


Strictly Confidential: (For Internal and Restricted use only)
Senior School Certificate Examination-2020
Marking Scheme – BIOLOGY (SUBJECT CODE - 044)
(PAPER CODE – 57 (B))

General Instructions: -

1. You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested that before starting evaluation, you must read and understand the spot evaluation guidelines carefully. **Evaluation is a 10-12 days mission for all of us. Hence, it is necessary that you put in your best efforts in this process.**
2. Evaluation is to be done as per instructions provided in the Marking Scheme. It should not be done according to one's own interpretation or any other consideration. Marking Scheme should be strictly adhered to and religiously followed. **However, while evaluating, answers which are based on latest information or knowledge and/or are innovative, they may be assessed for their correctness otherwise and marks be awarded to them.**
3. The Head-Examiner must go through the first five answer books evaluated by each evaluator on the first day, to ensure that evaluation has been carried out as per the instructions given in the Marking Scheme. The remaining answer books meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.
4. Evaluators will mark (✓) wherever answer is correct. For wrong answer 'X' be marked. Evaluators will not put right kind of mark while evaluating which gives an impression that answer is correct and no marks are awarded. **This is most common mistake which evaluators are committing.**
5. If a question has parts, please award marks on the right-hand side for each part. Marks awarded for different parts of the question should then be totaled up and written in the left-hand margin and encircled. This may be followed strictly.
6. If a question does not have any parts, marks must be awarded in the left-hand margin and encircled. This may also be followed strictly.
7. If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out.
8. No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
9. A full scale of marks **0-70** has to be used. Please do not hesitate to award full marks if the answer deserves it.
10. Every examiner has to necessarily do evaluation work for full working hours i.e. 8 hours every day and evaluate 20 answer books per day in main subjects and 25 answer books per day in other subjects (Details are given in Spot Guidelines).
11. Ensure that you do not make the following common types of errors committed by the Examiner in the past:-
 - Leaving answer or part thereof unassessed in an answer book.
 - Giving more marks for an answer than assigned to it.
 - Wrong totaling of marks awarded on a reply.

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- Wrong transfer of marks from the inside pages of the answer book to the title page.
 - Wrong question wise totaling on the title page.
 - Wrong totaling of marks of the two columns on the title page.
 - Wrong grand total.
 - Marks in words and figures not tallying.
 - Wrong transfer of marks from the answer book to online award list.
 - Answers marked as correct, but marks not awarded. (Ensure that the right tick mark is correctly and clearly indicated. It should merely be a line. Same is with the X for incorrect answer.)
 - Half or a part of answer marked correct and the rest as wrong, but no marks awarded.
12. While evaluating the answer books if the answer is found to be totally incorrect, it should be marked as cross (X) and awarded zero (0)Marks.
 13. Any unassessed portion, non-carrying over of marks to the title page, or totaling error detected by the candidate shall damage the prestige of all the personnel engaged in the evaluation work as also of the Board. Hence, in order to uphold the prestige of all concerned, it is again reiterated that the instructions be followed meticulously and judiciously.
 14. The Examiners should acquaint themselves with the guidelines given in the Guidelines for spot Evaluation before starting the actual evaluation.
 15. Every Examiner shall also ensure that all the answers are evaluated, marks carried over to the title page, correctly totaled and written in figures and words.
 16. The Board permits candidates to obtain photocopy of the Answer Book on request in an RTI application and also separately as a part of the re-evaluation process on payment of the processing charges

SECTION – A

1. The organism that reproduces asexually through conidia is

- (A) Hydra
- (B) Sponge
- (C) **Penicillium**
- (D) Amoeba

Ans. (C) / *Penicillium*

[1 Mark]

2. The scientists who used centrifugation in a cesium chloride density gradient that helped them to reach the conclusion that the DNA replication is semi-conservative are

- (A) Watson and Crick
- (B) **Meselson and Stahl**
- (C) Oparin and Haldane
- (D) Hershey and Chase

Ans. (B) / Meselson and Stahl

OR

The possible number of genotypes and phenotypes of human blood groups, where gene 'I' with three alleles control the blood group is

