Senior School Certificate Examination
COMPARTMENT (2015)
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 (v') 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 (x) 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.

Set 1 **Q.P.CODE 57/1/1**

Section A

Q nos 1-5 are of one mark each

Q1 Name the enzyme that transcribes hnRNA in eukaryotes.

Ans RNA Polymerase II 1

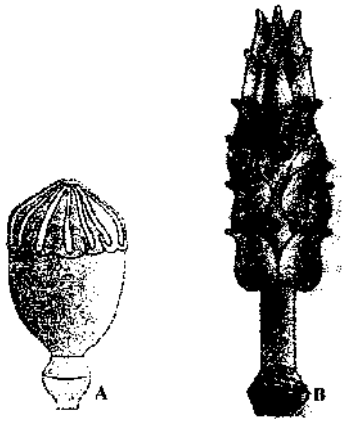
Q2. Name the interaction that exists between Cuscuta and shoe-flower plant.

Ans. Parasitism 1

Q3 State the chromosomal defect in individuals with Turner's syndrome.

Ans. Monosomy of sex chromosome // XO condition //Absence of one X chromosome(in female) 1

Q4. These pictures show the gynoecium of (A) Papaver and (B) Michellia flowers. Write the difference in the structure of their ovaries.



Ans. a. (multicarpellary) ovary showing fused/ syncarpous pistil

b. (multicarpellary) ovary showing free/ apocarpous pistil ½ + ½

Q5. Mention the economic value of Apis indica.

Ans. Bee keeping to be useful in agriculture yield / honey/bee wax/pollination 1

Section B

Q nos 6-10 are of two marks each

Q6. Shark is eurythermal while polar bear is stenothermal. What is the advantage the former has and what is the constraint the later has?

Ans. Shark -tolerates wide range of temperature so wide spread / survives in all waters

Polar bear- restricted occurrence in narrow range of temperature so constraint to live in very cold icy environment.

1+1=2

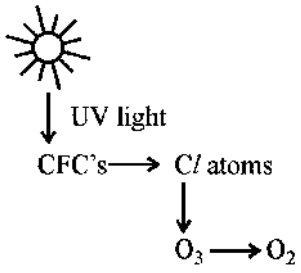
Q7. What is EcoRI ? How does EcoRI differ from an exonuclease?

Ans. EcoRI is restriction endonuclease enzyme. 1

Exonuclease removes nucleotides from the ends of DNA ½

EcoRI makes cuts at specific position within the DNA ½

Q8. (a) What are the after effects of the degradation of ozone?
(b) How does it affect human health?



Ans. a. Thinning of Ozone/ Ozone depletion/ UV-B penetrates Ozone- forms hole- reaches earth. 1

b. UV –B damages DNA causes mutation, ageing of skin/ damage of skin cells/ skin cancer/ inflammation of cornea (snow blindness, cataract) (any two) ½ + ½

Q9. A childless couple has agreed for a test tube baby programme. List only the basic steps the procedure would involve to conceive the baby.

OR

Banana fruit is said to be parthenocarpic where as turkey is said to be parthenogenetic. Why?

Ans. Extraction of gametes from the parents/donors. ½

Invitro / fertilisation (simulated conditions in laboratory) ½
transfer of the zygote / early embryo (at 8 blastomere stage) , into the fallopian tube ½ + ½

OR

Banana –the fruit develops without fertilisation from an unfertilised ovary. 1
Turkey- the ovum/ female gamete develop into a new chick without fertilisation. 1

Q10. Is sweet potato analogous or homologous to potato tuber ? Give reasons to support your answer.

Ans. Analogous , sweet potato- root modification , potato tuber – stem modification, they are structurally different but both are functionally similar (both store food). ½ x4=2

Section C

Q nos 11-22 are of three marks each

Q11. Why is Taq polymerase preferred in PCR ? Mention the source of this enzyme.

Ans. Taq polymerase is used for amplification of DNA /gene, (Usually enzymes get denatured) Taq polymerase remains active at high temperature, Thermus aquaticus (If bacteria written give only ½) 1+1+1=3

Q12. Our farmers still use DDT. How is this affecting the local bird population?

