1. Name the condition in vertebrates where the body attacks self-cells.

Ans Auto immune disorder / auto-immune disease. [1 Mark]

2. Write the function of a Bioreactor.

Ans Bioreactors are required to produce large volumes (100 - 1000 litres) of recombinant proteins/ desired protein / enzymes

[1 Mark]

3. A colour blind boy is born to a couple with a normal colour vision. Write the genotype of the parents.

Ans Father - XY , Mother -XX^C = ½ + ½

[1 Mark]

4. Mention any two conditions that enhance the chances of syngamy in organisms exhibiting external fertilization.

Ans Organisms exhibiting external fertilisation show great synchrony between the sexes , release a large number of gametes into the surrounding medium = ½ + ½

[1 Mark]

5. Write the conclusion Griffith arrived at the end of his experiment with <u>Streptococcus pneumoniae</u>.

Ans He concluded that the R-strain bacteria had somehow been transformed by heat- killed S-strain bacteria, this must be due to transfer of genetic material = ½ + ½

[1 Mark]

SECTION - B

Q Nos. 6-10 are of two marks each

6. Plants like potato, sugarcane do not require seeds for producing new plants. How do they produce new plants ? Give two other examples where new plants are produced in the same way.

Ans New plants arise from nodes present in the modified stems of these plants / through vegetative propagation = **½** when the nodes come in contact with damp soil or water they produce roots and new plants = **½ ,** e.g Banana / Ginger /Dahlia / *Bryophyllum*/any other correct example (Any two) = ½ + ½

[2 Marks]

7. Explain the role played by predators in a community.

Ans
- Predators act as conduits for energy transfer across trophic levels.
- They keep prey population under control.
- They help in maintaining species diversity in a community by reducing intensity of competition among competing prey species.
- An efficient predator may cause extinction of prey species (Any two) = 1 + 1

[2 Marks]

8. Name the first antibiotic discovered and by whom.

Ans Penicillin , Alexander Flemming = 1 +1 [2 Marks]

9. What happens when chromatids fail to segregate during cell division cycle ? Explain your

answer with an example.

Ans Failure of segregation of chromatids during cell division cycle results in the gain or loss of chromosome/ called aneuploidy = 1

E.g Down' syndrome results in the gain of extra copy of chromosome 21 /

Turner's syndrome results due to loss of an X-chromosome in human female = 1

OR

ABO blood groups is a good example of co-dominance. Justify.

Ans -ABO blood group in humans is contributed by gene 'I' that has 3 alleles 'I^A' 'I^B' and 'i.'

- Because human beings are diploid each person has two of the three alleles.

- I^A and I^B produce two different types of sugar while allele i does not produce sugar on the plasma membrane of RBC

- When I^A and I^B are present they both express their own type of sugar- this is codominance

= ½ × 4 [2 Marks]

10. What is the pathogenic property of baculovirus, used as a biological agents ? Name the genus of these organisms.

Ans Attacks insect, and other arthropods = ½ × 2

Nucleopolyhedrovirus = 1 [2 Marks]

SECTION - C

Q Nos. 11-22 are of three marks each

11. (a) What is an "allergic reaction" ?

(b) Name any two drugs used to quickly reduce the symptoms of allergy.

(c) Why do more and more children in metro cities of India suffer from allergies and asthma ?

Ans a) The exaggerated response of the immune system to certain antigens present in the enviornment (is called allergic reaction) =1

b) anti-histamine / adrenalin / steroids (Any two) = ½ + ½

c) due to deteriorating air quality / sensitivity to the environment /allergens / lowering of immunity due to modern day life style (which could be due to the protected environment provided largely in life) = ½ + ½

[3 Marks]

12. Identify a, b, c, d, e and f in the following table :

Name of Enzyme/ Bioactive Molecule	Source	Function
(i) a	Streptococcus	b
(ii) c	d	Immuno-suppressive agent in organ transplant patients
(iii) Statins	e	f

Ans i) a) Streptokinase b) 'Clot buster' for removing clots from the blood vessels (of patients who have undergone myocardial infaction leading to heart attack) /clot buster enzyme

ii) c) Cyclosporin A d) *Trichoderma polysporum*

iii) e) *Monascus purpureus* (yeast)

f) Blood cholesterol lowering agent.

[3 Marks]

13. list any two types of IUDs that are available for human females and state their mode of action.

Ans i) Non medicated IUDs =1 , increase phagocytosis of sperms within the uterus = ½

ii) Copper releasing IUDs = 1 , Cu ions suppress sperm motility and fertilising capacity of sperms=½

iii) Hormone releasing IUDs = 1 , make uterus unsuitable for implantation / makes cervix hostile to sperms = ½

(Any two) (1½ +1 ½) [3 Marks]

14. Mention the role of (i) selectable marker, (ii) Ori and (iii) rop in *E. coli* cloning vector pBR322.

Ans i) Selectable marker - helps in identifying and eliminating non transformants and selectively permitting the growth of the transformants = 1

ii) Ori - helps to start replication and any piece of DNA when linked to this sequence can be made to replicate within host cell, responsible for controlling the copy number of the linked DNA = ½ + ½

iii) -codes for the proteins involved in the replication of the plasmid = 1 [3 Marks]

15. Write the aim with which animal breeding programmes are carried. Describe the essential steps to be followed in Poultry management.

Ans Aims - increasing the yield of animals , improving the desirable qualities of the produce = ½ + ½

Steps to be followed in Poultry Management

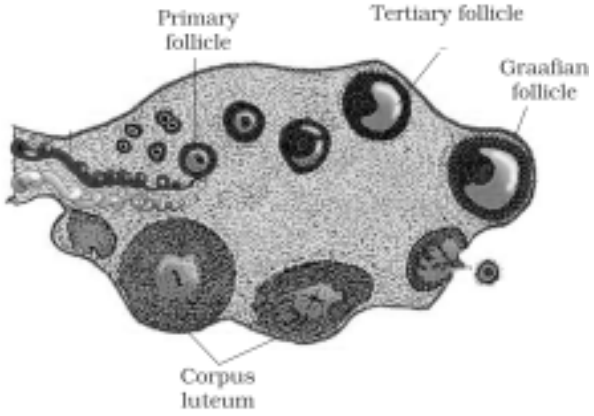
- Selection of disease free and suitable breeds
- Proper and safe farm conditions
- Proper feed and water
- Proper hygiene and health care = ½ × 4

[3 Marks]

16. (a) Draw a diagram of a sectional view of human ovary and label (i) Primary follicle; (ii) Tertiary follicle; (iii) Graafian follicle and (iv) Corpus luteum.

