Senior School Certificate Examination

July 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.

SECTION – A

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

1. Name the stage of Plasmodium that gains entry into the human when bitten by an infected female Anopheles.

Ans. Sporozoites

[1 mark]

2. List any two characters of Pea plants used by Mendel in his experiments other than height of the plant and the colour of the seed.

Ans. Flower colour / Flower position / Pod shape / Pod colour / Seed shape ***(Any two)*** = ½ + ½

[1 mark]

3. Mention the role of Restriction Enzymes in Recombinant DNA technology.

Ans. To cut DNA at specific sites / Molecular scissors (DNA)

[1 mark]

4. Name the disorder caused due to the absence of one of the X-chromosomes in a human female.

Ans. Turner's syndrome

[1 mark]

5. Name the type of asexual reproduction where the parent cell ceases to exist.

Ans. Fission / Binary fission / Longitudinal fission / Multiple fission

[1 mark]

SECTION-B

6. Name and state the effect of a drug that is often medically prescribed, but its overuse leads to drug dependence and drug abuse.

Ans. Morphine / barbiturates / amphetamines / benzodiazepines / lysergic acid diethyl amides (LSD) = 1

Affects the central nervous system / acts as a pain killer / acts as a sedative / treats depression / treats insomnia / creates hallucinogenic effect

(Any two) = ½ + ½

[1 + 1 = 2 marks]

7. Differentiate between pericarp and perisperm.

Ans. Pericarp - wall of the fruit (which develops from the wall of ovary) = 1

Perisperm - persistent residual nucellus = 1

[1 + 1 = 2 marks]

8. "Niche is a part of a habitat." Explain with the help of an example.

Ans. A single habitat may have different kind of organisms in it but within the habitat every organism has defined range of condition that it can tolerate , resources it utilises and plays a distinct functional role - all these together comprise its niche , for example pond is a habitat for variety of plants and animals , but in it Gambusia fish is found in its peripheral parts which is its niche. ***(Any other suitable example with explanation)*** = ½ × 4

[2 marks]

9. Name the type of immunity a baby is born with. How is it different from the one he gets from the mother's milk after birth ?

Ans. Innate Immunity , Acquired Immunity that a baby acquires from his mother's milk after birth is an example of passive Immunity = 1 + 1

[2 marks]

10. State the roles of AUG codon at 5' end and UAG at 3' end of a certain m-RNA during translation.

Ans. AUG codon at 5' end = start codon (for translation) / codes for methionine = 1

UAG codon at 3' end = stop codon (for translation) / terminate polypeptide chain= 1

[1 + 1 = 2 marks]

OR

'Degenerate' and 'Universal' are salient features of a genetic code. Explain.

Ans. Degenerate - Some aminoacids are coded by more than one codon = 1

Universal - one codon shall code for the same amino acid in all organisms (UUU would code for phenylalanine from bacteria to human beings) = 1

[1 + 1= 2 marks]

SECTION-C

11. Write the three basic facts that are highlighted in Mendel's Law of Dominance.

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

(ii) Factors occur in pairs = 1

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

[1 + 1+ 1= 3 marks]

12. (a) Name the causative agent of amoebiasis and mention its symptoms.

(b) Write how does it spread.

Ans. (a) *Entamoeba histolytica* = 1

Symptoms - Constipation / abdominal pain / cramps / stool with excess mucus and blood clot ***(Any two)*** = ½ + ½

(b) Spreads through housefly / drinking water contaminated with faecal matter / eating food contaminated with faecal matter ***(Any one)*** = 1

[1 + 1 + 1 = 3 marks]

13. (a) What is green revolution ? Mention the steps that led to it.

(b) Name the scientist whose contribution led to development of semi-dwarf wheat varieties in India.

Ans. (a) Dramatic increase in food production (wheat and rice) during the mid 1960's is termed as Green Revolution = 1

Various plant breeding techniques / better management practices / use of agrochemicals (fertilizers and pesticides) ***(Any two)*** = ½ + ½

(b) Norman E.Borlaug = 1

[1 + 1 + 1 = 3 marks]

14. Are humming birds and fish regulators or conformers ? Give reasons in support of your answer.

Ans. Conformers = ½

Heat loss or gain is a function of surface area = ½

Since small animals have a larger surface area (relative to their volume) , they tend to lose body heat very fast when it is cold outside , they have to expend much energy , to generate body heat through metabolism = ½ × 4 = 2 / (cannot maintain a constant body temperature)

[1 + 2 = 3 marks]

15. GM plants are useful in many ways. How would you convince farmers to grow GM plants on their field ? Explain giving three reasons.

Ans. Make crop more tolerant to abiotic stresses / Reduce reliance on chemical pesticides / Help to reduce post harvest loses / Increase efficiency of mineral usage / Enhance nutritional value of food ***(Any three)***

[1× 3 = 3 marks]

16. Name the male accessory glands in humans and write their functions.

Ans. (Paired) seminal vescicles , prostate , bulbourethral glands (paired) = ½ × 3

Functions - Secretions constitute the Seminal plasma , which is rich in fructose / calcium and certain enzymes , lubrication of penis = ½ × 3

[1½ + 1½ = 3 marks]

17. Write in what context did Darwin use the terms 'fitness', 'survival' and 'selection' while elaborating on the mechanism of evolution.

Ans. Fitness refers to reproductive fitness (will leave more progeny) - more survival and hence selected by nature - natural selection = 1 × 3

[3 marks]

18. State the objective with which a dairy farm is set up. Describe the essential steps to be followed for dairy farm management.

Ans. Processes and systems that increase yield and improve quality of milk / Selection of good breeds having high yielding potential and resistance to diseases / House to have adequate water and kept disease free / Feeding in a scientific manner with quality and quantity fodder / Storage and transport of milk and products /Regular inspection with proper record keeping / Regular visits of veterinary doctor

(Any six) = ½ × 6 = 3

[3 marks]

19. When Morgan conducted dihybrid cross on *Drosophila* like Mendel did with pea plants, the F_2 ratios deviated significantly from that of Mendel's F_2 ratio. Write the explanation Morgan and his group gave to the observations they obtained from their experiment.

