

**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 (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

Section A

Q nos 1-5 are of one mark each

**Q1. Write the two specific codons that a translational unit of mRNA is flanked by one on either sides.**

Ans. Start codon-AUG,

Stop codon- UAA/UGA/UAG

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

**Q2. State the type of interaction that exists between ticks and dogs.**

Ans. (Ecto)Parasitism

1

**Q3. Write the chromosomal defect in individuals affected with Klinefelter's syndrome.**

Ans. (Male) additional copy of X chromosome / XXY

1

**Q4. Identify the picture and mention the vegetative part that helps it to propagate.**



Ans. Rhizome of ginger/ underground stem, axillary bud grows from the node

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

**Q5. State the economic value of *Saccharum officinarum* in comparison to *S. barberi*.**

Ans.. Higher sugar content/thicker stem

1

Section B

Q nos 6-10 are of two marks each

**Q6. State the functions of Ribozyme and release factor in protein synthesis respectively.**

Ans.. Ribozyme- helps in peptide bond formation,

Release factor- terminates translation/ releases polypeptide from ribosome

1+1

**Q.7 Write the functions of**

**(a) cry IAC gene**

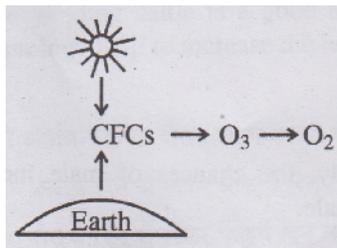
**(b) RNA interference (RNAi)**

Ans. (a) It produces inactive pro-toxin in the host cell /produces proteins to control cotton bollworms

(b) It produces ds RNA which silences host mRNA/cellular defence mechanism/prevents infestation by nematodes

1+1

Q8.



- (a) Expand CFC  
(b) How does it reduce ozone to oxygen?

Ans.. a) Chlorofluorocarbons

b) It releases Chlorine atoms which degrades ozone to release oxygen 1+1

Q9. What happens to corpus luteum in human female if the ovum is (i) fertilized, (ii) not fertilized?

OR

Write the difference between the tender coconut water and the thick, white kernel of a mature coconut and their ploidy.

Ans. i) Corpus luteum continues to secrete progesterone to maintain pregnancy/ it persists and produces progesterone

ii) it disintegrates/ changes into corpus albicans 1+1

OR

Coconut water from the tender coconut has free nuclear endosperm, kernel has the cellular endosperm  
Ploidy of the endosperms- 3n/ Triploid  $\frac{1}{2} + \frac{1}{2} + 1 = 2$

Q10. State the evolutionary relationship giving reasons between the thorn of Bougainvillea and tendril of cucurbit.

Ans.. Divergent evolution/ Homologous organs,

Similar in origin but perform different function 1+1=2

### Section C

Q nos 11-22 are of three marks each

Q11. Mention the cause of ADA deficiency in humans. How has genetic engineering helped patients suffering from it?

Ans. Deletion/ mutation of the gene which forms the enzyme –adenosine deaminase. 1

Lymphocytes from the blood of the patient, can be grown in a culture outside the body, ADA gene can be inserted into the lymphocyte using retroviral vector, then lymphocytes can be returned to the patient. (They can start producing ADA)  $\frac{1}{2} \times 4 = 2$

Q.12 Drinking water problem in our urban areas is caused mainly because we fail to protect our water bodies. Explain how accelerated eutrophication chokes our water bodies to death.

Ans. Sewage and industrial wastes are added to the lake, nitrates and phosphates act as plant nutrients, promotes algal bloom, dissolved oxygen depletes, less oxygen and pollutants poison the aquatic life, decomposing remains choke the lake to death.  $\frac{1}{2} \times 6 = 3$

**Q.13. (a) Differentiate between benign and malignant tumours.**

**(b) Why is colostrum a boon to the newborn baby?**

Ans. (a) Benign tumour- remains confined to original location/does not spread to other part of the body/ not cancerous  
 Malignant tumour-mass of proliferating (neoplastic)cells that invade and damage surrounding tissues/cancerous tumour/ tumour showing property of metastasis 1

