Confidential
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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.

Question Paper Code 57/B

SECTION – A

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

1. Why are cucurbits categorized as monoecious plants ?

Ans Plant bisexual /Male and Female flowers borne on the same plant

[1 Mark]

2. Write the genotypic ratio of F_2 generation in a monohybrid cross that was carried out by Mendel in a pea plant.

Ans 1:2:1- Genotypic ratio

[1 Mark]

3. Mention the patterns of inheritance exhibited by human ABO blood group.

Ans Multiple allelism, Co-dominance = ½ + ½

[1 Mark]

4. Why is secondary immune response more intense than the primary response in humans ? Give a reason.

Ans Memory cells produced from the first encounter , (produce intensified, response with subsequent encounter with same pathogen) produce protein / antibodies. = ½ + ½

[1 Mark]

5. Write one structural difference between the human functional insulin and proinsulin.

Ans Proinsulin has an additional 'C' peptide chain, human functional insulin has only 'A' and ' B' chains. = ½ + ½

[1 Mark]

SECTION - B

Q Nos. 6-10 are of two marks each

6. State any two characteristics of the tapetum, present in the microsporangium of an angiosperm. Why are non-viable pollen grains seen to develop in a microsporangium where tapetum is damaged or under developed ? Give a reason.

Ans Dense cytoplasm , with more than one nucleus = ½ + ½

damaged tapetum cannot nourish the developing pollen grains = 1 [2 Marks]

7. Write one difference each between

(a) Template strand and coding strand in a transcription unit of DNA.

(b) Exon and intron gene sequences.

Ans (a) Template strand → polarity 3 ' → 5' / code for mRNA = ½

Coding Strand → Polarity 5' - 3' / does not code for anything / all reference point while defiining a transcription unit is made from it = ½

(b) In the immature / unprocessed RNA the coding / expressed sequence - Exon = ½

Intron- The non-coding unexpressed (intervening) sequence in the immature / unprocessed RNA = ½ × 4

[2 Marks]

8. List the symptoms of Ascariasis. Mention any two preventive measures you would suggest to a local population against contracting the disease.

Ans Symptoms- internal bleeding, muscular pain, fever, anaemia , blockage of intestinal passage

(Any two) = ½ + ½

Prevention - By avoiding open defecation, avoid drinking and eating contaminated water / vegetables / fruits, hygeinic habits to be adopted as it spread through contaminated soil/ water/ foods

(Any two) = ½ + ½

[2 Marks]

OR

How is innate immunity different from acquired immunity ? Write any two differences.

Innate immunity	**Acquired Immunity**
-By birth	-Develops after birth when body encounters a pathogen
-Non Specific	-Pathogen specific = 1 × 2 = 2

9. What is Aneuploidy ? Write the karyotypes of an autosomal and sex chromosomal disorders in humans.

Ans Aneuploidy-Failure of segregation / separation of chromatids during cell division resulting in gain or loss of a chromosome = 1

Autosomal - (Down syndrome) 46 + 1 / extra 21st chromosome = ½

Sex Chromosomal disorder - (Turner's syndrome) 45 with XO / (Klinefelter' syndrome) 47 with XXY = ½

[2 Marks]

10. "Pyramid of number can be upright as well as inverted." Explain with the help of one example of each.

Ans Upright - ln a grass land producers are more in number than herbivores,and herbivores are more than Carnivores = ½ + ½

Inverted - On a big tree, a large number of insects feed up on the tree / many birds feeding on insects on the tree = ½ + ½

SECTION - C

Q Nos. 11-22 are of three marks each

11. Why many flowering plants have developed devices to discourage self-pollination ? Describe any two such out breeding devices in plants.

Ans To avoid in breeding depression/to encourage cross pollination , = 1

i) pollen is released before the stigma becomes receptive or stigma becomes receptive much before the release of pollen.

ii) the anther and stigma are placed at different positions so that the pollen cannot come in contact with the stigma of the same flower.

iii) self-incompatibility is a genetic mechanism and prevents self-pollination (from the same flower or other flowers of the same plant) from fertilising the ovules by inhibiting pollen germination or pollen tube growth in the pistil.

iv) the production of unisexual flowers- If both male and female flowers are present on the same plant such as castor and maize(monoecious) ***(Any two)*** = 1+1

12. Justify the following statements :

(a) Banana is categorized as true fruit and a parthenocarpic fruit.