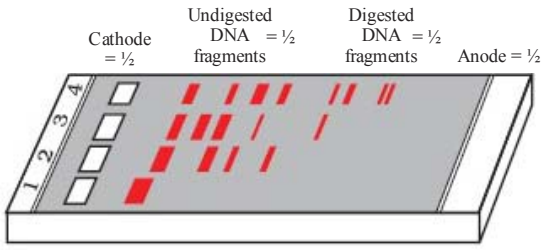
Ans. - When two genes in a dihybrid cross were located on the same chromosome they did not segregate independently = 1

- The proportion of parental gene combinations were much higher than non parental combinations / recombinants = 1

- Physical association of two genes was termed linkage = 1

[1× 3 = 3 marks]

20. Draw a diagram of a typical agarose gel electrophoresis showing migration of undigested and digested sets of DNA fragments. Label (a) the digested and undigested DNA fragments, (b) Anode and cathode ends of the plate. Mention the role of electrophoresis in biotechnology.



The cutting of DNA by restriction endonuclease results in fragments of DNA. These fragments can then be separated by (Gel) electrophoresis = 1

[2 + 1 = 3 marks]

21. (a) Name a terminal method to prevent pregnancy in humans.

(b) Describe the procedure of the terminal method carried in human male and female.

Ans. (a) Surgical methods / Sterilisation = 1

(b) Males - Vasectomy , a small part of vas deferens is removed or tied up through a small incision on the scrotum = ½ + ½

Females - Tubectomy , a small part of the fallopian tube is removed or tied up through a small incision in abdomen or through vagina = ½ + ½

[1 + 1 + 1 = 3 marks]

OR

(a) Do all pollen grains remain viable for the same length of time ? Support your answer with two suitable examples.

(b) How are pollen grains stored in pollen banks ? State the purpose of storing pollen grains in these banks.

Ans. (a) No = 1

Examples :

(i) Cereals / rice / wheat - pollen grains / loose viability with in thirty minutes of their release = ½

(ii) In some members of Rosaceae / leguminoseae / Solanacease maintain viability for months = ½

(b) Using cryopreservation techniques / in liquid nitrogen (-196° C) = ½

Maintaining viability / preserving threatened species / preserving commercially important plants / to be used for crop breeding programmes = ½

[1 + 1 + 1 = 3 marks]

22. Expand 'ELISA'. Why is this method preferred over conventional methods of diagnosis of diseases ?

Ans. Enzyme Linked Immunosorbent Assay = 1

Infection by pathogen detected by the presence of antigens (protein , glycoprotein etc.) / antibodies synthesised against the pathogen , = 1

Conventional methods cannot provide early diagnosis which is made possible by ELISA = 1

[1 + 1+ 1= 3 marks]

SECTION - D

23. Waste Disposal and Waste Management poses a major problem in present times. Generation of garbage and its disposal is a major threat and consequently leads to severe environmental issues. The problem is not with biodegradable and recycled wastes. We realise that the need is to reduce non-biodegradable wastes.

(a) Why is there a great concern of managing non-biodegradable waste in comparison to biodegradable waste ? Explain.

(b) As a member of eco club of your school, suggest any two ways that you will discuss with your fellow members to organise for a "Zero garbage day" once in a month in the school.

Ans. (a) In comparision to biodegradable waste non biodegradable waste pollute the soil and also underground water = 1

Such waste stays for a very long time without degradation in the environment = 1

(b) (i) Avoid use of plastics in packaging for milk and water /

(ii) Avoid use of plastics in packaging for fruits and vegetables /

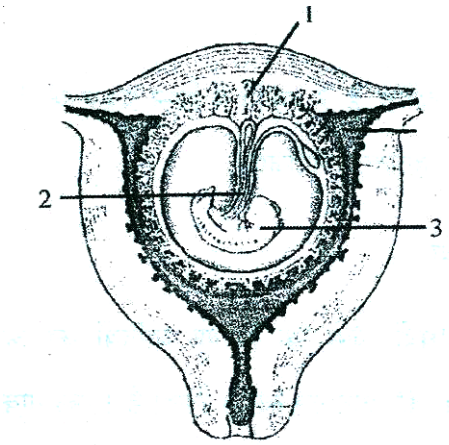
(iii) Any other correct valid point

(Any two) = 1 + 1

[1 × 4 = 4 marks]

SECTION-E

24.



(a) Identify the parts labelled 1, 2 and 3 in the diagram given.

(b) Draw a labelled diagram of a human blastocyst.

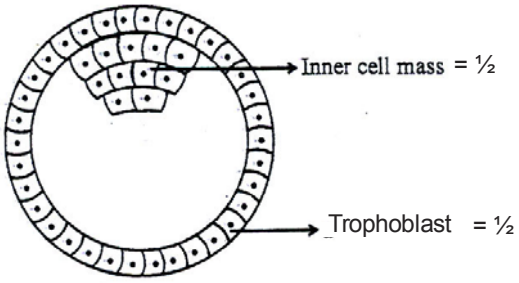
(c) What is parturition and how is it induced at the end of pregnancy in a human female ?

Ans. (a) 1 - Placental Villi = ½

2 - Umbilical cord (with its vessels) = ½

3 - Embryo = ½

(b)



(c) Process of delivery of the foetus (at the end of pregnancy) = 1

The signals for parturition originate from the fully developed foetus and placenta which induce mild uterine contractions / called foetal ejection reflex , this triggers release of oxytocin from the maternal pituitary which acts on uterine muscle and causes stronger uterine contraction which stimulates further secretion of oxytocin , the stimulatory reflex between uterine contraction and oxytocin secretion continues resulting in stronger and stronger contractions leading to parturition = ½ × 3

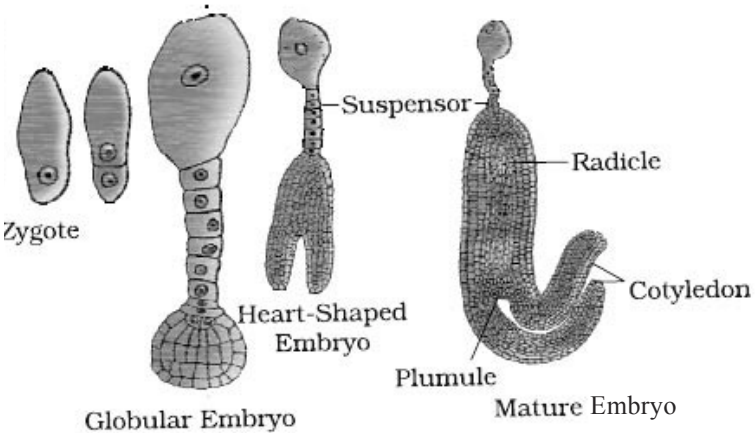
[1½ + 1 + 1 + 1½ = 5 marks]

OR

(a) With labelled diagrams, depict stages in embryo development in a dicotyledenous plant.

