

# Senior School Certificate Examination

March 2018

**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 substitute.
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 marks each**

**1. Name the process of formation of male gametes in flowering plants.**

Ans. Microsporogenesis / mitosis of generative cell of microspore =  $\frac{1}{2} + \frac{1}{2}$

[1 Mark]

**2. List the two ways that have been used and resulted in Sahiwal cows in Punjab from ancestral wild cows.**

Ans. Artificial Selection , Cross breeding =  $\frac{1}{2} + \frac{1}{2}$

[1Mark]

**3. Give an example of an organism that exhibits XO-type of sex determination. What is this sex determination designated as ?**

Ans. Grasshopper/ any other correct example , Male heterogamety =  $\frac{1}{2} + \frac{1}{2}$

[1 Mark]

**4. How does *Gambusia* fish help in controlling the spread of Malaria ?**

Ans. *Gambusia* feeds on larvae of (Anopheles) mosquitoes = 1

[1 Mark]

**5. Name the first discovered restriction endonuclease and state its specific role.**

Ans. Hind II , cuts DNA molecule at particular point by recognising a specific sequence of six base pairs / recognition sequence of Hind II =  $\frac{1}{2} + \frac{1}{2}$

[1 Mark]

## SECTION B

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

**6. (a) State the primary requirement to ensure cross breeding experiments in plants.**

**(b) Name the techniques which help to achieve this requirement.**

Ans. (a) Only desired pollen grains are used , (pollinated) stigma is protected =  $\frac{1}{2} + \frac{1}{2}$

(b) Emasculation , bagging =  $\frac{1}{2} + \frac{1}{2}$

[2 Marks]

**7. What is a cistron ? Why is the structural gene in a transcription unit of eukaryotes called monocistronic and that in prokaryotes/bacteria called polycistronic ? Give reasons.**

Ans. -A segment of DNA coding for a polypeptide = 1  
-In Eukaryotes the transcriptional unit have interrupted coding sequences / codes for one polypeptide only /exons and non coding sequences / introns =  $\frac{1}{2}$   
- In Prokaryotes structural genes have many continuous cistrons /coding sequences =  $\frac{1}{2}$

[2 Marks]

**8. How is e-waste generated ? Suggest a method for disposal of e-waste .**

Ans. Irreparable computers / electronic goods / mobile etc =1  
- recycle /incinerate / landfill = 1

[2 Marks]

**9. Name the flowering plant which employs ‘sexual deceit’ to get pollinated by a species of bee. Write how pollination occurs in this flower ?**

Ans. *Ophrys* =  $\frac{1}{2}$

One of its petal resembles the female bee (in size marking and colour) attracting the male bee , which pseudocopulates and gets dusted with pollen from the flower , when the same male bee pseudo- copulates with another flower pollination occurs =  $\frac{1}{2} \times 3$

[2 Marks]

**10. Differentiate between Commensalism and Mutualism. Give an example of each from the plant kingdom.**

Ans. Commensalism- This is an interaction in which one species benefits and the other is neither harmed nor benefitted =  $\frac{1}{2}$

e.g orchid / epiphytes growing on a tree =  $\frac{1}{2}$

Mutualism -It is an interaction between two species where both are benefitted =  $\frac{1}{2}$

e.g Lichens / mycorrhizae =  $\frac{1}{2}$

[2 Marks]

**OR**

**Expand GPP and NPP. Differentiate between the two.**

Ans. <b>Gross Primary Productivity</b> = $\frac{1}{2}$	<b>Net Primary Productivity</b> = $\frac{1}{2}$
It is the rate of production of organic matter during photosynthesis in an ecosystem = $\frac{1}{2}$	GPP-Respiratory Loss = NPP = $\frac{1}{2}$

[2 Marks]

### SECTION C

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

**11. Name and write the functions of the paired accessory glands in human male reproductive system .**

Ans. Seminal Vesicles =1

Secretion of this gland constitutes seminal plasma which is rich in fructose calcium and certain enzymes =  $\frac{1}{2}$