- (A) 7 genotypes and 7 phenotypes
- (B) 7 genotypes and 4 phenotypes
- (C) **6 genotypes and 4 phenotypes**
- (D) 4 genotypes and 4 phenotypes

Ans. (C) / 6 genotypes and 4 phenotypes

[1 Mark]

3. The sex chromosomes responsible for sex determination in birds are

- (A) XO type
- (B) XX type
- (C) **ZW type**
- (D) ZZ type

Ans. (C) / ZW type

[1 Mark]

4. The human disease where *Aedes* mosquito serves as a vector is

- (A) Malaria
- (B) Dengue
- (C) Diphtheria
- (D) Pneumonia

Ans. (B) / Dengue

[1 Mark]

5. The construction of the first recombinant DNA was by linking of a gene encoding antibiotic resistance with the native plasmid of

- (A) *Salmonella typhimurium*
- (B) *Agrobacterium tumefaciens*
- (C) *Entamoeba histolytica*
- (D) *Streptococcus pneumoniae*

Ans. (A) / *Salmonella typhimurium*

OR

In DNA recombinant technique, for desired results, the gene of interest is always linked to

- (A) host
- (B) parasite
- (C) vector
- (D) protein

Ans. (C) / vector

[1Mark]

SECTION –B

6. “Asexually reproducing animals produce clones.” Justify the statement with the help of an example.

Ans. In *Amoeba* / *Paramecium* / protists / monerans = 1

(cell divides mitotically) giving rise to two morphologically, and genetically similar organisms

= $\frac{1}{2} \times 2$

[2 Marks]

OR

Why, in *Michelia*, is the gynoecium said to be multicarpellary and apocarpous ?

Ans. Multicarpellary - more than one pistil (carpels) = 1

Apocarpous - pistils (carpels) are free / not fused = 1

[2 Marks]

7. What is a ‘test cross’ ? Write its importance.

Ans. An organism with dominant phenotype / whose genotype is to be determined, is crossed with the recessive parent = $\frac{1}{2} \times 2$

To determine the genotypic composition / genotype of individual in question / to determine whether the unknown genotype is homozygous dominant or heterozygous = 1

[1 + 1 = 2 Marks]

8. List the two specific features on which the acquired immune response is based. Differentiate between primary and secondary immune responses.

Ans. Pathogen specific, characterised by memory = $\frac{1}{2} \times 2$

Primary Immune Response	Secondary Immune Response
When the body encounters pathogen for the first time / of low intensity	subsequent encounter with the same pathogen / highly intensified = 1

[2 Marks]

9. Expand ELISA. Name the pathogen and the disease for which ELISA is used as a diagnostic test.

Ans. Enzyme linked immuno - sorbent assay = 1

HIV, AIDS (any other correct disease with pathogen) = $\frac{1}{2} \times 2$

[2 Marks]

10. ‘Mammals can live in Antarctica as well as in the Sahara Desert.’ Explain how they manage to do this.

Ans. Constant body temperature and osmoregulation / homeostasis / by sweating when temperature is higher than body temperature, by shivering when the outside temperature is much lower than the body temperature = $\frac{1}{2} \times 2$

In colder climate the mammals have shorter ears and limbs and aquatic mammals have a thick layer of fat (blubber), In Sahara desert production of concentrated urine by internal oxidation of fat (in which water is by product) = $\frac{1}{2} \times 2$

[1 + 1 = 2 Marks]

11. “All organisms are dependent for their food on producers, either directly or indirectly.” Do you agree with this statement ? Support your answer with the help of a suitable example.

Ans. Yes, Plants capture (2 - 10% of PAR) solar energy which flows through different organisms of an ecosystem (following 10% law) = $\frac{1}{2} + \frac{1}{2}$

Grass → Goat → Tiger
/ Producer → Primary consumer → Secondary consumer

(or any other correct food chain) = 1

[$\frac{1}{2} + \frac{1}{2} + 1 = 2$ Marks]

12. “Alien species invasion is one of the major causes of biodiversity loss.” Explain the statement with the help of a suitable example.