Ans. As a result of Biomagnification, through an aquatic food chain, high concentration of DDT disturbs calcium metabolism in birds,

Which causes thinning of egg shell, and premature breaking, eventually leading to decline in bird population.

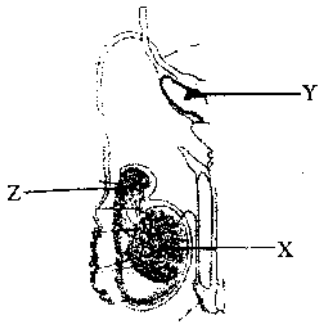
½ x6=3

Q13. How does the HIV breakdown the immune system of the AIDS patient? 3

Ans.

- Virus enters in macrophages
- RNA genome replicates to form viral DNA with help of reverse transcriptase,
- Viral DNA gets incorporated into host cells DNA to produce virus particles,
- HIV enters into helper 'T' lymphocytes and produces progeny virus,
- Which are released in the blood and attack other helper 'T' lymphocytes,
- This leads to progressive decrease number of helper 'T' lymphocytes and the persons starts suffering from infections (loss of immunity) ½x6=3

Q14.



The above diagram shows human male reproductive system (one side only).
(a) Identify 'X' and write its location in the body.
(b) Name the accessory gland *'Y'* and its secretion.
(c) Name and state the function of 'Z'.

Ans. (a)X=Testicular lobules, location – Testis// Testis , location outside the abdominal cavity/ scrotum ½+ ½

(b) Y= Accessory glands , seminal plasma ½+ ½
(c) Z= epididymis, function: storage of sperms ½+ ½

Q15. How did industrialization play a role in Natural Selection of light and dark coloured moth in England?

OR

What do you infer from the resemblance between flying squirrel and flying phalanger with reference to their evolution.

Ans. Before industrialisation there were more white winged moth on trees than dark winged. ½

- After industrialisation due to industrial smoke and soot, tree trunks became dark, ½ + ½
- Under this condition the white winged moths did not survive, due to predation ½ + ½
- And dark coloured moth survive/ able to camouflage to survive ½

OR

Evolution of marsupial mammals has resulted in flying phalanger, through adaptive radiation. ½ + ½
Evolution of placental mammals has led to the evolution of a flying squirrel (independently) .1
The resemblance between the two, proves convergent evolution. ½ + ½

Q16. A patient is down with Amoebiasis. List the symptoms that confirm this infection. Name the causative pathogen.

Ans. Constipation, abdominal pain, stools with mucous, and blood clot, ½ x4=2

Entamoeba histolytica 1

Q17. (a) Differentiate between a template strand and coding strand of DNA.
(b) Name the source of energy for the replication of DNA.

Ans. a.

Role/Strand	Template strand	Coding strand
function	codes for the protein molecule	Does not code for anything
polarity	3'→5'	5'→3'

1+1=2

b. Deoxynucleoside triphosphates 1

Q18. Explain succession of plants in xerophytic habitat until it reaches climax community.

Ans. Lichens on bare rock, acids to dissolve rock (weathering of soil), Bryophytes to hold soil water, grass , small plants / shrubs, trees- forest(Climax community) ½ x6=3

Q19. A sugarcane has been affected by virus. How can a virus free cane be developed from it ? Explain the procedure

Ans. Tissue culture / micropropagation, 1

Meristem (Apical and axillary) can be removed from the explants, grown in vitro culture with special nutrient medium(with sucrose, amino acids, auxins & cytokinin) , under sterile / aseptic condition, plantlets develop as virus free plants ½ x4=2

Q20. Why is DNA a better genetic material when compared to RNA?

Ans.

	DNA	RNA
1	Stable molecule because of having 2' H group at every nucleotide	Unstable molecule (more reactive) because of having 2'OH group at every nucleotide,
2	presence of thymine ,	presence of uracil,
3	occasional mutation ½ x3=1 ½	prone to faster mutation resulting in shorter life span. ½x3=1 ½

Q21. How does a detritivore differ from a decomposer ? Explain with an example each.