Bulbourethral gland / Cowper's gland =1

Help in lubrication of the penis =  $\frac{1}{2}$

[3 Marks]

**12. Name the cell from which the endosperm develops in a coconut. Mention its ploidy. Explain the process of endosperm development in a coconut.**

Ans. Primary Endosperm Cell = 1

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

Free nuclear division / PEN undergoes successive nuclear division forming free nuclear endosperm, followed by subsequent cell wall formation (on the periphery), endosperm becomes cellular =  $\frac{1}{2} \times 3$

[3 Marks]

**13. Explain initiation, elongation and termination in the process of transcription in bacteria.**

Ans. **Initiation**-RNA polymerase binds to promoter and initiation factor /  $\sigma$  =  $\frac{1}{2}$

**Elongation** - It uses nucleoside triphosphates as substrates, and polymerises in a template dependent fashion following the rule of complementarity, it also facilitates opening of the helix and continues elongation =  $\frac{1}{2} \times 3$

**Termination** -Once polymerase reaches terminator region and associates with termination factor/ $\rho$  , the nascent RNA falls off =  $\frac{1}{2} + \frac{1}{2}$

[3 Marks]

**14. Why did Hershey and Chase work with bacteriophages in their experiments to prove that DNA is the genetic material ? Explain.**

- Ans. - A bacteriophage has only two components- protein and DNA ,  
- They worked to find whether it was protein or DNA from the virus that entered the bacteria ,  
- The bacteriophage attaches to the bacteria ,  
- Its genetic material enters the bacterial cell ,  
- The bacterial cell treats the viral genetic material as if it was its own and subsequently manufactures more virus particles ,  
- Proving DNA to be the genetic material / by tracing the radioactivity on DNA =  $\frac{1}{2} \times 6$

[3 Marks]

**15. Name and explain the phenomenon of evolution exhibited by Australian marsupials.**

Ans. Adaptive Radiation = 1

The process of evolution of different species in a given geographical area starting from a point and literally radiating to other areas of geography , a number of marsupials evolved , from a common ancestral stock , but all within the Australian Island continent.  
=  $\frac{1}{2} \times 4$

[3 Marks]

**16. Tobacco smoking, chewing or snuffing is very injurious to health of humans. Justify.**

Ans. Tobacco contains Nicotine =  $\frac{1}{2}$

Stimulates the adrenal gland to release adrenaline and nor adrenaline, which raises blood pressure and increases heart rate, increased incidence of cancer of lungs urinary bladder and throat , bronchitis / emphysema /coronary heart disease /gastric ulcer etc, increases CO content in blood and reduces concentration of haembound oxygen =  $\frac{1}{2} \times 5$

[3 Marks]

**17. List the three traits or characters that plant breeders have tried to incorporate into crop plants**

- Ans. - Resistance to Insect Pest  
- Improved Food Quality

- Disease Resistance
- Increased crop yield
- Increased tolerance to environmental stress
- Drought resistance (*Any three*) = 1 × 3

[3 Marks]

**18. Explain the different steps involved in the primary treatment of sewage.**

- Ans - Floating debris is removed by sequential filtration .
- The grit/ soil and small pebbles are removed by sedimentation.
  - The effluent from the primary settling tank is taken for secondary treatment.
- = 1 × 3

[3 Marks]

**19. Write the three basic steps involved in genetically modifying an organism.**

- Ans. (a) Identification of DNA having desirable genes and cutting DNA at specific location with Restriction Endonuclease.
- (b) The desired cut piece of DNA is linked to plasmid of vector with DNA ligase leading to formation of rDNA .
- (c) Transfer of rDNA to new host for replication using DNA polymerase of the host
- = 1×3 [3 Marks]