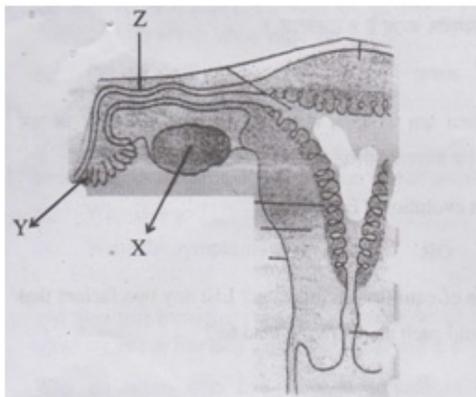
(b) Colostrum contains antibodies/that provides resistance (immunity) to new born babies 1

**Q.14. This diagram above shows a part of the human female reproductive system.**

**(a) Name the gamete cells that would be present in 'X' if taken from a newborn baby.**

**(b) Name 'Y' and write its function.**

**(c) Name 'Z' and write the events that take place here.**



Ans. (a)X= Primary oocytes 1

(b)Y= Fimbriae, collection of ovum 1/2+ 1/2

(c) Z=ampullary- isthmic junction/fallopian tube, the ovum encounters the sperm/fertilisation takes place 1/2 + 1/2

**Q.15 How does the study of fossils support evolution ? Explain.**

**OR**

**What does Hardy-Weinberg Principle of equilibrium indicate ? List any two factors that could alter the equilibrium. What would such an alteration lead to?**

Ans. Fossils are remains/ hard parts of life forms, found in sedimentary rocks, some of them appear similar to modern organisms /some represent extinct organisms, study of fossils in different sedimentary layers indicates the geological period in which they existed ( provide palaeontological evidence) 1 x 3

**OR**

(a) Allele frequencies are stable and constant from generation to generation /the gene pool (total genes and their alleles in a population) remains a constant/ sum total of all allelic frequencies is one 1

Factors– Gene migration, gene flow, genetic drift, mutation, genetic recombination, natural selection (any two 1/2 + 1/2 )

(b) Leads to –Evolution 1

**Q.16 Mention any two human diseases caused by round worms. Name their causative agents and their mode of transmission into the human body.**

Ans.. Ascariasis ,Ascaris, contaminated water /vegetables/fruits,

Elephantiasis/filariasis, *Wuchereria bancrofti* /filarial worm, bite by female mosquito vectors 1/2 x 6 =3

**Q.17 (a) Differentiate between exons and introns.**

**(b) What is a plasmid ? Why is it selected as a vector?**

Ans. a) Exons are the coding or expressed sequences that appear in mature or processed RNA, introns are intervening sequences that do not appear in mature or processed RNA//Exons are codons that code for amino acid sequence, introns do not code for amino acids 1

b) Autonomously replicating circular DNA / extra chromosomal DNA,exclusively present in bacteria  $\frac{1}{2} + \frac{1}{2}$

It takes in alien DNA/acts as vector, and delivers is into a host cell  $\frac{1}{2} + \frac{1}{2}$

**Q.18 What is ecological succession ? Where and why would the rate of succession be faster in newly created pond or a forest destroyed by a forest fire?**

Ans. Gradual/predictable change in the species composition of a given area,

Rate of succession would be faster in a forest destroyed by a forest fire,

Such disturbances create new conditions that encourage some species and discourage or eliminate other species /since after a forest fire some soil is already present and succession is faster than primary succession

1 x 3 = 3

**Q.19 High yielding cattle is a good solution for food enhancement. How does the MOET technology help to increase the herd size?**

Ans. High yielding female administered with FSH ,6-8 eggs / multiple eggs produced, inseminated, fertilised eggs recovered non-surgically, at 32-cell stage , transferred to surrogate mother (for development)  $\frac{1}{2} \times 6=3$

**Q.20 If there is a history of haemophilia in the family, the chances of male members becoming haemophilic are more than that of the females.**

**(a) Why is it so ?**

**(b) Write the symptoms of the disease.**

Ans.. a) Defective gene is on X chromosome, in case the carrier female (mother) passes  $X^h$  to the son he suffers, if she passes  $X^h$  to the daughter, she has the other X( from father ) to make it heterozygous so the daughters escape as carriers

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

b) The blood does not clot in the affected person after an injury or a small cut.