Ans.

	detritivore	**decomposer**
1	feeds on waste dead plant and animal remains including faecal matter.	degrades dead organic matter
2	breaks feeding material into fragments	secretes enzymes into dead organic matter for decomposition
3	Eg. Earth worm	eg- Bacteria/ Fungi

1+1+1=3

Q22. Explain the events in a normal woman during her menstrual cycle on the following days.
(a) Ovarian event from 13-15 days
(b) Ovarian hormones level from 16 to 23 days
(c) Uterine events from 24 to 29 days

Ans. (a) Rupture of Graafian follicle leads to ovulation / release of ovum

(b). Estrogen level is low
(c). Disintegration of endometrium and menstrual cycle begins 1+1+1 =3

Section D

Q no 23 is of four marks

Q23. A youth in his twenties met with an accident and succumbed to the injuries. His parents agreed to donate his organs. List any two essential clinical steps to be undertaken before any organ transplant. Why is the transplant rejected sometimes ? What views would you share with your health club members to promote organ donation?

Ans. Blood group matching, and tissue matching should be done prior to the organ transplant , the body is able to identify the 'non-self' graft, triggers the cell mediated immune response , this rejects the graft

5x ½ =2 ½

Views-
Cornea can be transplanted to any one and a blind can see the world . Heart / lung/ Kidney can be transplanted and a person is gifted with life , the mind set to volunteer to register for organ donation – (particularly eye donation) (any other valid views) 3x ½ =1 ½

Section E

Q nos 24-26 are of five marks each

Q24. Explain the process of DNA replication with the help of a replicating fork.

OR

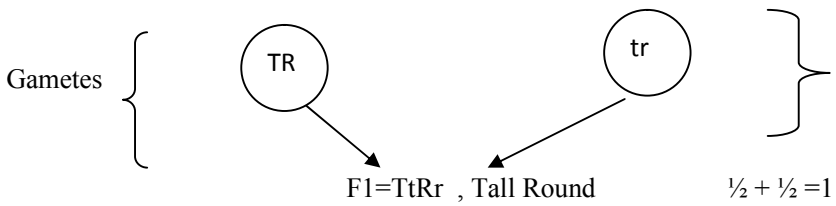
(a) Dihybrid cross between two garden pea plant one homozygous tall with round seeds and the other dwarf with wrinkled seeds was carried.
(i) Write the genotype and phenotype of the F1 progeny obtained from this cross.
(ii) Give the different types of gamates of the F1 progeny.
(iii) Write the phenotypes and its ratios of the F2 generation obtained in this cross along with the explanation provided by Mendel.
(b) How were the observations of F2 progeny of dihybrid crosses in Drosophila by Morgan different from that of Mendel carried in pea plants ? Explain giving reasons.

Ans. There is a definite region in DNA where the replication originates called as origin of replication, For long DNA molecules since the two strands of DNA cannot be separated in its entire length, the replication occurs within a small opening of the DNA helix , referred to as replication fork.

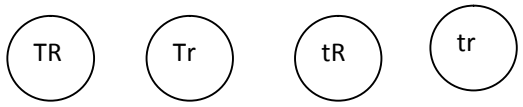
The DNA dependent DNA polymerase, catalyze polymerization only in one direction, that is 5'-- >3', on one strand (the template with polarity 3'-->5') the replication is continuous, while on the other(the template with polarity 5'--->3') it is discontinuous. The discontinuous synthesized fragments are later joined by the enzyme DNA ligase.

OR (10 x ½ = 5)

(i) Parents TTRR x ttrr



(ii)

gametes F1 

½ + ½ =1

(½ mark for two correct gamete genotypes)

(iii)

Phenotypes	Tall Round : Tall Wrinkled : Dwarf Round : Dwarf Wrinkled	½
ratio	9 : 3 : 3 : 1	½

Explanation:– The law of Independent Assortment states that when two pairs of traits are combined in a hybrid , segregation of one pair of character is independent of the other pair of characters 1.