**20. (a) Write the importance of gel electrophoresis in biotechnology.**

- (b) Explain the different steps carried in gel electrophoresis to get the desired results.**

- Ans. (a) Separation of DNA fragments = ½
- (b) -Negatively charged DNA fragments move towards anode under an electric field through agarose gel medium = ½
- The DNA fragments separate according to their size through sieving effect, smaller fragments move farther = ½ + ½
- They can be visualised after staining with ethidium bromide followed by exposure to UV radiation = ½
- Separated bands of DNA are cut out from agarose gel and extracted from the gel piece /elution =½

[3 Marks]

**21. How are 'competent' bacteria transformed with recombinant DNA ? Explain.**

Ans. - Recombinant DNA can be forced into competent bacterial cells by incubating the cells with recombinant DNA on ice, followed by placing them briefly at 42°C (Heat shock), and then back on ice = 1 × 3

[3 Marks]

**22. What is Altitude Sickness ? How does your body physiologically adapt to overcome it ?**

Ans Symptoms like nausea / fatigue / heart palpitation / breathlessness experienced by a person while travelling to higher altitude (**Any two**) = ½ + ½  
- The body compensates low O<sub>2</sub> availability by increasing RBC production / decreasing the binding capacity of Hb / increasing breathing rate (**Any two**) = 1 × 2

[3 Marks]

**OR**

**Where and how does the Primary Succession occur ? Explain.**

Ans Newly cooled lava / bare rocks / newly created pond or reservoir (**Any one**) = 1

On the rocks usually lichens (Pioneer Species) which are able to secrete acids to dissolve rocks helping in weathering and soil formation, later pave way to some very small plants like bryophytes which are able to hold small amount of soil, with time succeeded by bigger plants, ultimately a stable climax forest community is formed  
= ½ × 4

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In water the pioneers are small phytoplanktons, they are replaced with time by free floating angiosperms, then by rooted hydrophytes sedges grasses and finally the trees, climax would again be a forest and water body is converted into land = ½ × 4

[3 Marks]

**SECTION D**

**Q No. 23 is of four mark**

**23. The practice of defecation in the open fields is not advised due to many reasons. Such a practice affects human health by causing and spreading diseases. Name a disease thus caused with any two symptoms and mode of infection. Also name the causative organism.**

Ans. - Ascariasis / Amoebiasis / Amoebic dysentery =1

**Symptoms**-Internal bleeding / muscular pain / fever / anaemia / intestinal blockage  
(*Any two*)= $\frac{1}{2} + \frac{1}{2}$

**Mode of infection** -Eggs of parasite excreted along with faeces of infected person which contaminate soil water plants , a healthy person acquires this infection through contaminated water fruits vegetables = $\frac{1}{2} + \frac{1}{2}$

- Ascaris = 1

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Amoebiasis / Amoebic dysentery = 1

**Symptoms** - Constipation /Abdominal pain and cramps / stools with excess mucus and blood clots (*Any Two*) =  $\frac{1}{2} + \frac{1}{2}$

**Modes of Infection** - Houseflies transmit parasite from faeces of infected person to food and food products / Drinking water = 1

*Entamoeba histolytica* = 1

[4 Marks]

## SECTION E

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

24. (a) **Seeds offer several advantages to angiosperms. Describe any three such advantages.**

(b) **Why is banana called a parthenocarpic fruit ? Would you call banana a true fruit ? Give reason in support of your answer.**

Ans (a) Reproductive process such as pollination and fertilisation are independent of water.