(b) Endosperm development precedes embryo development. Why ?

Ans. (a)



= 4

(b) Endosperm is filled with reserve food materials which are used for as nutrition of the developing embryo = 1

[4 + 1 = 5 marks]

25. (a) How are polygenic inheritance and multiple allelism different ? Explain with the help of an example each.

(b) List the criteria a chemical molecule must fulfill to be able to act as a genetic material.

Ans. (a)

Polygenic Inheritance	**Multiple allelism**
Controlled by three or more genes	More than two alleles govern the same character
Example	Example
A - B - C gene control human skin colour	ABO blood grouping in humans = 2

(b)
- It should be able to generate its replica / replication
- It should be chemically and structurally stable
- It should provide the scope for slow changes / mutation that are required for evolution
- It should be able to express itself in the form of a Mendelian characters.

(Any three) = 1 × 3

[2 + 3 = 5 marks]

OR

State the hypothesis proposed by Oparin and Haldane. How was it experimentally proved by S.L. Miller ? Explain.

Ans. The first form of life could have come from pre-existing non living organic molecules (RNA , protein etc.) , and that formation of life was preceded by chemical evolution / formation of diverse organic molecule from inorganic constituents , the condition on earth were high temperature (Volcanic storms) reducing atmosphere (containing CH_4, NH_3, etc) , Miller in his experiment created electric discharge in a closed task , containing CH_4 , H_2 , NH_3 and water

vapour at 800° C , and observed the formation of aminoacids / organic compounds , which supported chemical evolution.

[½ ×10 = 5 marks]

26. What does an Ecological Pyramid indicate ? Explain the three different types of upright Pyramids in nature with the help of an example each.

Ans. It indicates food / energy relationship between organisms at different trophic levels = ½

(i) Pyramid of Number = example grassland ecosystem = ½

↓

Producers are more in number than herbivores carnivores

(ii) Pyramid of Biomass example = forest / tree ecosystem = ½

↓

Producers have more biomass than herbivores / carnivores

//

Pyramid of biomass shows a sharp decrease in biomass in higher trophic levels

(iii) Pyramid of energy = example. grassland ecosystem = ½

↓

Producers have more energy than herbivores / carnivores

[5 marks]

OR

(a) Indiscriminate human activities such as alien species invasion, fragmentation and habitat loss have accelerated the loss of biodiversity. Justify by taking one example for each.

(b) State the importance of (i) IUCN Red data list and (ii) Hot spots in conservation of biodiversity.

Ans. (a) Alien species invasion

When alien species are introduced unintentionally / deliberately for whatever purpose , some of them turn invasive and cause decline / extinction of indigenous species

eg.

- the introduction of African catfish / *Clarias gariepinus* (for aquaculture purpose) poses a threat to indigenous catfishes in our rivers
- The Nile perch introduced into lake Victoria in East Africa led to the extinction of more than 200 species of Cichlid fish in the lake
- Carrot grass / Parthenium , Lantana , Water hyacinth / Eichhornia poses a threat to indigenous species

Fragmentation

When large habitats are broken up into small fragments due to various human activities

- mammals / birds requiring large territories and certain animals with migratory habits are badly affected

Habitat Loss

The Amazon rain forest is being cut and cleared for cultivating soyabeans / conversion to grasslands for raising cattle

(b) (i) Provides information of extinction of species

(ii) Regions with very high levels of species richness , high degree of endemism / species confined to that region and not found anywhere else are identified which need to be conserve all priority basis.

SECTION – A

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

1. Write the palindromic sequence that EcoRI recognises.

Ans. EcoRI recognises GAATTC

[1 mark]

2. Trace the route of Sporozoite of Plasmodium when it enters the human body through the bite of infected female Anopheles mosquito till its entry into the R.B.C.

Ans. Sporozoites attack liver cells = ½

Sporozoites reproduce asexually in liver cells bursting them and then reach RBC = ½

[½ + ½ = 1 mark]

3. List any two characters of Pea plants used by Mendel in his experiments other than height of the plant and the colour of the seed.

Ans. Flower colour / Flower position / Pod shape / Pod colour / Seed shape ***(Any two)*** = ½ + ½

[1 mark]

4. Name the disorder caused due to the absence of one of the X-chromosomes in a human female.

Ans. Turner's syndrome

[1 mark]

5. Write one difference between binary fission and budding.

Ans.

	Binary Fission	**Budding**
-	Cell divides into two equal halves	The division is unequal
-	Each of the two equal halves rapidly grows into an adult	The smaller part (Bud) remains attached initially to the parent cell which eventually gets separated and matures into a new organism
-	Parent cell loses its identity	The parent cell maintain its identity and forms a separate bud

(Any two) = ½ + ½

SECTION-B

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

6. Name the type of immunity a baby is bom with. How is it different from the one he gets from the mother's milk after birth ?

Ans. Innate Immunity , Acquired Immunity that a baby acquires from his mother's milk after birth is an example of passive Immunity = 1 + 1

[2 marks]

7. "Niche is a part of a habitat." Explain with the help of an example.

