

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 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 (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.

Section A

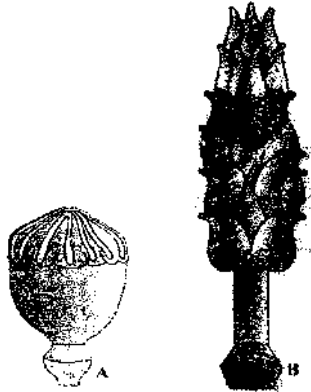
Q nos 1-5 are of one mark each

Q1. Why is RNA more reactive in comparison to DNA?

Ans. 2'-OH present in RNA (in every nucleotide) make it reactive 1

Q2. Name the interaction that exists between sucker fish and shark

Ans. Commensalism 1

Q3. These pictures show the gynaecium of (A) Papaver and (B) Michellia flowers. Write the difference in the structure of their ovaries.

Ans. a. (multicarpellary) ovary showing fused / syncarpous pistil ½

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

Q4. In what way is monocyte a cellular barrier with reference to immunity?

Ans. Phagocytose ,and destroy microbes // engulfs, and destroys the antigen/microbes ½ + ½

Q5. State the chromosomal defect in individuals with Turner's syndrome

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

½ + ½

SECTION – B

Q nos 6-10 are of two marks each

Q6. 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****Mention the function of****(a) Zona pellucida****(b) Coleorhiza**

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

Invitro / fertilisation (simulation conditions in laboratory) ½

transfer of the zygote or early embryo, (at 8 blastomere stage)into the fallopian tube ½ + ½

OR

a. Protective layer of the ovum 1

b. protects the radicle in a monocot embryo 1

Q7. Explain with the help of an example the type of evolution homology is based on.

- Ans. Homology is based on divergent evolution $\frac{1}{2}$
 These have similar anatomical structure but perform different function. 1
 • Example- Thorn of bougainvillea and tendril of cucurbita/ Forelimbs of human and horse/ any other appropriate example. $\frac{1}{2}$

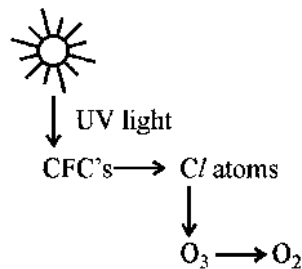
Q8. What is EcoRI ? How does EcoRI differ from an exonuclease? 2

- Ans. EcoRI is restriction endonuclease enzyme. 1
 Exonuclease removes nucleotides from the ends of DNA $\frac{1}{2}$
 EcoRI makes cuts at specific position within the DNA $\frac{1}{2}$

Q9. Why do people suffer from altitude sickness after reaching the high altitude regions ? How does their body acclimatized after a couple of days?

- Ans. "Altitude sickness" is because of low atmospheric pressure at high altitude , the body does not get sufficient oxygen $\frac{1}{2} + \frac{1}{2}$
 The body compensates low oxygen availability by increasing RBCs production decreasing the binding capacity of haemoglobin , by increasing breathing rate (any two) $\frac{1}{2} + \frac{1}{2}$

**Q10. (a) What are the after effects of the degradation of ozone? 2
 (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) $\frac{1}{2} + \frac{1}{2}$

Section C

Q nos 11-22 are of three marks each

Q11. Explain succession of plants in xerophytic habitat until it reaches climax community.

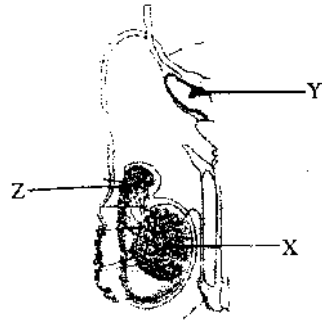
- Ans. Lichens on bare rock, acids to dissolve rock (weathering of soil), Bryophytes to hold soil water, grass , small plants / shrubs, trees- forest(Climax community) $\frac{1}{2} \times 6 = 3$

Q12. Which chromosomes carry the mutant genes causing thalassaemia in humans ? What are the problems caused by these mutant genes?

- Ans 11th and 16th chromosomes carry the Mutant gene causing thalassaemia $\frac{1}{2} + \frac{1}{2}$

These cause the formation of abnormal haemoglobin molecules resulting into anaemia. 1

Q. 13



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

$\frac{1}{2} + \frac{1}{2}$

(b) Y= Accessory glands, seminal plasma

$\frac{1}{2} + \frac{1}{2}$

(c) Z= epididymis, function: storage of sperms

$\frac{1}{2} + \frac{1}{2}$

Q14. 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 acids, auxins & cytokinin) under sterile / aseptic condition, plants lets develop as virus free plants

$\frac{1}{2} \times 4 = 2$

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. $\frac{1}{2}$

- After industrialisation, tree trunks became dark, due to industrial smoke and soot $\frac{1}{2} + \frac{1}{2}$
- Under this condition the white winged moths did not survive, due to predation $\frac{1}{2} + \frac{1}{2}$
- And dark coloured moth survive/ able to camouflage to survive $\frac{1}{2}$

OR

Evolution of marsupial mammals has resulted in flying phalanger, through adaptive radiation. $\frac{1}{2} + \frac{1}{2}$

Evolution of placental mammals has led to the evolution of a flying squirrel (independently) .1

The resemblance between the two, proves convergent evolution. $\frac{1}{2} + \frac{1}{2}$

Q16.(a) What is the functional difference between B cells and T cells.