(b) Write the function of corpus luteum.

Ans



= ½ × 4

[3 Marks]

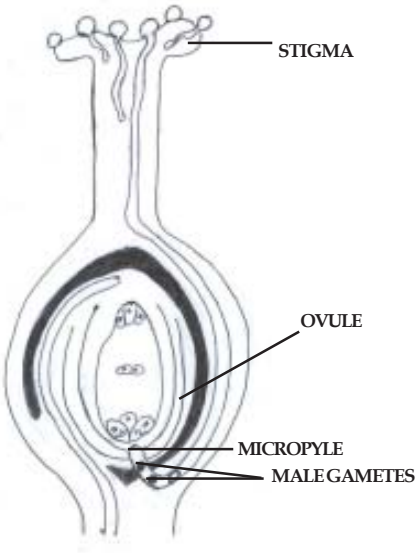
b) Secretes (large amounts of) progesterone , which is essential for maintenance of endometrium = ½ × 2

OR

(a) Draw a diagram of Pistil showing pollen tube growth in angiosperm and label (i) Stigma; (ii) male gametes; (iii) micropyle and (iv) Ovule.

(b) Write the function of micropyle.

Ans (a)



=½× 4

(b) the pollen tube enters the ovule through micropyle , it facilitates the entry of oxygen and water for seed germination. = ½ + ½

[3 Marks]

17. What was the challenge for production of insulin using rDNA techniques ? How did Eli Lilly produce insulin using rDNA technology ?

Ans The challenge for production of insulin using r DNA technique was getting insulin assembled into a mature form = 1

- Prepared two DNA sequence corresponding to A and B chains of human insulin.
- introduced them in plasmids of *E.coli* to produce insulin chains.
- chains A and B were produced separately.
- extracted and combined by creating disulfide bonds to form human insulin = ½ × 4

[3 Marks]

18. Identify A, B, C, D, E and F in the following table

S.No.	Component-I	Component-II	Chemical linkage bonding the two components	Product
i.	A	B	C	Nucleoside
ii.	Nucleoside	D	E	Nucleotide
iii.	Nucleotide	Nucleotide	F	Dinucleotide

Ans i) A - Nitrogenous base / A - Pentose sugar .
B - Pentose Sugar / B- Nitrogenous base
C - N glycosidic linkage.

ii) D - phosphate group.
E - phospho ester linkage

iii) F- (3 -'5') phosphodiester linkage.

[3 Marks]

19. Name the organism from which the 'cry' genes are isolated. Mention with the help of suitable example why and how bio-technologists have made use of 'cry' genes.

Ans *Bacillus thuringiensis* = 1

- Source of insecticidal (crystal) protein that control the cotton bollworms / corn borer = 1

- Specific Bt toxin genes were isolated from *Bacillus thuringiensis* , incorporated into several crop plants such as cotton = ½ × 2

[3 Marks]

20. Excessive and continuous use of pesticides has resulted in evolution of some new species of pests. Explain what must have led to this. What is this type of evolution called ?

Ans Excessive use of pesticides has resulted in selection of resistant varieties in a much lesser time scale, as evolution is a stochastic process based on chance events in nature and chance mutation in organism = 1 +1

Evolution by anthropogenic action = 1

[3 Marks]

21. Explain with the help of two examples how certain plants have evolved morphological and chemical defenses against primary consumers such as cows and goats.

Ans - Thorns of *Acacia* / Cactus are morphological means of defence against cows & goats = 1

- Plants produce & store chemicals that make herbivore sick when they are eaten inhibit feeding or digestion and disrupt its reproduction or even kill it = 1

- *Calotropis* produces highly poisonous cardiac glycosides so cows and goats can never browse on these plants / Chemical substances like nicotine / caffeine / defences / strychnine / opium are actually defences against grazers & browsers = 1

[3 Marks]

22. What type of organs eye of an Octopus and that of a human called ? Give another example from the animal group and one from the plants of such organs. Name and explain the evolutionary process they exhibit.

Ans Analogous = 1

- Flippers of Penguins & Dolphins / Eye of octopus and mammals = ½ (any other appropriate & correct example)

- Sweet potato (root modification) and potato (stem modification) = ½

They are anatomically dissimilar structure though they perform similar function , convergent evolution = ½ + ½

[3 Marks]

SECTION - D

Q No. 23 is of four mark

23. With the revolution in information technology, now it has become an integral part of everybody's life, living in rural and urban India. You are asked to address the gathering of students of eco-clubs of your neighbourhood schools on generation and management of e-waste.

(a) Write how e-waste is generated.

(b) Explain how would you address the awareness issue of e-waste management amongst the students.

(c) How have the developed countries exploited the developing countries with respect to e-waste managements ?

Ans (a) irreparable computers / any other electronic good = 1

(b) Recycling is the only possible solution of e-waste management keeping in mind the safety measures to be adopted by the worker involved in the cycling of e- wastes , so as to avoid their exposure to the toxic substance present in the e- wastes = 1 + 1

(c) By exporting their e-waste to the developing countries / China / India / Pakistan = 1

[4 Marks]

SECTION - E

Q Nos. 24-26 are of five marks each

24. (a) Explain the steps involved in *in vitro* fertilisation popularly known as test tube baby programme.

(b) State the importance of this programme.

Ans (a) i) Ova from wife / donor and sperms from husband / donor are collected

ii) They are induced to form zygote under simulated conditions (in the labortory)

iii) The zygote or early embryos upto 8 blastomeres could then be transferred to fallopian tube /ZIFT

iv) Embryos more than 8 blastomeres, into the uterus / IUT/ Intra uterin transfer = 1× 4

(b) Allows couples to bear children who were unable to do so naturally = 1

[4+1=5]

OR

(a) State one difference and one similarity between geitonogamy and xenogamy.

(b) Explain any three devices developed in flowering plants to discourage self pollination and encourage cross pollination.