- Better adaptive strategies for dispersal to new habitats.
- Hard seed coat provides protection to young embryo .
- Sexual reproduction- new genetic combinations.
- Sufficient food reserves for the seedling.
- Basis of agriculture-storage of seeds can occur due to seed habit-dehydration and dormancy (*Any three*) =  $1 \times 3$

- (b) Banana fruit develops without fertilisation = 1  
 Yes =  $\frac{1}{2}$   
 Develops from ovary =  $\frac{1}{2}$

[5 Marks]

**OR**

- (a) **Describe ovarian events in the menstrual cycle of the female reproductive system in humans.**
- (b) **Explain the role played by pituitary hormones during the events described above.**

- Ans. (a) (i) **Follicular phase** (Days 1- 13) primary follicles grow to become mature Graafian follicles =1
- (ii) **Ovulatory phase** (Day 14)- one ovum is released from one ovary/ovulation =1
- (iii) **Luteal phase** -(Day 15 to 28/29) Graafian follicle transform to form corpus luteum =1
- (b) Role played by pituitary hormones -secretion of gonadotropins /LH and FSH gradually increase during follicular phase, stimulating follicular development =  $\frac{1}{2} + \frac{1}{2}$

Rapid secretion of LH during mid cycle (LH surge) , resulting in ovulation and subsequent development of Corpus Luteum =  $\frac{1}{2} + \frac{1}{2}$

[5 Marks]

25. (a) **Mention the traits in pea plants, where a single gene product produces more than one phenotypic effect. Write their effect in homozygous dominant and homozygous recessive states.**
- (b) **Taking an example of human blood groups, explain dominance, co-dominance and multiple allelism.**

- Ans (a) Size of grain ( large and small) =  $\frac{1}{2}$   
 Shape of grain ( round and wrinkled) =  $\frac{1}{2}$

homozygous dominant(BB)- large starch grain, round seeds =  $\frac{1}{2}$   
 homozygous recessive (bb) -small starch grain ,wrinkled seeds =  $\frac{1}{2}$

- (b) **Dominance**- $I^A$  and  $I^B$  are dominant over  $i$  = 1

**Co-dominance** -Since  $I^A$  and  $I^B$  are both dominant when present together the blood group is AB = 1

**Multiple Allelism** - human blood groups are expressed as a result of three alleles  $I^A$ ,  $I^B$  and  $i$  of gene I = 1

[5 Marks]

**OR**

(a) **How can the comparative study made of the fore limbs of different mammals be considered an evidence for evolution ?**

(b) **What are these compared limbs called and why ?**

(c) **Name the kind of evolution it is a result of.**

(a) Though these forelimbs perform different functions, they have similar anatomical structure ( humerus, radius, ulna , carpals, metacarpals , phalanges) =1+1

(b) Homologous Organs , same structure and origin with different functions (in different mammals) = 1 + 1

(c) Divergent Evolution =1

[5 Marks]

26. (a) **Describe how DDT undergoes biological magnification.**

(b) **How does it cause a decline in bird population ? Explain.**

Ans (a) - DDT accumulated by an organism cannot be metabolised or excreted , thus passed on to the next trophic level with increase in concentration at successive trophic levels =  $1 \times 2$

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- From water zooplanktons accumulate 0.004 ppm DDT , small fish accumulate 0.5 ppm DDT , large fish accumulate 2 ppm DDT , and ultimately fish eating birds accumulate 5 ppm DDT =  $\frac{1}{2} \times 4$

- DDT accumulates in fish eating birds , DDT disturbs calcium metabolism in birds, which causes thinning of egg shells and their premature breaking =  $1 \times 3$

[5 Marks]

**OR**

(a) **Why is the pyramid of energy always upright ? Explain .**

**(b) What are the limitations of ecological pyramids ?**

Ans (a) Pyramid of energy is always upright because when energy flows from a particular trophic level to the next trophic level, some energy is always lost as heat at each step =1×2

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Only 10% of the energy is transferred to each trophic level from the lower trophic level, energy at lower trophic level is always more than higher trophic level =1×2

- (b) (i) it does not take into account same species belonging to two or more trophic levels.  
(ii) It assumes a simple food chain something that never exists in nature  
(iii) It does not accommodate a food web  
(iv) Saprophytes which are so significant are not given a place (**Any three**) =1 × 3

[5 Marks]