Ans. A single habitat may have different kind of organisms in it but within the habitat every organism has defined range of condition that it can tolerate , resources it utilises and plays a distinct functional role - all these together comprise its niche , for example pond is a habitat for variety of plants and animals , but in it Gambusia fish is found in its peripheral parts which is its niche. ***(Any other suitable example with explanation)*** = ½ × 4

[2 marks]

8. State the roles of AUG codon at 5' end and UAG at 3' end of a certain m-RNA during translation.

Ans. AUG codon at 5' end = start codon (for translation) / codes for methionine = 1

UAG codon at 3' end = stop codon (for translation) / terminate polypeptide chain= 1

[1 + 1 = 2 marks]

OR

'Degenerate' and 'Universal' are salient features of a genetic code. Explain.

Ans. Degenerate - Some aminoacids are coded by more than one codon = 1

Universal - one codon shall code for the same amino acid in all organisms (UUU would code for phenylalanine from bacteria to human beings) = 1

[1 + 1= 2 marks]

9. Both nucellus and endosperm have abundant reserve food materials. How is their food reservoir utilised in angiosperms ?

Ans. The reserve food material is utilised for the development of the embryo in angiosperms

[2 marks]

10. What is a vaccine ? How do they act to provide long term immunity to an individual who is vaccinated ?

Ans. Vaccine is a preparation of antigenic proteins of pathogens or inactivated / weakened pathogen introduced into the body = 1

The antibodies produced in the body against these antigens would neutralise the pathogenic agents during actual infection , also generate memory B and T cells that recognise the pathogen quickly on subsequent exposure and overwhelm the invaders with a massive production of antibodies = ½ + ½

[1 +1 = 2 marks]

SECTION - C

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

11. Are humming birds and fish regulators or conformers ? Give reasons in support of your answer.

Ans. Conformers = ½

Heat loss or gain is a function of surface area = ½

Since small animals have a larger surface area (relative to their volume) , they tend to lose

body heat very fast when it is cold outside , they have to expend much energy , to generate body heat through metabolism = ½ × 4 = 2 / (cannot maintain a constant body temperature)

[1 + 2 = 3 marks]

12. (a) What is green revolution ? Mention the steps that led to it.

(b) Name the scientist whose contribution led to development of semi-dwarf wheat varieties in India.

Ans. (a) Dramatic increase in food production (wheat and rice) during the mid 1960's is termed as Green Revolution = 1

Various plant breeding techniques / better management practices / use of agrochemicals (fertilizers and pesticides) ***(Any two)*** = ½ + ½

(b) Norman E.Borlaug = 1

[1 + 1 + 1 = 3 marks]

13. Expand 'ELISA'. Why is this method preferred over conventional methods of diagnosis of diseases ?

Ans. Enzyme Linked Immunosorbent Assay = 1

Infection by pathogen detected by the presence of antigens (protein , glycoprotein etc.) / antibodies synthesised against the pathogen , = 1

Conventional methods cannot provide early diagnosis which is made possible by ELISA = 1

[1 + 1+ 1= 3 marks]

14. State the objective with which a dairy farm is set up. Describe the essential steps to be followed for dairy farm management.

Ans. Processes and systems that increase yield and improve quality of milk / Selection of good breeds having high yielding potential and resistance to diseases / House to have adequate water and kept disease free / Feeding in a scientific manner with quality and quantity fodder / Storage and transport of milk and products /Regular inspection with proper record keeping / Regular visits of veterinary doctor

(Any six) = ½ × 6 = 3

[3 marks]

15. Write in what context did Darwin use the terms 'fitness[5], 'survival' and 'selection' while elaborating on the mechanism of evolution.

Ans. Fitness refers to reproductive fitness (will leave more progeny) - more survival and hence selected by nature - natural selection = 1 × 3

[3 marks]

16. Name the specific enzyme responsible for nucleotide polymerisation in DNA replication. Write two characteristic features of this enzyme. Name the region on E. coli DNA where this enzyme can initiate replication.

Ans. (i) DNA - dependent DNA polymerase = ½

(ii) The enzyme uses DNA template to catalyse the polymerisation of deoxyribonucleotides = 1

have to catalyse the reaction with high degree of accuracy = 1

origin of replication / ori = ½

[½ + 1 + 1 + ½ = 3 marks]

17. Write the causative agent of filariasis in human. Mention its mode of transmission and symptoms of the disease.

Ans. *Wuchereria* = 1

transmitted to a healthy person through the bite by the female mosquito vector = 1

inflammation of lymphatic vessels of the lower limbs / genital organs , leading to gross deformities = ½ + ½

[1 + 1 + 1 = 3 marks]

18. (a) Name a terminal method to prevent pregnancy in humans.

(b) Describe the procedure of the terminal method carried in human male and female.

Ans. (a) Surgical methods / Sterilisation = 1

(b) Males - Vasectomy , a small part of vas deferens is removed or tied up through a small incision on the scrotum = ½ + ½

Females - Tubectomy , a small part of the fallopian tube is removed or tied up through a small incision in abdomen or through vagina = ½ + ½

[1 + 1 + 1 = 3 marks]

OR

(a) Do all pollen grains remain viable for the same length of time ? Support your answer with two suitable examples.

(b) How are pollen grains stored in pollen banks ? State the purpose of storing pollen grains in these banks.

Ans. (a) No = 1

Examples :

(i) Cereals / rice / wheat - pollen grains / loose viability with in thirty minutes of their release = ½

(ii) In some members of Rosaceae / leguminoseae / Solanacease maintain viability for months = ½

(b) Using cryopreservation techniques / in liquid nitrogen (-196° C) = ½

Maintaining viability / preserving threatened species / preserving commercially important plants / to be used for crop breeding programmes = ½

[1 + 1 + 1 = 3 marks

19. GM plants are useful in many ways. How would you convince farmers to grow GM plants on their field ? Explain giving three reasons.

Ans. Make crop more tolerant to abiotic stresses / Reduce reliance on chemical pesticides / Help to reduce post harvest loses / Increase efficiency of mineral usage / Enhance nutritional value of food ***(Any three)***

[1× 3 = 3 marks]

20. Name and explain the technique that heips in the separation of DNA fragments for DNA recombinant technology experiments. How can these separated DNA fragments be visualised?