Ans (a) Difference- In geitonogamy pollen grains from one flower are transferred to the stigma of another flower on the same plant whereas in xenogamy the pollen grains are transferred to the stigma of a flower on another plant(of the same species) genetically similar , genetically different

Similarity -In both types of pollination pollen grains from the anther are transferred to the stigma of another flower of the same species =1

(b) - Pollen release & stigma receptivity not synchronised / hence the maturity of stigma and pollen are different /Protandry / Protogyny

- Anther and Stigma are placed at different positions so that pollen cannot come in contact with stigma of the same flower.

- Self incompatibility/ Self sterility.

- Production of unisexual flowers (Any three) = 1 × 3

[5Marks]

25. (a) Hershey and Chase carried their experiment in three steps : infection, blending, centrifugation. Explain each step.

(b) Write the conclusion and interpretation of the result they obtained.

(a) • Infection - Radioactive phosphorus / phosphorus labelled bacteriophages were allowed to infect *E.coli* - growing in a culture medium,simultaneously radioactive sulphur / sulphur labelled bacteriophage was allowed to infect *E.coli* growing in another culture medium = 1+1

• Blending- As infection proceeds- the viral coats are removed from the bacteria by agitating in a blender =½

- Centrifugation - virus particles were seperated from bacteria by spinning them in a centrifuge = ½

(b) Conclusion - DNA is the genetic material = 1

Interpretation - sulphur labelled viral protein did not enter the bacteria during infection , whereas phosphorus labelled viral DNA entered into the bacteria to cause infection = ½ + ½

OR

Taking an example of white-winged moths and dark-winged moths of England in pre and post industrialised era, explain evolution by natural selection.

Ans The number of light winged moths was more during the pre industrialised period in England than dark winged moth where as it reversed in the post industrialised period = 1

In Pre industrialised period the tree trunks were covered with white coloured thick growth of lichens = 1

hence the light coloured moth were not spotted by the predator and their number increased , where as the dark coloured moths were captured and their numbers decreased = 1

During post industrialisation period the tree trunks became dark due to industries smoke and hence the dark coloured moths were not captured by the predators and their number increased where as the light coloured moths were captured and their number decreased = 1

In a mixed population those moths that are better adapted camouflaged to the changed environment survive and increase in population size = 1 [5Marks]

26. (a) Write the percentage of land area that was covered by forests by the end of the last century.

(b) Describe any two practices that led to deforestation.

(c) State the consequences of deforestation.

(d) Suggest a method to overcome deforestation.

Ans (a) 19.4% = ½

(b) -Trees are axed for timber / firewood / land for industrial requirement
-Slash and burn agriculture
- habitat loss and fragmentation- clearing of forest land into grass land for raising cattle
(Any two) = 1+1

(c) -Deterioration of our environment in terms of air - water and soil quality.
-causes loss of bio diversity
- disturbance in hydrological cycle / biogeochemical cycle
(Any two) = 1 + 1

(d) Reforestation or any other appropriate alternative = ½

[5Marks]

OR

(a) Comment on the pattern in which all communities undergo a change in composition and structure with changing environmental conditions.

(b) Explain 'Climax community' and 'sere'.

(c) Differentiate between primary and secondary succession with examples.

Ans (a) Orderly and sequential changes parallel with changes in physical environment =1

(b) climax community-changes finally lead to a community that is in equilibrium with environment =1
Sere-the entire sequence of communities that successively change in a given area =1

(c)	**Primary succesion**	**Secondary sucession**	
(i)	occurs in newly cooled lava / bare rock / newly created pond.	occurs in abandoned / destroyed forest	
(ii)	Slow process	Fast Process	½ ×4= 2

[5Marks]

Question Paper Code 57/2

SECTION – A

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

1. What is Gene therapy ?

Ans Correction of genetic defect / involves delivery of a normal gene to take over the function of non-functional gene = 1

[1 Mark]

2. Name the category of disease in which 'Rheumatoid arthritis' in human is put under.

Ans Auto-immune disease = 1

[1 Mark]

3. Write the conclusion Griffith arrived at the end of his experiment with <u>Streptococcus pneumonia</u>.

Ans He concluded that the R-strain bacteria had somehow been transformed by heat- killed S-strain bacteria, this must be due to transfer of genetic material = ½ + ½

[1 Mark]

4. State where do the signals for parturition orginate from in humans.

Ans Fully developed foetus and the placenta = 1 [1 Mark]

5. A colour blind boy is born to a couple with a normal colour vision. Write the genotype of the parents.

Ans Ans Father - XY , Mother -XX^C = ½ + ½

[1 Mark]

SECTION - B

Q Nos. 6-10 are of two marks each

6. Name the first antibiotic discovered and by whom.

Ans Penicillin , Alexander Flemming = 1 +1 [2 Marks]

7. Mycorrhizal association exists between fungi (<u>Glomus</u> sp) and roots of higher plants. How is this association beneficial to each member ?

Ans The Glomus helps the plant in absorption of essential nutrients / phosphorus from the soil , and the plant in turn provide the fungus with energy yielding carbohydrate = 1 + 1

[2 Marks]

8. Explain the role played by predators in a community.

Ans
- Predators act as conduits for energy transfer across trophic levels.
- They keep prey population under control.
- They help in maintaining species diversity in a community by reducing intensity of competition among competing prey species.
- An efficient predator may cause extinction of prey species (Any two) = 1 + 1

[2 Marks]

9. What happens when chromatids fail to segregate during cell division cycle ? Explain your answer with an example.

Ans Failure of segregation of chromatids during cell division cycle results in the gain or loss of chromosome/ called aneuploidy = 1

E.g Down' syndrome results in the gain of extra copy of chromosome 21 /

Turner's syndrome results due to loss of an X-chromosome in human female = 1

OR

ABO blood groups is a good example of co-dominance. Justify.

Ans -ABO blood group in humans is contributed by gene 'I' that has 3 alleles 'I^{A}' 'I^{B}' and 'i.'

- Because human beings are diploid each person has two of the three alleles.