(b) Apple fruit develops only after fertilisation but is referred to as a false fruit.

(c) Castor seed is dicotyledonous and albuminous.

Ans a) Develops from ovary, but without fertilization = ½ + ½

b) Ovary not involved in fruit formation /Thalamus contributes towards fruit formation, but only after fertilization = ½ + ½

c) has two cotyledons , and a persistent endosperm = ½ + ½

OR

"Seeds offer several advantages to angiosperms". Explain

i) better adaptive strategies for dispersal to new habitats and help the species to colonise in other areas,

ii) have sufficient food reserves, young seedlings are nourished until they are capable of photosynthesis on their own.

iii) The hard seed coat provides protection to the young embryo.

iv) Being products of sexual reproduction, they generate new genetic combinations leading to variations. (Any three) = 1 × 3

[3 Marks]

13. Explain the role of t-RNA during translation and where does peptide bond formation occurs in a prokaryote ?

Ans t-RNA are specific for each amino acid , its anticodon loop show base complimentary to the code of amino acid, has an amino acid acceptor end that binds with specific amino acid, during translation t-RNA linked to the amino acid binds with appropriate codon on m-RNA, thus t-RNA reads the code and arranges amino acids for proteins accordingly = ½ × 5 = 2 ½

On the large subunit of ribosome = ½

[3 Marks]

14. How does Darwin's theory of natural selection explain the increase in the number of antibiotic resistant pests in our ecosystem ?

Ans Pests have (built in) variations in terms of their ability to survive in a given environment, a change in the environment, in the form of an antibiotic would bring out (select) , that part of population that can survive under new environment, in due course of time the variant/ resistant population reproduces/ outgrows, the other, and appears as an antibiotic resistant pest species = ½ × 6

[3 Marks]

15. Describe the various steps of Griffith's experiment that led to the conclusion of the 'transforming principle'.

Ans (F.Griffith) used *Streptococcus pneumoniae* (bacterium responsible for pneumonia) , S- strain (producing shiny colonies) when injected into mice the mice develop pneumonia and die , R- strain(producing rough colonies) when injected into mice the mice do not develop pneumonia,Griffith killed S-strain with heat and injected into mice & mice live, he then mixed heat killed S-strain with live R-strain and mice die,recovered living S-bacteria from dead mice concluding that R-strain had been transformed by heat killed S-strain = ½ × 6

[3 Marks]

16. What is a cloning vector ? Describe any two features that are required to facilitate cloning into a vector.

Ans Vectors that help easy linking of foreign DNA, and selection of recombinants from non-recombinants = 1

(i) ***Origin of replication (ori)* :** This is a sequence from where replication starts and any piece of DNA when linked to this sequence can be made to replicate within the host cells,controls copy number of the linked DNA

(ii) ***Selectable marker* :** In addition to 'ori' the vector requires a selectable marker, which helps in identifying and eliminating nontransformants and selectively permitting the growth of the transformants.

(iii) ***Cloning sites:*** In order to link the alien DNA, the vector needs to have very few preferably single, **recognition sites** for the commonly used restriction enzymes.

(iv) ***Vectors for cloning genes in plants and animals* :** bacteria and viruses have been used for ages for delivering of genes to transform eukaryotic cells and force them to do what the bacteria or viruses want. (Any Two) = (½ + ½) × 2

[1 + 2 = 3]

17. Name and describe the technique that helps in separation and isolation of DNA fragments for biotechnology experiment.

Ans Gel - electrophoresis , cutting of DNA by restriction endonucleases results in fragments of DNA , DNA fragments are negatively charged molecules, they can be separated by forcing them to move towards the anode , under an electric field through agarose , DNA fragments separate (resolve) according to their size through sieving effect (provided by the agarose gel.) = ½ ×6

[3 Marks]

18. What are Genetically Modified Organisms (G.M.O.) ? Write the usefulness of GM plants.

Ans Plants/bacteria/ fungi /animals whose genes have been altered = 1

(i) more tolerant to abiotic stresses (cold, drought, salt, heat).

(ii) reduced reliance on chemical pesticides (pest-resistant crops).

(iii) reduced post harvest losses.

(iv) increased efficiency of mineral usage (this prevents early exhaustion of fertility of soil).