Ans. Gel electrophoresis , Since DNA fragments are negatively charged , they move towards anode (under an electric field) through a medium / matrix / agarose gel , The fragments separate (resolve) according to their size through sieving effect provided by agarose gel , The separated DNA fragments can be visualised after staining the DNA with ethidium bromide , followed by exposure to UV radiation

[½ × 6 = 3 marks]

21. When Morgan conducted dihybrid cross on Drosophila like Mendel did with pea plants, the ratios deviated significantly from that of Mendel's F_2 ratio. Write the explanation Morgan and his group gave to the observations they obtained from their experiment.

Ans. - When two genes in a dihybrid cross were located on the same chromosome they did not segregate independently = 1

- The proportion of parental gene combinations were much higher than non parental combinations / recombinants = 1

- Physical association of two genes was termed linkage = 1

[1× 3 = 3 marks]

22. Name the male accessory glands in humans and write their functions.

Ans. (Paired) seminal vescicles , prostate , bulbourethral glands (paired) = ½ × 3

Functions - Secretions constitute the Seminal plasma , which is rich in fructose / calcium and certain enzymes , lubrication of penis = ½ × 3

[1½ + 1½ = 3 marks]

SECTION-D

Q. Nos. 23 is of Four mark

23. Waste Disposal and Waste Management poses a major problem in present times. Generation of garbage and its disposal is a major threat and consequently leads to severe environmental issues. The problem is not with biodegradable and recycled wastes. We realise that the need is to reduce non-biodegradable wastes.

(a) Why is there a great concern of managing non-biodegradable waste in comparison to biodegradable waste ? Explain.

(b) As a member of eco club of your school, suggest any two ways that you will discuss with your fellow members to organise for a "Zero garbage day" once in a month in the school.

Ans. (a) In comparision to biodegradable waste non biodegradable waste pollute the soil and also underground water = 1

Such waste stays for a very long time without degradation in the environment = 1

(b) (i) Avoid use of plastics in packaging for milk and water /

(ii) Avoid use of plastics in packaging for fruits and vegetables /

(iii) Any other correct valid point

(Any two) = 1 + 1

[1 × 4 = 4 marks]

SECTION-E

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

24. What does an Ecological Pyramid indicate ? Explain the three different types of upright Pyramids in nature with the help of an example each.

Ans. It indicates food / energy relationship between organisms at different trophic levels = ½

(i) Pyramid of Number = example grassland ecosystem = ½

↓

Producers are more in number than herbivores carnivores

(ii) Pyramid of Biomass example = forest / tree ecosystem = ½

↓

Producers have more biomass than herbivores / carnivores

//

Pyramid of biomass shows a sharp decrease in biomass in higher trophic levels

(iii) Pyramid of energy = example. grassland ecosystem = ½

↓

Producers have more energy than herbivores / carnivores

[5 marks]

OR

(a) Indiscriminate human activities such as alien species invasion, fragmentation and habitat loss have accelerated the loss of biodiversity. Justify by taking one example for each.

(b) State the importance of (i) IUCN Red data list and (ii) Hot spots in conservation of biodiversity.

Ans. (a) Alien species invasion

When alien species are introduced unintentionally / deliberately for whatever purpose , some of them turn invasive and cause decline / extinction of indigenous species

eg.

- the introduction of African catfish / *Clarias gariepinus* (for aquaculture purpose) poses a threat to indigenous catfishes in our rivers
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indigenous species

Fragmentation

When large habitats are broken up into small fragments due to various human activities - mammals / birds requiring large territories and certain animals with migratory habits are badly affected

Habitat Loss

The Amazon rain forest is being cut and cleared for cultivating soyabeans / conversion to grasslands for raising cattle

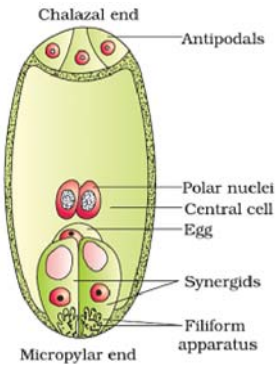
(b) (i) Provides information of extinction of species

(ii) Regions with very high levels of species richness , high degree of endemism / species confined to that region and not found anywhere else are identified which need to be conserve all priority basis.

25. (a) Explain the development of female gametophyte from a megaspore mother cell in an angiosperm.

(b) Draw a labelled diagram of a fully developed embryo sac.

Ans. (a) MMC (Megaspore mother cell - 2n) $\xrightarrow{\text{Meiosis}}$ 4 megaspores (n) , $\xrightarrow{\text{3 degenerate}}$ one functional megaspore (n) , $\xrightarrow{\text{mitosis}}$ 2 nuclei (n) move to opposite poles, $\xrightarrow{\text{2 sequential mitosis}}$ 8 nuclei stage of embryo sac (n) , $\longrightarrow$ 6 of 8 nuclei develop cell wall , remaining two nuclei in large central cell = ½ × 6



(Any 4 correct labellings) = ½ × 4

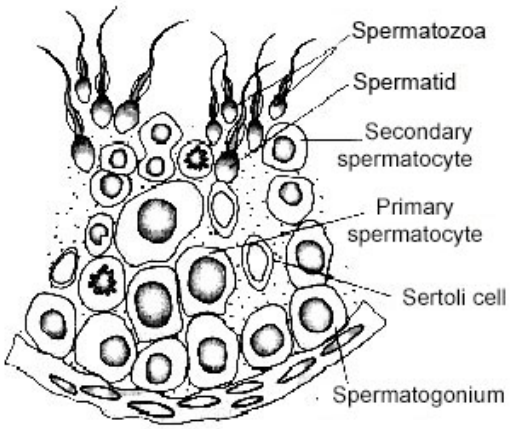
[3 + 2 = 5 marks]

OR

(a) Draw a diagrammatic sectional view of a seminiferous tubule (enlarged) of human male and label (i) Spermatogenium, (ii) Sertoli cell, (iii) Primary spermatocyte. Write the function of each labelled part.

(b) Differentiate between spermatogenesis and spermiogenesis.