- I^{A} and I^{B} produce two different types of sugar while allele i does not produce sugar on the plasma membrane of RBC

- When I^{A} and I^{B} are present they both express their own type of sugar- this is codominance

= ½ × 4 [2 Marks]

10. What is parthenogenisis ? Give two examples .

Ans A new organism develops from an unfertilised egg / without fertilization of an egg = 1

e.g Drones /turkey / Rotifers / some lizards (whiptail) (Any two) = ½ + ½

[2 Marks]

SECTION - C

Q Nos. 11-22 are of three marks each

11. Explain with the help of two examples how certain plants have evolved morphological and chemical defenses against primary consumers such as cows and goats.

Ans - Thorns of *Acacia* / Cactus are morphological means of defence against cows & goats = 1

- Plants produce & store chemicals that make herbivore sick when they are eaten inhibit feeding or digestion and disrupt its reproduction or even kill it = 1

- *Calotropis* produces highly poisonous cardiac glycosides so cows and goats can never browse on these plants / Chemical substances like nicotine / caffeine / defences / strychnine / opium are actually defences against grazers & browsers = 1

[3 Marks]

12. Excessive and continuous use of pesticides has resulted in evolution of some new species of pests. Explain what must have led to this. What is this type of evolution called?

Ans Excessive use of pesticides has resulted in selection of resistant varieties in a much lesser time scale, as evolution is a stochastic process based on chance events in nature and chance mutation in organism = 1 +1

Evolution by anthropogenic action = 1

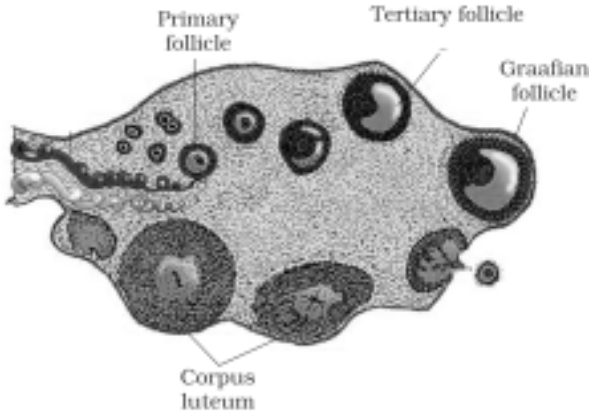
[3 Marks]

13. (a) Draw a diagram of a sectional view of human ovary and label (i) Primary follicle;

(ii) Tertiary follicle; (iii) Graafian follicle and (iv) Corpus luteum.

Write the function of corpus luteum.

Ans



= ½ × 4

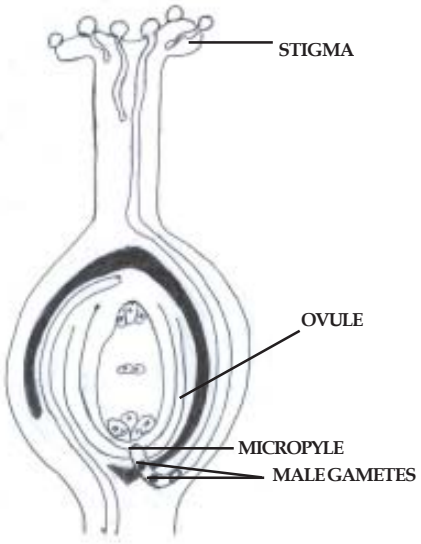
b) Secretes (large amounts of) progesterone , which is essential for maintenance of endometrium = ½ × 2

OR

(a) Draw a diagram of Pistil showing pollen tube growth in angiosperm and label (i) Stigma; (ii) male gametes; (iii) micropyle and (iv) Ovule.

(b) Write the function of micropyle.

Ans (a)



=½× 4

(b) the pollen tube enters the ovule through micropyle , it facilitates the entry of oxygen and water for seed germination. = ½ + ½

[3 Marks]

14. β-galactosidase enzyme site, is a preferred selectable marker in comparison to antibiotic resistant selectable marker in biotechnology experiments. Justify.

Ans When a gene of interest is inserted within the coding sequence of β-galactosidase enzyme (select-

able marker),if the receipient cell fails to develop blue colour in presence of a chromogenic substrate, it is an indicative of successful recombinant formation and presence of blue colour show no recombinants formed , whereas when an antibiotic resistant selectable markers are used it requires simultaneous plating of two different plates having different antibiotics, to differentiate between transformants from non - transformants and then select the transformants to identify the recombinants from them , which is a very time consuming and cumbersome process in comparision to the first one = ½ × 6

15. Identify a, b, c, d, e and f in the following table :

Name of Enzyme/ Bioactive Molecule	Source	Functions
(i) a	**Streptococcus**	**b**
(ii) c	**d**	**Immuno-suppressive agent in organ transplant patients**
(iii) Statins	**e**	**f**

Ans i) a) Streptokinase b) 'Clot buster' for removing clots from the blood vessels (of patients who have undergone myocardial infaction leading to heart attack) /clot buster enzyme

ii) c) Cyclosporin A d) *Trichoderma polysporum*

iii) e) *Monascus purpureus* (yeast)

f) Blood cholesterol lowering agent.

[3 Marks]

16. Explain the following salient features of a DNA molecule :

(a) Complimentarity of the base pairs of its two chains.

(b) Anti-parallel polarity of the two chains.

Ans (a) Complimentarity- Adenine (A) , Guanine (G) , Thymine (T) and Cytosine (C) are the four bases in a DNA molecule; 'A' always pairs with 'T' with the help of two hydrogen bonds; 'G' always pairs with 'C' with the help of three hydrogen bonds = ½ × 3

(b) It means if one chain has polarity 5' → 3' the other has 3' → 5' ,a polymer thus formed has at one end a free phosphate moiety at 5 ' of deoxyribose sugar (5' end of the polynucleo tide chain), at the other end of the polymer the deoxyribose sugar has a free 3 ' OH (3' end of polynucleotide chain) = ½ × 3

17. Name the organism from which the 'cry' genes are isolated. Mention with the help of suitable example why and how bio-technologists have made use of 'cry' genes.

Ans *Bacillus thuringiensis* = 1

- Source of insecticidal (crystal) protein that control the cotton bollworms / corn borer = 1

- Specific Bt toxin genes were isolated from *Bacillus thuringiensis* , incorporated into several crop plants such as cotton = ½ × 2

[3 Marks]

18. The Indian Agricultural Research Institute has introduced several cereal and vegetable crops that are nutritionally rich in vitamins and minerals. What is this kind of breeding called? Write the main objectives with which such breeding programme is carried.