(b) Morgan observed the result of linkage of genes on a chromosome , but Mendel did not observe phenomenon of linkage in pea plants // F2 ratio of Morgan deviated significantly from 9:3:3:1 ratio (Mendelian ratio) 1

Q25. Explain the application of biotechnology in producing Bt cotton.

OR

Unless the vector and source DNA are cut, fragments separated and joined, the desired recombinant vector molecule cannot be created.

(a) How are the desirable DNA sequences cut?

(b) Explain the technique used to separate the cut fragments.

(c) How are the resultant fragments joined to the vector DNA molecule?

Ans. Bt toxin gene has been cloned from the bacteria, and has been expressed in plants, to provide resistance to insects (without the need for synthetic insecticide) , Bt toxin gene forms protein crystals, these crystals contain a toxic insecticidal protein, Bt toxin protein exists as inactive protoxin in the host , but once the insect ingests the inactive toxin, it is converted in active form of toxin , due to alkaline pH of the gut which solubilises the crystals, causing death of the insect. (10 x ½ = 5)

OR

(a)DNA sequences of the vector as well as the source are cut by the same restriction enzyme like EcoRI, in a palindromic Sequence ½+ ½

(The Cut ends overhang as sticky ends in the medium.)

(b) These cut ends fragments are to be extracted from the culture medium using gel electrophoresis. ½

This has an agarose gel matrix ½

Fragments are fed in the wells ½

They are negatively charged ½

So move towards anode under an electric field through the gel ½

smaller fragments move faster ,thus separated ½

(c) Fragments are now added to the medium containg the vector DNA ½

The sticky ends facilitates the action of the enzyme ligase and join the source DNA to the Vector

½ (10x ½ =5)

Q26. Mention the site of fertilization of a human ovum. List the events that follow in sequence until the implantation of the blastocyst.

OR

(a) Draw a diagram of a fertilized embryo sac of a dicot flower. Label all its cellular components.
(b) Explain the development of a mature embryo from this embryo sac.

Ans. The site of fertilisation is the ampullary isthmic junction (fallopian tube) ½

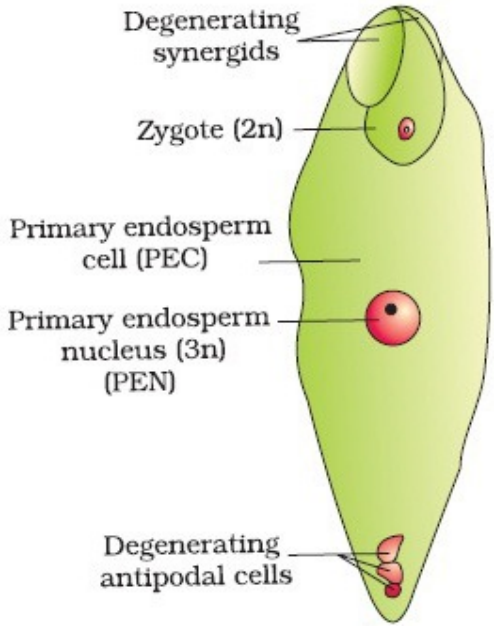
Events:

Fertilisation(Zygote formation),→Cleavage, →8-16 Blastomeres stage- Morula,→ Continuously divides and transforms in blastocyts(as it moves into uterus), → Blastomeres in the Blastocyst arrange to form outer layer trophoblast and inner cell mass,→ Trophoblast attaches to endometrium ,and inner cell mass differentiates as embryo, → After attachment of blastocyst the uterine cells cover it, → Embeded blastocyst in the endometrium- implantation

(9 x ½ = 4 ½)

OR

(a)



(Five correct labelling 5x ½ = 2 ½)

Zygote starts mitotic division and gives rise to pro-embryo,→ globular and heart shaped, →mature embryo with radicle- plumule and two cotyledons, primary endosperm nucleus divides and forms endosperm, which may persist or used up in nourishing the embryo (5x ½ = 2 ½)