Ans. (a)



***(Any three correct labellings*) = ½ × 3**

Spermatogonium - multiply by mitotic division to increase in number = ½

Sertoli cells - provide noursihment to developing sperms = ½

Primary spermatocytes - undergo meiosis to form haploid secondary spermatocytes = ½

(b) Spermatogenesis - Development of sperms in testis from spermatogonium = 1

Spermiogenesis - maturation of spermatids into spermatozoa / sperms = 1

26. (a) How are polygenic inheritance and multiple allelism different ? Explain with the help of an example each.

(b) List the criteria a chemical molecule must fulfill to be able to act as a genetic material.

Ans. (a)

Polygenic Inheritance	**Multiple allelism**
Controlled by three or more genes	More than two alleles govern the same character
Example	Example
A - B - C gene control human skin colour	ABO blood grouping in humans = 2

(b)
- It should be able to generate its replica / replication
- It should be chemically and structurally stable
- It should provide the scope for slow changes / mutation that are required for evolution
- It should be able to express itself in the form of a Mendelian characters.

(Any three) = 1 × 3

[2 + 3 = 5 marks]

OR

State the hypothesis proposed by Oparin and Haldane. How was it experimentally proved by S.L. Miller ? Explain.

Ans. The first form of life could have come from pre-existing non living organic molecules (RNA , protein etc.) , and that formation of life was preceded by chemical evolution / formation of diverse organic molecule from inorganic constituents , the condition on earth were high temperature (Volcanic storms) reducing atmosphere (containing CH_4, NH_3, etc) , Miller in his experiment created electric discharge in a closed task , containing CH_4 , H_2 , NH_3 and water vapour at 800° C , and observed the formation of aminoacids / organic compounds , which supported chemical evolution.

[½ ×10 = 5 marks]

Question Paper Code 57/1/3

SECTION – A

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

1. Name the two enzymes that are essential for constructing a recombinant DNA.

Ans. Restriction enzymes / polymerase enzymes / ligase

(Any Two) = ½ + ½

[1 mark]

2. Name the host where fertilisation occurs in the life cycle of Plasmodium.

Ans. Female Anopheles Mosquito

[1 mark]

3. Name the disorder caused due to the absence of one of the X-chromosomes in a human female.

Ans. Turner's syndrome

[1 mark]

4. List any two characters of Pea plants used by Mendel in his experiments other than height of the plant and the colour of the seed.

Ans. Flower colour / Flower position / Pod shape / Pod colour / Seed shape ***(Any two)*** = ½ + ½

[1 mark]

5. Provide an example each of single celled organisms which reproduce by :

(i) binary fission

(ii) budding

Ans. (i) Amoeba / Paramoecium = ½

(ii) Yeast = ½

SECTION-B

6. "Niche is a part of a habitat." Explain with the help of an example.

Ans. A single habitat may have different kind of organisms in it but within the habitat every organism has defined range of condition that it can tolerate , resources it utilises and plays a distinct functional role - all these together comprise its niche , for example pond is a habitat for variety of plants and animals , but in it Gambusia fish is found in its peripheral parts which is its niche. ***(Any other suitable example with explanation)*** = ½ × 4

[2 marks]

7. For a layman, both apples and mangoes are 'fruits'. Do you agree ? Give reasons in support of your answer.

Ans. No = 1

Apple - thalamus , (false fruit) = ½

Mango - Ovary , (true fruit) = ½

[1 + 1 = 2 marks]

8. State the role of T-lymphocytes and B-lymphocytes in developing acquired immunity against certain diseases.

Ans. T-lymphocytes - help B-lymphocytes to produce antibodies / mediate CMI (Cell Mediated Immunity) = 1

B-lymphocytes - produce antibodies into blood to fight antigens = 1

[1 + 1 = 2 marks]

9. Name and state the effect of a drug that is often medically prescribed, but its overuse leads to drug dependence and drug abuse.

Ans. Morphine / barbiturates / amphetamines / benzodiazepines / lysergic acid diethyl amides (LSD) = 1

Affects the central nervous system / acts as a pain killer / acts as a sedative / treats depression / treats insomnia / creates hallucinogenic effect

(Any two) = ½ + ½

[1 + 1 = 2 marks]

10. State the roles of AUG codon at 5' end and UAG at 3' end of a certain m-RNA during translation.

Ans. AUG codon at 5' end - start codon (for translation) / codes for methionine = 1

UAG codon at 3' end - stop codon (for translation) / terminate polypeptide chain= 1

[1 + 1 = 2 marks]

OR

'Degenerate' and 'Universal' are salient features of a genetic code. Explain.

Ans. Degenerate - Some aminoacids are coded by more than one codon = 1

Universal - one codon shall code for the same amino acid in all organisms (UUU would code for phenylalanine from bacteria to human beings) = 1

[1 + 1= 2 marks]

11. Expand 'ELISA'. Why is this method preferred over conventional methods of diagnosis of diseases ?

Ans. Enzyme Linked Immunosorbent Assay = 1

Infection by pathogen detected by the presence of antigens (protein , glycoprotein etc.) / antibodies synthesised against the pathogen = 1

Conventional methods cannot provide early diagnosis which is made possible by ELISA = 1

[1 + 1+ 1= 3 marks]

12. State the objective with which a dairy farm is set up. Describe the essential steps to be followed for dairy farm management.

Ans. Processes and systems that increase yield and improve quality of milk / Selection of good breeds having high yielding potential and resistance to diseases / House to have adequate water and kept disease free / Feeding in a scientific manner with quality and quantity fodder / Storage and transport of milk and products /Regular inspection with proper record keeping / Regular visits of veterinary doctor

(Any six) = ½ × 6 = 3

[3 marks]

13. Are humming birds and fish regulators or con formers ? Give reasons in support of your answer.

Ans. Conformers = ½

Heat loss or gain is a function of surface area = ½

Since small animals have a larger surface area (relative to their volume) , they tend to lose body heat very fast when it is cold outside , they have to expend much energy , to generate body heat through metabolism = ½ × 4 = 2 / (cannot maintain a constant body temperature)

[1 + 2 = 3 marks]

14. (a) Why is Taq polymerase used instead of ordinary DNA polymerase in polymerase chain reaction (PCR) ? Name the source organism of Taq polymerase.