(b) Name the source used to produce hepatitis B vaccine using rDNA technology.

Ans. (a) T cell recognise the pathogen and trigger the B cells, B cells produce the antigens specific antibodies called Immunoglobulins 1+1=2

(b) By yeast using recombinant DNA technology. 1

Q17. How does the HIV breakdown the immune system of the AIDS patient?

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 start suffering from infections(loss of immunity) 6x ½ =3

Q18. 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 to into dead organic matter for decomposition
3	Eg. Earth worm	eg- Bacteria / Fungi

1+1+1=3

Q19. 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 also get denatured) Taq polymerase remains active at high temperature, Thermus aquaticus (If bacteria written give only ½)

1+1+1=3

Q20. 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

Q21. 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

Q22. 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.

6x ½ =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. 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. 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

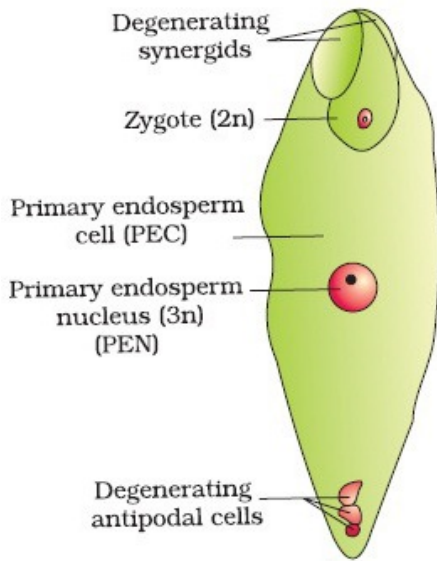
Events:

Fertilisation(Zygote formation), →Cleavage, →8-16 Blastomeres stage- Morula, → Continuously divides and transforms in blastocysts(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 $5 \times \frac{1}{2} = 2 \frac{1}{2}$)

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 gets used up in nourishing the embryo.

($5 \times \frac{1}{2} = 2 \frac{1}{2}$)

Q25. How did Griffith prove transforming principle in Genetics. Explain the procedure.

OR

How do “Pleiotropy”, “incomplete dominance”, “co-dominance” and “polygenic inheritance” deviate from the observation made by Mendel ? Explain with the help of one example for each.

Ans. Griffith took two strains of streptococcus pneumonia – R strain rough colony – non virulent, S- strain-smooth colony highly virulent

R- Injected into mice → mice alive

S- strain injected into mice → mice die due to pneumonia

Heat killed ,S train injected into mice→ mice alive

Heat killed S train + live R strain, → injected into mice→ mice die

Reason → The heat killed S train had the DNA which transformed R strain into virulent S type , This proves that there is a transfer of DNA to transform R to S type.

OR

No.	Mendel's Observations	Deviations
1	One gene responsible for a single phenotype	Pleiotropy - Single gene exhibits multiple phenotypic expressions eg. Disease Phenylketonuria(a single gene codes for enzyme phenylalanine hydroxylase which manifests in form of mental retardation and a reduction in hair and skin pigmentation $\frac{1}{2} + \frac{1}{2}$
2	Only one of the parental characters appear in a monohybrid cross (with contrasting character) in the F1 generation	Incomplete dominance -In a monohybrid cross (with contrasting character) phenotype in the F1 generation did not resemble either of the two parents and was in between the two.eg.Dogflower/snapdragon/Antirrhinum $\frac{1}{2} + \frac{1}{2}$

3	Only one of the parental characters appear in a monohybrid cross (with contrasting character) in the F1 generation	Co-dominance- In a monohybrid cross (with contrasting character) phenotype in the F1 generation resembles both the parents eg.ABO blood group $\frac{1}{2} + \frac{1}{2}$
4	All the traits have distinct alternate forms since One gene responsible for a single phenotype	Polygenic inheritance- The occurrence of traits are spread across a gradient. Such traits are controlled by three or more genes.eg.Human height/skin colour $\frac{1}{2} + \frac{1}{2}$

Two types of Mendel's observations ---- $\frac{1}{2} + \frac{1}{2}$

Q26. 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 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 $\frac{1}{2}$ = 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 $\frac{1}{2} + \frac{1}{2}$

(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. $\frac{1}{2}$

This has an agarose gel matrix $\frac{1}{2}$

Fragments are fed in the wells $\frac{1}{2}$

They are negatively charged $\frac{1}{2}$

So move towards anode under an electric field through the gel $\frac{1}{2}$

Smaller fragments move faster, thus separated $\frac{1}{2}$

(c) Fragments are now added to the medium containing the vector DNA $\frac{1}{2}$

The sticky ends facilitates the action of the enzyme ligase joins the source DNA to the Vector $\frac{1}{2}$

(10x $\frac{1}{2}$ = 5)