(v) enhanced nutritional value of food, e.g.. Vitamin 'A' enriched rice (Any two) = 1 + 1

[1 + 2 = 3]

19. (a) Since the origin and diversification of life on earth there had been five episodes of mass extinctions. How is the sixth extinction presently in progress, different from the previous episodes and why ?

(b) Mention any two negative effects of loss of biodiversity in the region where it occurs.

Ans (a) The current extinction rate are estimated to be 100 to 1000 times faster than in the pre-human times , because of human activities = ½ + ½

(b) (i) Decline in plant production

(ii) Lowered resistance to environmental perturbations such as drought

(iii) Increased variability in certain ecosystem processes such as plant productivity / water use / pest and disease cycles (Any two) = 1+ 1

20. Increasing amounts of inorganic fertilisers and pesticides are being used for enhancing crop yield in our country. List any two current problems arising from this practice. Suggest a method that can help in overcoming these problems and how.

Ans. Fertilisers and pesticides are

(i) toxic to important components of the soil ecosystem

(ii) causes biomagnification in the terrestrial ecosystem

(iii) eutrophication in an aquatic ecosystem (Any two) = 1 + 1

Integrated organic farming which is a cyclical / zero waste procedure where waste product of one process are cycled as nutrients for other process allowing maximum utilisation of resources and increase efficiency of production / inclding dairy farming / water harvesting / composting and agriculture in a chain of process (Any one) = 1

21. How does tissue culture help in growing explants into independent plants ? Write any two advantages of growing crops by tissue culture.

Ans. Regeneration of whole plants from explants/ any part of a plant taken out and grown in a test tube, under sterile conditions in special nutrient media (containing a carbon source such as sucrose and also inorganic salts, vitamins, amino acids and growth regulators) = ½ + ½

(i) recovery of healthy plants from diseased plants

(ii) thousands of plants can be produced/ micropropogation

(iii) genetically identical to the original plant from which they were grown / somaclones

(Any two) = 1 + 1

22 Describe the Secondary/Biological treatment given to the sewage water before it can be released into natural water bodies.

Ans. The primary effluent is passed into large aeration tanks where it is constantly agitated mechanically , air is pumped into it,allows vigorous growth of useful aerobic microbes into flocs,microbes consume the major part of the organic matter in the effluent significantly reducing theBOD (biochemical oxygen demand) of the effluent , the effluent is then passed into a settling tank where the bacterial 'flocs' are allowed to sediment (This sediment is called activated sludge) , a small part of the activated sludge is pumped back into the aeration tank to serve as the inoculum , the remaining major part of the sludge is pumped into large tanks called anaerobic sludge digesters. (Here, other kinds of bacteria , which grow anaerobically, digest the bacteria and the fungi in the sludge.) During this digestion, bacteria produce a mixture of gases such as methane, hydrogen sulphide and carbon dioxide. (These gases form biogas and can be used as source of energy as it is inflammable.) (The effluent from the secondary treatment plant is generally released into natural water bodies) = ½ × 6

SECTION - D

Q No. 23 is of four marks

23. Good air quality is one of the important factors for healthy life for young and old alike. Vehicular pollution is one of the major causes of deterioration of air quality in big cities.

(a) List any two ways in which you can try to bring in awareness amongst the students of your age group to reduce air pollution in your city.

(b) Why is the Government promoting use of CNG/unleaded Petrol as a fuel for public and private cars, and buses etc. ? Explain.

Ans. a) organising programmes (Street play,debates , slogan writing , drawing / painting events etc.)in the school and outside the school for community to create awareness drive related to the ill effect of pollution = 1

b) providing opportunity for hands on experiments/suveys to help students to internalise the actual problems and then influence the adults around them = 1

Air pollution problems are becoming so serious that it is causing serious health problems .and also a public interest litigation (PIL) was filed in the Supreme Court of India. After being censured very strongly by the Supreme Court, under its directives, the government was asked to take preventive measures within a specified time periodfor reducing emission of poisonous gases and reduce air pollution / CNG is less expensive / CNG burns with no residue / CNG is non polluting / CNG cannot be adulterated like petrol and diesel (Any two) = 1 + 1

[4 Marks]

SECTION - E

Q Nos. 24-26 are of five marks each

24. (a) Explain with the help of an example each, the following interactions that arise between the organisms living in a particular habitat.