Ans Biofortification = 1

Objectives : Improving -

i) Protein content and quality
ii) Oil content and quality
iii) Micronutrient and mineral content
iv) Vitamin content = ½ × 4

19. What was the challenge for production of insulin using rDNA techniques ? How did Eli Lilly produce insulin using rDNA technology ?

Ans The challenge for production of insulin using r DNA technique was getting insulin assembled into a mature form = 1

- Prepared two DNA sequence corresponding to A and B chains of human insulin.
- introduced them in plasmids of *E.coli* to produce insulin chains.
- chains A and B were produced separately.
- extracted and combined by creating disulfide bonds to form human insulin = ½ × 4

[3 Marks]

20. Write the aim with which animal breeding programmes are carried. Describe the essential steps to be followed in Poultry management.

Ans Aims - increasing the yield of animals , improving the desirable qualities of the produce = ½ + ½

Steps to be followed in Poultry Management

- Selection of disease free and suitable breeds
- Proper and safe farm conditions
- Proper feed and water
- Proper hygiene and health care = ½ × 4

[3 Marks]

21 What type of organs eye of an Octopus and that of a human called ? Give another example from the animal group and one from the plants of such organs. Name and explain the evolutionary process they exhibit.

Ans Analogous = 1

- Flippers of Penguins & Dolphins / Eye of octopus and mammals = ½ (any other appropriate & correct example)

- Sweet potato (root modification) and potato (stem modification) = ½

They are anatomically dissimilar structure though they perform similar function , convergent evolution = ½ + ½

[3 Marks]

22. list any two types of IUDs that are available for human females and state their mode of action.

Ans i) Non medicated IUDs =1 , increase phagocytosis of sperms within the uterus = ½

ii) Copper releasing IUDs = 1 , Cu ions suppress sperm motility and fertilising capacity of sperms=½

iii) Hormone releasing IUDs = 1 , make uterus unsuitable for implantation / makes cervix hostile to sperms = ½

(Any two) (1½ +1 ½) [3 Marks

SECTION - D

Q Nos. 23 are of four marks each

23. With the revolution in information technology, now it has become an integral part of everybody's life, living in rural and urban India. You are asked to address the gathering of students of eco-clubs of your neighbourhood schools on generation and management of e-waste.

(a) Write how e-waste is generated.

(b) Explain how would you address the awareness issue of e-waste management amongst the students.

(c) How have the developed countries exploited the developing countries with respect to e- waste managements ?

Ans (a) irreparable computers / any other electronic good = 1

(b) Recycling is the only possible solution of e-waste management keeping in mind the safety measures to be adopted by the worker involved in the cycling of e- wastes , so as to avoid their exposure to the toxic substance present in the e- wastes = 1 + 1

(c) By exporting their e-waste to the developing countries / China / India / Pakistan = 1

[4 Marks]

SECTION - E

Q Nos. 24-26 are of five marks each

24. Skin colour in humans does not have distinct alternate forms but shows a whole range of possible variations in skin colour. Explain the pattern of inheritance of such a trait. What is this type of inheritance known as ? Provide another example of exhibiting such an inheritance pattern.

Skin colour is controlled by three genes; A,B,C dominant genes and a,b,c the recessive genes ; the effect of each type of allele is addictive ; more the dominant allele, darker the skin colour; more the recessive allele lighter the skin colour ; when three dominant alleles and three recessive alleles

are present in an individual the skin colour is intermediate = ½ × 6

- Polygenic inheritance =1

- Human Height /or any other correct example =1

OR

Explain the process of transcription in a prokaryote

Ans DNA dependent RNA polymerase ; binds to the promoter site (of DNA) ; to initiate transcription; it uses nucleoside triphosphate / nucleotides as substrates; polymerises in a template dependant fashion; following the rule of complementarity.

DNA dependent RNA polymerase is only capable of catalysing elongation process; it associates temporarily with initiation factor (σ) / to initiate transcription ; and with termination factor (ρ)to terminate transcription, once the polymerase reaches terminator region the nascent RNA falls off so also the RNA polymerase from DNA template thus completing transcription. = ½ × 10 = 5

25. (a) Write the percentage of land area that was covered by forests by the end of the last century.

(b) Describe any two practices that led to deforestation.

(c) State the consequences of deforestation.

(d) Suggest a method to overcome deforestation.

Ans (a) 19.4% = ½

(b) -Trees are axed for timber / firewood / land for industrial requirement
-Slash and burn agriculture
- habitat loss and fragmentation- clearing of forest land into grass land for raising cattle
(Any two) = 1+1

(c) -Deterioration of our environment in terms of air - water and soil quality.
-causes loss of bio diversity
- disturbance in hydrological cycle / biogeochemical cycle
(Any two) = 1 + 1

(d) Reforestation or any other appropriate alternative = ½

[5Marks]

OR

(a) Comment on the pattern in which all communities undergo a change in composition and structure with changing environmental conditions.

(b) Explain 'Climax community' and 'sere'.

(c) Differentiate between primary and secondary succession with examples.

Ans (a) Orderly and sequential changes parallel with changes in physical environment =1

(b) climax community-changes finally lead to a community that is in equilibrium with environment =1
Sere-the entire sequence of communities that successively change in a given area =1

(c)	**Primary succesion**	**Secondary sucession**	
(i)	occurs in newly cooled lava / bare rock / newly created pond.	occurs in abandoned / destroyed forest	
(ii)	Slow process	Fast Process	½ ×4= 2

[5Marks]

26 (a) Explain the steps involved in *in vitro* fertilisation popularly known as test tube baby programme.

(b) State the importance of this programme.

Ans (a) i) Ova from wife / donor and sperms from husband / donor are collected

ii) They are induced to form zygote under simulated conditions (in the labortory)

iii) The zygote or early embryos upto 8 blastomeres could then be transferred to fallopian tube /ZIFT

iv) Embryos more than 8 blastomeres, into the uterus / IUT/ Intra uterin transfer = 1× 4

(b) Allows couples to bear children who were unable to do so naturally = 1

[4+1=5]

OR

(a) State one difference and one similarity between geitonogamy and xenogamy.

(b) Explain any three devices developed in flowering plants to discourage self pollination and encourage cross pollination.