Ans. (Unintentional / deliberate introduction of alien species in habitat resulted in decline / extinction of indigenous species) introduction of Nile perch (into lake victoria in East Africa) led to the extinction of ecologically unique , hundreds of cichlid fish in the lake

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(Illegal) introduction of the African Cat fish / *Clarias gariepinus* ,for aquaculture purposes is posing a threat to indigenous cat fishes in our river

//

Parthenium / *Lantana* / water hyacinth, poses a threat to our indigenous species(or any other correct example) = 1 + 1

[2 Marks]

SECTION – C

13. Where and how does a megaspore develop in an ovule of an angiosperm ? State what is a monosporic development.

Ans. (In the micropylar region of) nucellus = 1

MMC undergoes meiosis to produce four megaspores , three degenerate , and one functional megaspore develops into embryo sac / female gametophyte = $\frac{1}{2} \times 3$

Method of embryo sac formation from a single (functional) megaspore is called monosporic development = $\frac{1}{2}$

[3 Marks]

14. Continued self-pollination in plants results in inbreeding depression. Explain any three outbreeding devices developed by plants to discourage self-pollination.

Ans. (i) Pollen release and stigma receptivity not synchronised / either the pollen is released before stigma becomes receptive or vice versa

(ii) Anther and stigma are placed at different positions

(iii) Self incompatibility , prevents self pollen from fertilising the ovules by inhibiting pollen germination or pollen tube growth on pistil.

(iv) Production of unisexual flower / male and female flower present on different plants (dioecy)

(Any three) = 1×3

[3 Marks]

OR

Where are the following located in the specific regions of a human female’s reproductive organs ? State the function of each one of them.

(a) **Fimbriae**

(b) **Ampulla**

(c) **Primary follicle**

- Ans. (i) Fimbriae - at the edges of infundibulum , help in the collection of ovum / secondary oocyte (after ovulation) = $\frac{1}{2} \times 2$
- (ii) Ampulla - between infundibulum and isthmus , site of fertilisation = $\frac{1}{2} \times 2$
- (iii) Primary follicle - Ovary (during embryonic stage) , to develop matured follicle / graafian follicle = $\frac{1}{2} \times 2$

[1 × 3 = 3 Marks]

15. Write the scientific name of the bacterium used by Griffith in his experiment. Name the different strains of bacteria used, and their characteristic features.

Ans. *Streptococcus pneumoniae* = 1

- (i) S strain , have mucus (polysaccharide) coat / virulent / pathogenic = $\frac{1}{2} + \frac{1}{2}$
- (ii) R strain , No coat / non - virulent / avirulent / non-pathogenic = $\frac{1}{2} + \frac{1}{2}$

[3 Marks]

16. List the different anthropogenic actions, and explain how have they led to evolution.

Ans. Excessive use of herbicides / pesticides / antibiotics , have resulted in the selection of pest resistant / antibiotic resistant varieties , in much lesser time / time scale of months or years and not centuries (example from industrial melanism / effect on DDT on mosquito / any other to be accepted)

[1 + 1 + 1 = 3 Marks]

17. How did Darwin explain ‘adaptive radiation’ ? Support your answer with the help of an example.

Ans. Darwin observed that there were many varieties of finches in the same island , initially they had seed eating features , gradually as they migrated to different habitats other features with altered beak arose , enabling them to become insectivorous and vegetarian finches , This process of evolution of different species in a given geographical area , starting from a (geographical) point and radiating to other geographical areas = $\frac{1}{2} \times 6$

[3 Marks]

18. List any six common warning signs of drug and alcohol abuse among the youth.

Ans. Drop in academic performance , unexplained absence from school , lacking in personal hygiene , withdrawl from family , prolonged isolation , depression , excessive fatigue , excessive aggression , rebellious behaviour , loss of interest in hobbies , change in sleeping and eating habits , unexplained fluctuations in weight , loss of appetite , deteriorating relationship with family and friends

(Any six points) = $\frac{1}{2} \times 6$

[3 Marks]

19. Mention where are the domesticated fowls used for food or for their eggs managed for commercial purpose. Write any four important components of their farm management.