(b) What is PCR used for ?

Ans. (a) It is thermostable / remains active during the high temperature induced denaturation of (double stranded) DNA , (bacterium) Thermus acquaticus 1

(b) To obtain multiple copies of the gene (or DNA) of interest = 1

[2 + 1 = 3 marks]

15. (a) What is green revolution ? Mention the steps that led to it.

(b) Name the scientist whose contribution led to development of semi-dwarf wheat varieties in India.

Ans. (a) Dramatic increase in food production (wheat and rice) during the mid 1960's is termed as Green Revolution = 1

Various plant breeding techniques / better management practices / use of agrochemicals (fertilizers and pesticides) ***(Any two)*** = ½ + ½

(b) Norman E.Borlaug = 1

[1 + 1 + 1 = 3 marks]

16. GM plants are useful in many ways. How would you convince farmers to grow GM plants on their field ? Explain giving three reasons.

Ans. Make crop more tolerant to abiotic stresses / Reduce reliance on chemical pesticides / Help to reduce post harvest loses / Increase efficiency of mineral usage / Enhance nutritional value of food ***(Any three)***

[1× 3 = 3 marks]

17. Explain with the help of an example each, male and female heterogamety mechanisms of sex determination.

Ans. Male produces 2 different types of gametes

XO - e.g. grasshopper /

XY e.g. human , it is the type of sperm fertilising the egg that determine the sex of the offspring = 1 + ½

Female produces 2 different types of gametes

ZW eg. : Birds , it is the type of egg getting fertilised with the sperm that determine the sex of the chick = 1 + ½

[1½ + 1½ = 3 marks]

18. Name the male accessory glands in humans and write their functions.

Ans. (Paired) seminal vescicles , prostate , bulbourethral glands (paired) = ½ × 3

Functions - Secretions constitute the Seminal plasma , which is rich in fructose / calcium and certain enzymes , lubrication of penis = ½ × 3

[1½ + 1½ = 3 marks]

19. When Morgan conducted dihybrid cross on Drosophila like Mendel did with pea plants, the F_2 ratios deviated significantly from that of Mendel's F_2 ratio. Write the explanation Morgan and his group gave to the observations they obtained from their experiment.

Ans. - When two genes in a dihybrid cross were located on the same chromosome they did not segregate independently = 1

- The proportion of parental gene combinations were much higher than non parental combinations / recombinants = 1

- Physical association of two genes was termed linkage = 1

[1× 3 = 3 marks]

20. Some microbes act as very good biofertilisers. Explain with the help of three suitable examples.

Ans. Rhizobium - Symbiotically Fix atmospheric nitrogen into organic forms which can be used by the plant as nutrients

Azospirullum / Azotobacter - free living bacteria fix atmospheric nitrogen

Glomus / Fungi - Symbiotic with plants absorbs phosphorus from soil and passes it to plant

Cyanobacteria / Anabaena / Nostoc / Oscillatoria - fix atmospheric nitrogen in acquatic and terrestrial environment

Blue green algae - add organic matter to soil and increase soil fertility

(Any three) = 1× 3

[3 marks]

21. (a) Name a terminal method to prevent pregnancy in humans.

(b) Describe the procedure of the terminal method carried in human male and female.

Ans. (a) Surgical methods / Sterilisation = 1

(b) Males - Vasectomy , a small part of vas deferens is removed or tied up through a small

incision on the scrotum = ½ + ½

Females - Tubectomy , a small part of the fallopian tube is removed or tied up through a small incision in abdomen or through vagina = ½ + ½

[1 + 1 + 1 = 3 marks]

OR

(a) Do all pollen grains remain viable for the same length of time ? Support your answer with two suitable examples.

(b) How are pollen grains stored in pollen banks ? State the purpose of storing pollen grains in these banks.

Ans. (a) No = 1

Examples :

(i) Cereals / rice / wheat - pollen grains / loose viability with in thirty minutes of their release = ½

(ii) In some members of Rosaceae / leguminoseae / Solanacease maintain viability for months = ½

(b) Using cryopreservation techniques / in liquid nitrogen (-196° C) = ½

Maintaining viability / preserving threatened species / preserving commercially important plants / to be used for crop breeding programmes = ½

[1 + 1 + 1 = 3 marks

22. Write in what context did Darwin use the terms 'fitness', 'survival' and 'selection' while elaborating on the mechanism of evolution.

Ans. Fitness refers to reproductive fitness (will leave more progeny) - more survival and hence selected by nature - natural selection = 1 × 3

[3 marks]

Section-D

23. Waste Disposal and Waste Management poses a major problem in present times. Generation of garbage and its disposal is a major threat and consequently leads to severe environmental issues. The problem is not with biodegradable and recycled wastes. We realise that the need is to reduce non-biodegradable wastes.

(a) Why is there a great concern of managing non-biodegradable waste in comparison to biodegradable waste ? Explain.

(b) As a member of eco club of your school, suggest any two ways that you will discuss with your fellow members to organise for a "Zero garbage day" once in a month in the school.

Ans. (a) In comparision to biodegradable waste non biodegradable waste pollute the soil and also underground water = 1

Such waste stays for a very long time without degradation in the environment = 1

(b) (i) Avoid use of plastics in packaging for milk and water /

(ii) Avoid use of plastics in packaging for fruits and vegetables /

(iii) Any other correct valid point

(Any two) = 1 + 1

[1 × 4 = 4 marks]

Section-E

24. (a) How are polygenic inheritance and multiple allelism different ? Explain with the help of an example each.

(b) List the criteria a chemical molecule must fulfill to be able to act as a genetic material.

Ans. (a)

Polygenic Inheritance	**Multiple allelism**
Controlled by three or more genes	More than two alleles govern the same character
Example	Example
A - B - C gene control human skin colour	ABO blood grouping in humans = 2

(b) - It should be able to generate its replica / replication

- It should be chemically and structurally stable
- It should provide the scope for slow changes / mutation that are required for evolution
- It should be able to express itself in the form of a Mendelian characters.