Ans (a) Difference- In geitonogamy pollen grains from one flower are transferred to the stigma of another flower on the same plant whereas in xenogamy the pollen grains are transferred to the stigma of a flower on another plant(of the same species) genetically similar , genetically

different

Similarity -In both types of pollination pollen grains from the anther are transferred to the stigma of another flower of the same species =1

(b) - Pollen release & stigma receptivity not synchronised / hence the maturity of stigma and pollen are different /Protandry / Protogyny

- Anther and Stigma are placed at different positions so that pollen cannot come in contact with stigma of the same flower.

- Self incompatibility/ Self sterility.

- Production of unisexual flowers (Any three) = 1 × 3

[5Marks]

Question Paper Code 57/3

SECTION – A

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

1. Name the enzyme that helps to join DNA fragments. [1 Mark]

Ans (DNA) ligase

2. A colour blind boy is born to a couple with a normal colour vision. Write the genotype of the parents.

Ans Father - XY , Mother -XX^C = ½ + ½

[1 Mark]

3. Write the function of a Bioreactor.

Ans Bioreactors are required to produce large volumes (100 - 1000 litres) of recombinant proteins/ desired protein / enzymes

[1 Mark]

4. What is an auto-immune disease

Ans When the body attacks self cells it results in damage

5. How are different varieties of pollen grains stored for long period of time in pollen banks ?

Ans In Liquid nitrogen (- 196 ^{0} C) / cryopreservation

[1 Mark]

SECTION - B

Q Nos. 6-10 are of two marks each

6. What is the pathogenic property of baculovirus, used as a biological agents ? Name the genus of these organisms.

Ans Attacks insect, and other arthropods = ½ × 2

Nucleopolyhedrovirus = 1 [2 Marks]

7. Differentiate between monoecious and dioecious plants. Give one example of each.

Ans Monoecious- bisexual condition of a plant / when both male and female flowers are on the same plant , e.g coconut palm /cucurbits / or any other correct example = ½ + ½

Dioecious -unisexual conditon of a plant / male and female flowers present on different plants ,

eg- Papaya / date palm / or any other correct example = ½ + ½ [2 Marks]

8. What happens when chromatids fail to segregate during cell division cycle ? Explain your answer with an example.

Ans Failure of segregation of chromatids during cell division cycle results in the gain or loss of chromosome/ called aneuploidy = 1

E.g Down' syndrome results in the gain of extra copy of chromosome 21 /

Turner's syndrome results due to loss of an X-chromosome in human female = 1

OR

ABO blood groups is a good example of co-dominance. Justify.

Ans -ABO blood group in humans is contributed by gene 'I' that has 3 alleles '$I^{A'}$ '$I^{B'}$ and 'i.'

- Because human beings are diploid each person has two of the three alleles.

- I^A and I^B produce two different types of sugar while allele i does not produce sugar on the

plasma membrane of RBC

- When I^A and I^B are present they both express their own type of sugar- this is codominance

= ½ × 4 [2 Marks]

9. Why are certain group of bacteria referred to as methanogens ? List any two characteristic features of methanogens.

Ans There are methane producing bacteria = 1

They are anaerobic , break down cellulose to produce methane ½ + ½ =1

10. Explain the role played by predators in a community.

Ans
- Predators act as conduits for energy transfer across trophic levels.
- They keep prey population under control.
- They help in maintaining species diversity in a community by reducing intensity of competition among competing prey species.
- An efficient predator may cause extinction of prey species (Any two) = 1 + 1

[2 Marks]

SECTION - C

Q Nos. 11-22 are of three marks each

11 What type of organs eye of an Octopus and that of a human called ? Give another example from the animal group and one from the plants of such organs. Name and explain the evolutionary process they exhibit.

Ans Analogous = 1

- Flippers of Penguins & Dolphins / Eye of octopus and mammals = ½ (any other appropriate & correct example)

- Sweet potato (root modification) and potato (stem modification) = ½

They are anatomically dissimilar structure though they perform similar function , convergent evolution = ½ + ½

[3 Marks]

12 (a) Why must bacterial cells be first made 'competent' in r-DNA technology ? How is process carried ?

(b) Name the method by which an alien DNA can be made to enter (i) plant cell; (ii) animal cell.

Ans (a) Since DNA is hydrophillic , it cannot pass through cell membrane hence bacterial cells are made competent = ½ + ½

by treatment with a specific concentration of a divalent cation,such as Ca^{++} which increases efficiency of entry of DNA through the pores of cell wall = 1

(b) i) plant cells - biolistic/ gene guns = ½

ii) animal cells- Micro injection = ½

[3 Marks]

13. Explain with the help of two examples how certain plants have evolved morphological and chemical defenses against primary consumers such as cows and goats.

Ans - Thorns of *Acacia* / Cactus are morphological means of defence against cows & goats = 1

- Plants produce & store chemicals that make herbivore sick when they are eaten inhibit feeding or digestion and disrupt its reproduction or even kill it = 1

- *Calotropis* produces highly poisonous cardiac glycosides so cows and goats can never browse on these plants / Chemical substances like nicotine / caffeine / defences / strychnine / opium are

actually defences against grazers & browsers = 1

[3 Marks]

14. What was the challenge for production of insulin using rDNA techniques ? How did Eli Lilly produce insulin using rDNA technology ?

Ans The challenge for production of insulin using r DNA technique was getting insulin assembled into a mature form = 1

- Prepared two DNA sequence corresponding to A and B chains of human insulin.
- introduced them in plasmids of *E.coli* to produce insulin chains.
- chains A and B were produced separately.
- extracted and combined by creating disulfide bonds to form human insulin = ½ × 4

[3 Marks]

15. Identify A, B, C, D, E and F in the following table

S.No.	Component-I	Component-11	Chemical linkage bonding the two components	Product
i.	A	B	C	Nucleoside
ii.	Nucleoside	D	E	Nucleotide
iii.	Nucleotide	Nucleotide	F	Dinucleotide

Ans i) A - Nitrogenous base / A - Pentose sugar .
B - Pentose Sugar / B- Nitrogenous base
C - N glycosidic linkage.

ii) D - phosphate group.
E - phospho ester linkage

iii) F- (3 -'5') phosphodiester linkage.