Ans. Poultry Farm = 1

Selection of disease free and suitable breeds, proper feed and water , proper and safe farm conditions , hygiene and health care = $\frac{1}{2} \times 4$

[3 Marks] 7

OR

- (a) **How do normal cells in a human body become cancerous ?**
(b) **What is metastasis ?**

Ans. (a) Cell growth and differentiation is a highly regulated / controlled (property) called contact inhibition, cancer cells lose this property, as a result they continue to divide, form masses of cells called tumors. = $\frac{1}{2} \times 4$
(b) Cells sloughed / pinched off from malignant tumors, to reach distant sites through blood and forming new tumor (is called metastasis) = $\frac{1}{2} \times 2$

[2 + 1 = 3 Marks]

20. (a) **Name any two naturally occurring cloning vectors.**
(b) **State the role of 'Ori' and 'Cloning sites' in a cloning vector.**

Ans. (a) Plasmids, bacteriophage = $\frac{1}{2} + \frac{1}{2}$
(b) (i) ('Ori') - replication of DNA starts / any piece of DNA when linked to the sequence can be made to replicate within host cell, controls the copy number of the linked DNA = $\frac{1}{2} + \frac{1}{2}$
(ii) ('Cloning sites') - in order to link alien DNA, vectors need recognition sites where alien DNA is linked to be identified by restriction enzymes = $\frac{1}{2} + \frac{1}{2}$

[1 + 2 = 3 Marks]

21. (a) **Name the DNA polymerase used in PCR technique.**

Write the scientific name of its source organism. How is this DNA different from the DNA polymerase ?

- (b) **Mention the application of PCR technique.**

Ans. (a) *Taq* polymerase = $\frac{1}{2}$

Thermus aquaticus = $\frac{1}{2}$

This is thermostable / remain active during high temperature induced denaturation of double stranded DNA = 1

- (b) Synthesis of multiple copies of gene / DNA of interest (invitro)/ detection of HIV in (suspected) AIDS patients / detection of mutations / genetic disorders (in suspected cancer patients) = 1

[2 + 1 = 3 Marks]

SECTION -D

22. **Biotechnology has played a very important role in reducing reliance on pesticides by developing pest-resistant crop varieties. Thus it has helped in increasing crop yields which has helped the farmers. One such example is of cotton plant being developed. Answer the questions that follow :**

- (a) **Name the bollworm resistant variety of cotton plant that was developed.**
(b) **When the bollworm ingests this plant,**

(i) how do prototoxins from the plant get activated in the gut ?

(ii) how does the gut get affected causing death of the pest ?

Ans. (a) Bt cotton = $\frac{1}{2}$

(b) (i) Protoxin / inactive toxin once ingested is converted into active form of toxin , due to alkaline pH of insect's gut = $\frac{1}{2} + \frac{1}{2}$

(ii) binds to the midgut epithelial cells , create pores , cause swelling and lysis (causing death of the insect) = $\frac{1}{2} \times 3$

[$\frac{1}{2} + 2\frac{1}{2} = 3$ Marks]

23. In nature, no living species, whether of a plant, an animal or microbes, tend to live as a single individual, but they have a population of their own species.

(a) Why do different species of organisms tend to live in groups that constitute population ?

(b) How do the following affect the population density ?

(i) Emigration

(ii) Immigration

Ans. (a) Share / compete for similar resources / Interact / potentially interbreed = 1

(b) (i) emigration - decreases population density = 1

(ii) immigration - population density increases = 1

[1 + 2 = 3 Marks]

24. Beekeeping practice is an age-old cottage industry which is relatively easy, inexpensive and does not require specialisation. It can help in generating regular income for the farmers from its produce.

(a) Name two popular products obtained from the beekeeping industry.

(b) Write the scientific name of the most common species of bees used in beekeeping in our country.

(c) Mention any suitable area to be selected for beekeeping practices.

Ans. (a) Honey , Beeswax = $\frac{1}{2} \times 2$

(b) *Apis indica* = 1

(c) can be practised where there are sufficient bee pastures of wild shrubs / fruit orchards / cultivated crops /crop field = 1

[1 + 1+ 1= 3 Marks]

SECTION – E

(Q Nos. 25-27 are of five marks each)

25. Describe the events that follow after compatible pollination up to zygote formation only, in an angiosperm flower.

Ans. Compatible Pollen belonging to same species germinates on stigma , to produce pollen tube through one of the germ pores , content of pollen grain move into pollen tube , that grow through the tissue of stigma and style and reaches ovary , generative cells divides to form two

male gametes , pollen tube after reaching ovary enters ovule through micropyle , and enter one of the synergids , releases two male gametes , one of the male gametes fuses with the nucleus of egg cell called syngamy , resulting in a diploid cell zygote.