(Any three) = 1 × 3

[2 + 3 = 5 marks]

OR

State the hypothesis proposed by Oparin and Haldane. How was it experimentally proved by S.L. Miller ? Explain.

Ans. The first form of life could have come from pre-existing non living organic molecules (RNA , protein etc.) , and that formation of life was preceded by chemical evolution / formation of diverse organic molecule from inorganic constituents , the condition on earth were high temperature (Volcanic storms) reducing atmosphere (containing CH_4, NH_3, etc) , Miller in his experiment created electric discharge in a closed task , containing CH_4 , H_2 , NH_3 and water vapour at 800° C , and observed the formation of aminoacids / organic compounds , which supported chemical evolution.

[½ ×10 = 5 marks]

25. What does an Ecological Pyramid indicate ? Explain the three different types of upright Pyramids in nature with the help of an example each.

OR

(a) Indiscriminate human activitie Ans. It indicates food / energy relationship between organisms at different trophic levels = ½

(i) Pyramid of Number = example grassland ecosystem = ½

↓

Producers are more in number than herbivores carnivores

(ii) Pyramid of Biomass example = forest / tree ecosystem = ½

↓

Producers have more biomass than herbivores / carnivores

//

Pyramid of biomass shows a sharp decrease in biomass in higher trophic levels

(iii) Pyramid of energy = example. grassland ecosystem = ½

↓

Producers have more energy than herbivores / carnivores

[5 marks]

OR

(a) Indiscriminate human activities such as alien species invasion, fragmentation and habitat loss have accelerated the loss of biodiversity. Justify by taking one example for each.

(b) State the importance of (i) IUCN Red data list and (ii) Hot spots in conservation of biodiversity.

Ans. (a) Alien species invasion

When alien species are introduced unintentionally / deliberately for whatever purpose , some of them turn invasive and cause decline / extinction of indigenous species

eg.

- the introduction of African catfish / *Clarias gariepinus* (for aquaculture purpose) poses a threat to indigenous catfishes in our rivers
- The Nile perch introduced into lake Victoria in East Africa led to the extinction of more than 200 species of Cichlid fish in the lake
- Carrot grass / Parthenium , Lantana , Water hyacinth / Eichhornia poses a threat to indigenous species

Fragmentation

When large habitats are broken up into small fragments due to various human activities - mammals / birds requiring large territories and certain animals with migratory habits are badly affected

Habitat Loss

The Amazon rain forest is being cut and cleared for cultivating soyabeans / conversion to grasslands for raising cattle

(b) (i) Provides information of extinction of species

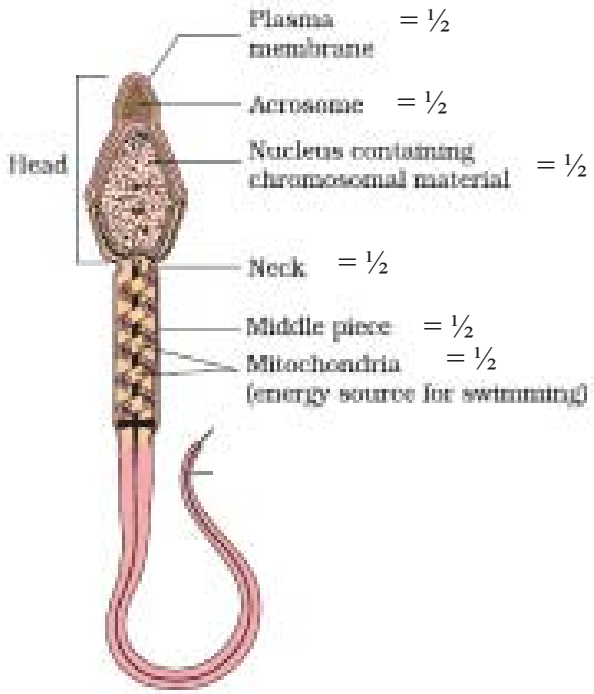
(ii) Regions with very high levels of species richness , high degree of endemism / species confined to that region and not found anywhere else are identified which

need to be conserve all priority basis.

26. (a) Draw a diagram of a human sperm. Label the different components in its head and middle piece region.

(b) Explain the process of fertilisation in human female.

Ans. (a)



Any 6 correct labelling in head and middle piece = ½ × 6

(b) A sperm comes in contact with zona pellucida layer of ovum and induces changes in the membrane that block the entry ofadditional sperms, secretions of acrosome help the sperm to enter into cytoplasm of ovum (through zona pellucida and plasm membrane) , this induces completion of unequal meiotic division of secondary oocyte which leads to formation of a second polar body and haploid ovum , soon haploid nucleus of sperm and ovum fuse to form zygote (fertilization) = ½ × 4

[3 + 2 = 5 marks]

OR

(a) Draw a schematic transverse section of an anther of an angiosperm and label the following parts :

(i) Sporogenous tissue

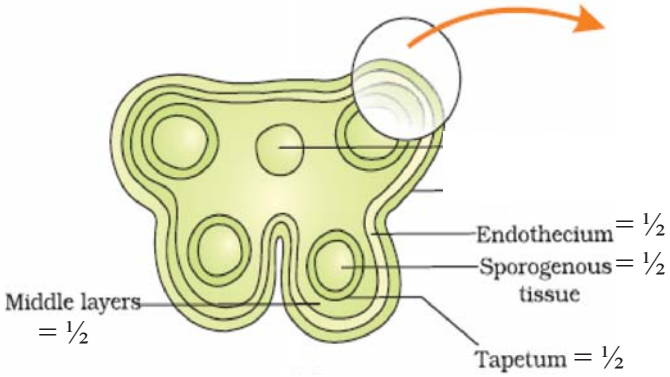
(ii) Tapetum

(iii) Endothecium

(iv) Middle layers

(b) Describe the special characteristic features of wind pollinated flowers.

Ans. (a)



(b) Pollen grain light , nonsticky , well exposed stamens , feathery stigma , a single ovule in each ovary , numerous flowers packed into infloresance , flowers non-colourful

(Any three) = 1 × 3

[2 + 3 = 5 marks]