[3 Marks]

16. Write the aim with which animal breeding programmes are carried. Describe the essential steps to be followed in Poultry management.

Ans Aims - increasing the yield of animals , improving the desirable qualities of the produce = ½ + ½

<u>Steps to be followed in Poultry Management</u>

- Selection of disease free and suitable breeds
- Proper and safe farm conditions
- Proper feed and water
- Proper hygiene and health care = ½ × 4

[3 Marks]

17. Name the organism from which the 'cry' genes are isolated. Mention with the help of suitable example why and how bio-technologists have made use of 'cry' genes.

Ans *Bacillus thuringiensis* = 1

- Source of insecticidal (crystal) protein that control the cotton bollworms / corn borer = 1

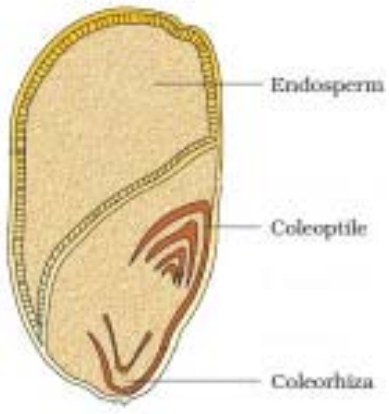
- Specific Bt toxin genes were isolated from *Bacillus thuringiensis* , incorporated into several crop plants such as cotton = ½ × 2

[3 Marks]

18. (a) Draw a diagram of a sectional view of monocoat seed (grain).

(b) Label and write the functions of coleoptile , coleorhiza , endosperm .

Ans



= ½ × 3

Functions

coleoptile- sheath of plumule / protection of plumule

coleorhiza- sheath of radicle / protection of radicle

endosperm- filled with reserve food materials for nutrition of developing embryo. = ½ × 3

19. Mention the role of (i) selectable marker, (ii) Ori and (iii) rop in E. coli cloning vector pBR322.

Ans i) Selectable marker - helps in identifying and eliminating non transformants and selectively permitting the growth of the transformants = 1

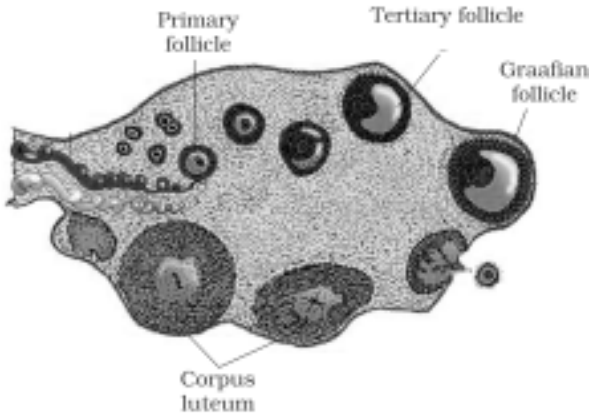
ii) Ori - helps to start replication and any piece of DNA when linked to this sequence can be made to replicate within host cell, responsible for controlling the copy number of the linked DNA = ½ + ½

iii) rop-codes for the proteins involved in the replication of the plasmid = 1 [3 Marks]

20. (a) Draw a diagram of a sectional view of human ovary and label (i) Primary follicle; (ii) Tertiary follicle; (iii) Graafian follicle and (iv) Corpus luteum.

(b) Write the function of corpus luteum.

Ans



= ½ × 4

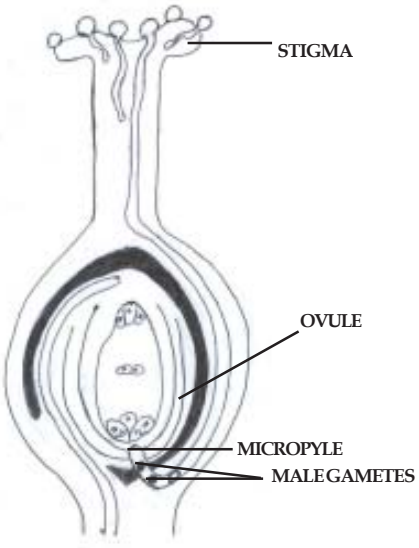
b) Secretes (large amounts of) progesterone , which is essential for maintenance of endometrium = ½ × 2

OR

(a) Draw a diagram of Pistil showing pollen tube growth in angiosperm and label (i) Stigma; (ii) male gametes; (iii) micropyle and (iv) Ovule.

(b) Write the function of micropyle.

Ans (a)



=½× 4

(b) the pollen tube enters the ovule through micropyle , it facilitates the entry of oxygen and water for seed germination. = ½ + ½ [3 Marks]

21. Identify a, b, c, d, e and f in the following table :

Name of Enzyme/ Bioactive Molecule		Source	Functions
(i)	a	Streptococcus	b
(ii)	c organ	d	Immuno-suppressive agent in transplant patients
(iii)	Statins	e	f

Ans i) a) Streptokinase b) 'Clot buster' for removing clots from the blood vessels (of patients who have undergone myocardial infaction leading to heart attack) /clot buster enzyme

ii) c) Cyclosporin A d) *Trichoderma polysporum*

iii) e) *Monascus purpureus* (yeast)

f) Blood cholesterol lowering agent.

[3 Marks]

22. Explain the following with reference to drug/alcohol abuse : (a) Addiction, (b) dependence and (c) withdrawal symptoms.

Ans (a) Addiction- frequent use of drugs / alcohol leads to increase in the level of tolerance of receptors present in our body , thus making these receptors respond to only higher doses of

drugs / alcohol = ½ + ½

//

Psychological attachment to certain effects such as euphoria and temporary feeling of well being associated with drugs and alcohol = 1

(b) Dependence - Due to inherent addictive nature / its psychological attachment to drugs / alcohol and are unable to live without them = 1

(c) Withdrawal syndrome-when a person is taking drugs / alcohol regularly and the intake of drugs is abruptly discontinued it leads to various characteristics symptoms (nausea, anxiety, shakiness, sweating etc.) = 1

[3 Marks]

SECTION - D

Q Nos. 23 are of four marks each

23. With the revolution in information technology, now it has become an integral part of everybody's life, living in rural and urban India. You are asked to address the gathering of students of eco-clubs of your neighbourhood schools on generation and management of e-waste.