[$\frac{1}{2} \times 10 = 5$ Marks]

OR

Describe the process of ‘Oogenesis’ in a human female, from early embryonic life till adult reproductive life

Ans. (Initiated during embryonic development) millions of gamete mother cells / oogonia are formed in each foetal ovary , these cells undergo meiosis and enter prophase I , called primary oocyte , forms primary follicle , that get surrounded by more layers of granulosa to form secondary follicles , secondary follicles develop a fluid filled antrum and transform into tertiary follicle , primary oocyte undergoes unequal division resulting in a large haploid secondary oocyte and a tiny polar body , tertiary follicle changes into Graafian follicle , Graafian follicle ruptures to release the secondary oocyte / ovum , by the process called ovulation

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Foetal life - oogonia $\xrightarrow{= \frac{1}{2}}$ mitosis and differentiation $\xrightarrow{= \frac{1}{2}}$ Primary oocyte , inside the Graafian follicle $\xrightarrow{= \frac{1}{2}}$

Birth childhood puberty - Primary oocyte $\xrightarrow[= \frac{1}{2}]{\text{Meiosis I (Completed prior to Ovulation)}} \xrightarrow{= \frac{1}{2}}$ Secondary oocyte + 1st polar body $\xrightarrow{= \frac{1}{2}}$

Adult reproductive life - Secondary oocyte , release during ovulation $\xrightarrow{= \frac{1}{2}}$

[$\frac{1}{2} \times 10 = 5$ Marks]

26. (a) **Carry out a cross between true-bred red-flowered plant and true-bred white-flowered plant in *Antirrhinum* sp. up to F_2 generation. Describe the pattern of inheritances observed in the following :**

(i) F_1 generation

(ii) F_2 generation

(b) **How is this pattern of inheritance different from the one described by Mendel in a monohybrid cross ?**

Ans. (a)

(b)		Euchromatin	Heterochromatin	
	Structure	loosely packed	densly packed	=1 + 1
	Function	Transcriptionally active	Inactive	

[3 + 2 = 5 Marks]

27. (a) Write the important characteristics of all the ecological communities with respect to structure and composition. What is a climax community ?
- (b) What is an ecological succession ? Differentiate between primary and secondary succession.

Ans. (a) In an ecological community the change is orderly and sequential , parallel with the changes in the physical environment = 1

Finally leading to a community that is in near equilibrium with the environment is called climax community = 1

- (b) The gradual and fairly predictable change in the species composition of a given area is called ecological succession = 1

Primary succession

starts in an area where no living organism ever existed as on a bare rock

slow process takes hundred to several thousand years

Secondary succession

Areas that somehow lost all living organisms that existed there due to burned forests / cuts forests / floods

succession is faster
= 1 + 1

[3 + 2 = 5 Marks]

OR

- (a) Name the two 'greenhouse gases' responsible for the maximum contribution towards global warming.
- (b) What would have happened on Earth without the 'greenhouse effect' ? How is it caused ?
- (c) Explain the impact of global warming on Earth.

Ans. (a) CO₂ , Methane = ½ + ½

- (b) The avreage temperature on Earth would have been chilly / -18° C // rather than present average of 15° C / Impossible for life to exist = 1

Earth's surface re-emits heat from solar radiations in the form of infrared radiations , but part of this does not escape into space due to carbon dioxide and methane , (which absorb a major fraction of it) = ½ + ½

The molecules of these gases radiate heat energy , and a major part of which again comes to Earth's surface thus heating up once again = ½ + ½

- (c) Odd climatic changes / EL Nino effect / melting of polar ice caps / Himalayan snow caps / submerging of many coastal areas / adversely affects the biodiversity (any two) = ½ + ½

[1 + 3 + 1= 5 Mark]