(i) Predation

(ii) Competition

(b) "Evolution of 'mutualists' is tightly linked. " Justify with the help of an example.

Ans. (a) (i) Predation ; Predators act as conduit of energy in the habitat / keep the prey population under check / help to maintain healthy balance among populations in a habitat / reduce intenstiy of competition among prey species (help as bio-control agents) = ½

eg - Star fish Pisaster / sparrow eating worms / any other appropriate answer = ½

(ii) Competition : Here closely related species compete with same resources that are limited , which means fitness of one species is significantly reduced in presence of another species, = ½

eg. flamingo and fishes in water compete for the same food source - Zooplankton in the water / any other suitable example = ½

(b) Many species of fig trees have one - to one relationship with the pollinator species of wasp. (i.e. a given specification of fig tree can be pollinated by its partners wasp only) , as the female wasp uses the fruit both for egg laying as well as nourishing the larvae on the developing seeds , wasp pollinates the fig inflorences while searching for suitable egg laying site (or any other suitable example) = ½ × 6

OR

How does the primary succession occur and progress in a newly created pond ? Give one example each of the plants appearing at different stages of succession. What would you call this type of succession ?

Ans. • It progresses from hydric to mesic condition = 1

[5 Marks]

- Pioneer species are - phytoplanktons = ½
- Replaced with time - small free floating angiosperm = ½
- next - Rooted hydrophytes / seeds / grass = ½
- Finally - Trees = ½
- Climax - Forest = ½
- as with time water body is converted into land = ½
- It is a Hydrach succession = 1

[5 marks]

25. (a) "The female gametophyte of an angiosperm is a seven celled, eight nuclei containing structure."Justify.

(b) Explain double fertilization in angiosperms.

Ans. (a) Eight nuclei in mature Embryo sac

- Three cell form an egg apparatus , consisting of one egg cell and two synergids = 1
- Three cells at chalazal end called antipodals = 1
- A large central cell with two polar nuclei = 1

(b) After entering a synergid, pollen releases two male gametes into the cytoplasm = ½

- one male gamete fuses with egg nucleus and completes syngamy resulting in zygote = ½
- other male gamete fuses with the two polar nuclei located in the central cell to produce a triploid primary endosperm nucleus this is called triple fusion = ½
- since two types of fusions take place → double fertilisastion = ½

[5 marks]

OR

(a) Differentiate between spermatogenesis and oogenesis in humans with respect to :

(i) time of their initiation; (ii) number of gametes produced by each primary spermatocyte or primary oocyte; (iii) size of the gametes produced.

(b) Write the role of F.S.H. and L.H. in regulation of spermatogenesis and oogenesis.

Ans. (a)

	Spermatogenesis	**Oogenesis**
(i)	At puberty	at the embryonic stage
(ii)	four gametes	one gamete
(iii)	much smaller	larger = 1 × 3

(b) Spermatogenesis

- LH - Leydig's cell stimulates secretion of androgens = ½
- FSH - Sertoli cells - factor helping spermiogenesis = ½

Oogenesis

- LH - Ovulation , maintenance of endometrium = ½

- FSH - Stimulates follicular growth , secretion of estrogen = ½

[5 marks]

26. Describe the experiment conducted by S.L. Miller and write its contribution towards origin of life on earth.

Ans. (S.L. Miller) created electric discharge in a closed flask, containing CH_4, H_2, NH_3, and water vapour, at 800°C in a laboratory = ½ × 6

He observed formation of organic compound / amino acids = 1

He proved the theory of abiogenesis / the first form of life arose slowly through evolutionary process from non-living molecules / first form of life could have come from pre-existing non-living organic molecules & formation of life was preceded by chemical evolution / formation of of diverse organic molecules from inorganic constituents = 1

OR

Write any five salient features of genetic code.

Ans. (i) The codon is triplet. (61 codons code for amino acids and 3 codons do not code for any amino acids, hence they function as stop codons)

(ii) One codon codes for only one amino acid / it is unambiguous and specific.

(iii) Some amino acids are coded by more than one codon / the code is degenerate.

(iv) The codon is read in mRNA in a contiguous fashion / There are no punctuations.

(v) The code is nearly universal / from bacteria to human UUU would code for Phenylalanine

(vi) AUG has dual functions / It codes for Methionine (met) and it also act as initiator codon.

(Any Five) = 1 × 5

[5 marks]