(a) Write how e-waste is generated.
(b) Explain how would you address the awareness issue of e-waste management amongst the students.
(c) How have the developed countries exploited the developing countries with respect to e- waste managements ?

Ans (a) irreparable computers / any other electronic good = 1

(b) Recycling is the only possible solution of e-waste management keeping in mind the safety measures to be adopted by the worker involved in the cycling of e- wastes , so as to avoid their exposure to the toxic substance present in the e- wastes = 1 + 1

(c) By exporting their e-waste to the developing countries / China / India / Pakistan = 1

[4 Marks]

SECTION - E

Q Nos. 24-26 are of five marks each

24 a) Write the percentage of land area that was covered by forests by the end of the last century.

(b) Describe any two practices that led to deforestation.
(c) State the consequences of deforestation.
(d) Suggest a method to overcome deforestation.

Ans (a) 19.4% = ½

(b) -Trees are axed for timber / firewood / land for industrial requirement
-Slash and burn agriculture
- habitat loss and fragmentation- clearing of forest land into grass land for raising cattle
(Any two) = 1+1

(c) -Deterioration of our environment in terms of air - water and soil quality.
-causes loss of bio diversity
- disturbance in hydrological cycle / biogeochemical cycle
(Any two) = 1 + 1

(d) Reforestation or any other appropriate alternative = ½

[5Marks]

OR

(a) Comment on the pattern in which all communities undergo a change in composition and structure with changing environmental conditions.

(b) Explain 'Climax community' and 'sere'.

(c) Differentiate between primary and secondary succession with examples.

Ans (a) Orderly and sequential changes parallel with changes in physical environment =1

(b) climax community-changes finally lead to a community that is in equilibrium with environment =1

Sere-the entire sequence of communities that successively change in a given area =1

	(c) Primary succesion	**Secondary sucession**	
(i)	occurs in newly cooled lava / bare rock / newly created pond.	occurs in abandoned / destroyed forest	
(ii)	Slow process	Fast Process	½ ×4= 2

[5Marks]

25 (a) Explain the steps involved in *in vitro* fertilisation popularly known as test tube baby programme.

(b) State the importance of this programme.

Ans (a) i) Ova from wife / donor and sperms from husband / donor are collected

ii) They are induced to form zygote under simulated conditions (in the labortory)

iii) The zygote or early embryos upto 8 blastomeres could then be transferred to fallopian tube /ZIFT

iv) Embryos more than 8 blastomeres, into the uterus / IUT/ Intra uterin transfer = 1× 4

(b) Allows couples to bear children who were unable to do so naturally = 1

[4+1=5]

OR

(a) State one difference and one similarity between geitonogamy and xenogamy.

(b) Explain any three devices developed in flowering plants to discourage self pollination and encourage cross pollination.

Ans (a) Difference- In geitonogamy pollen grains from one flower are transferred to the stigma of another flower on the same plant whereas in xenogamy the pollen grains are transferred to the stigma of a flower on another plant(of the same species) genetically similar , genetically different

Similarity -In both types of pollination pollen grains from the anther are transferred to the stigma of another flower of the same species =1

(b) - Pollen release & stigma receptivity not synchronised / hence the maturity of stigma and pollen are different /Protandry / Protogyny

- Anther and Stigma are placed at different positions so that pollen cannot come in contact with stigma of the same flower.

- Self incompatibility/ Self sterility.

- Production of unisexual flowers (Any three) = 1 × 3

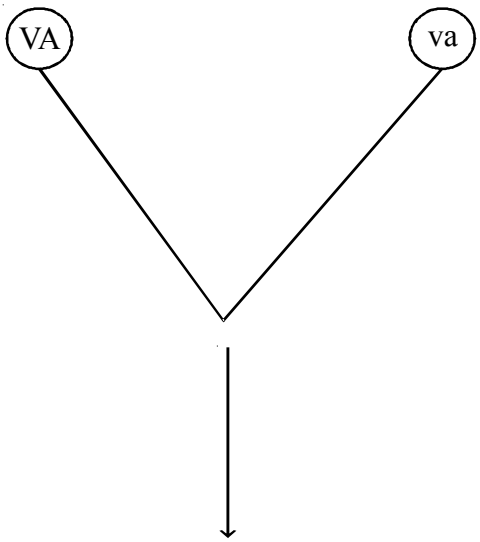
[5Marks]

26. (a) Work out a dihybrid cross upto F_2 generation between pea plants bearing violet coloured axial flowers and white coloured terminal flowers. Give their phenotypic ratio.

(b) State the Mendel's law of inheritance that was derived from such a cross.

Ans. (a) **Parents :** **V V A A** × **v v a a** = (1)
Violet , axial **White , terminal**

gametes :



F_1 VvAa (Violet axial) = 1

F_2

	VA	vA	Va	va
VA	VVAA Violet axial	VvAA Violet axial	VVAa Violet axial	VvAa Violet axial
vA	VvAA Violet axial	vvAA White Axial	VvAa Violet axial	vvAa White Axial
Va	VVAa Violet axial	VvAa Violet axial	VVaa Violet terminal	Vvaa Violet terminal
va	VvAa Violet axial	vvAa white Axial	Vvaa Violet terminal	vvaa White terminal

= 1

Phenotypes –	violet axial	:	white axial	:	violet terminal	:	white terminal
Phenotype ratio –	9	:	3	:	3	:	1 =1

(b) Law of Independent Assortment : When two pairs of traits are combined in a hybrid segregation of one pair of characters is independent of the other pair of characters = 1

OR

(a) How did Darwin explain adaptive radiation by taking an example of finches ?
(b) How did Darwin's view on evolution differ from that of de-Vries ?

Ans a) Darwin conjectured that the birds evolved on the island itself = ½

There were seed-eating features and other altered beaks arose allowing different types of food eating habits like insectivorous and vegetarian finches = ½

This process of evolution of different species in a given geographical area starting from a point and radiating to other areas of (geographical) habitats is called adaptive radiation = 1

b)

Darwin	**de Vries**
-Minor Variation(heritable) cause evolution	-Mutation caused evolution
-Variations are small and directional	-Mutation are random and directionless
-Evolution is gradual	-Single step large mutation / saltation causes speciation = 1 × 3 =3

[2 + 3=5]