1

**Q.21 Why do tribes who live in high altitude of Himalayas experience discomfort in respiration ? How do they get adapted to survive in such a situation?**

Ans. Atmospheric pressure is low,  $O_2$  content is lower at high altitude

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

Body increases RBC production, decreases binding capacity of haemoglobin, increases breathing rate (any two)

1+1

**Q.22 Explain the events in a normal woman during her menstrual cycle on the following days:**

**(a) Pituitary hormone levels from 8 to 12 days.**

**(b) Uterine events from 13 to 15 days.**

**(c) Ovarian events from 16 to 23 days.**

Ans. a) FSH and LH levels – low

1

b) Endometrium is highly vascularised / proliferative phase of uterine lining

1

c) Formation of corpus luteum / secretion of progesterone

1

**Section D**

Q no 23 is of four marks

**Q.23 Peer pressure plays a negative role in triggering smoking habits in adolescents. As a school captain list any two activities you would like to organize with the help of senior students of your school and any other two activities you would like your school authorities to organize for the students to tackle this problem. Explain how these activities will help in doing so.**

Ans. Students activities- Poster making , slogan writing , essay writing , processions , display of banners , highlighting its ill- effects during assembly, power-point presentation on harmful effects of tobacco (any two= ½ + ½ )

School activities – Seminars, workshops, talks-by doctors, counsellors ,psychologists, government officials, vigilant supervision, value education through class teachers (any two= ½ + ½)

This will help in bringing about awareness/ prevent diseases associated with smoking /provide alternatives / help the smokers in doing away with this habit(Any other relevant point to be evaluated) (any two =1+1)

**Section E**

Q nos 24- 26 is of five marks each

**Q.24(a) What is Central dogma ? Who proposed it?**

**(b) Describe Meselson and Stahl’s experiment to prove that the DNA replication is semi-conservative.**

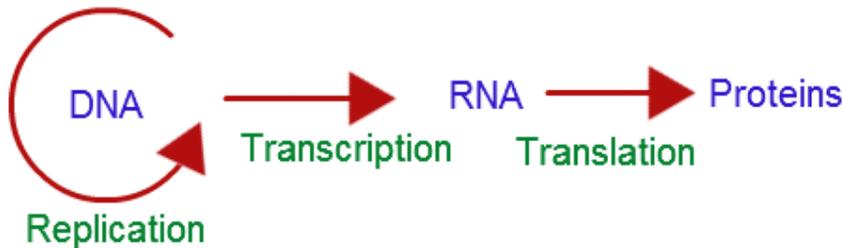
OR

**(a) A couple with blood groups ‘A’ and ‘B’ respectively have a child with blood group ‘O’. Work out a cross to show how it is possible and the probable blood groups that can be expected in their other off-springs.**

**(b) Explain the genetic basis of blood groups in human population.**

Ans. (a) Central dogma-

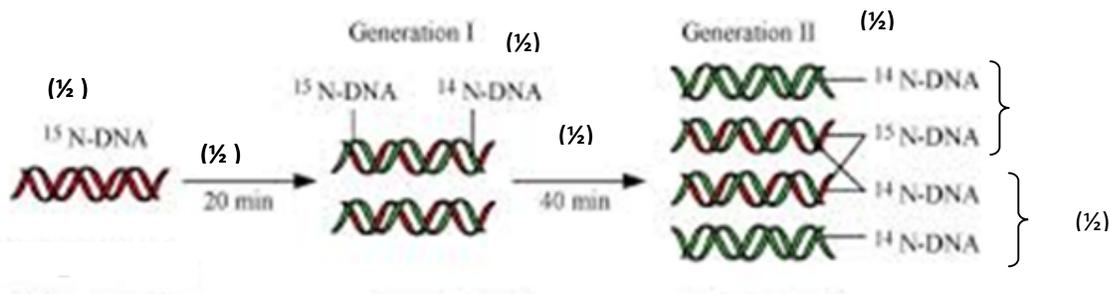
1



Given by Francis Crick

1

b)



(Same value points to be awarded in an explanation)

½ x 6 = 3

OR

Father =I<sup>A</sup>i

Child=ii

$I^A i$ (Father)	X	$I^B i$ (Mother)	$\frac{1}{2} + \frac{1}{2}$
	$I^A$	$i$	
$I^B$	$I^A I^B$ Blood Group AB	$I^B i$ Blood Group B	( $\frac{1}{2}$ )
$I$	$I^A i$ Blood Group A	$ii$ Blood Group O	( $\frac{1}{2}$ )

Phenotypes of all off springs= AB, B, A and O blood group 1

b) Genetic basis of blood groups ;

Three alleles of one gene / multiple alleles/ gene  $I^A, I^B, I$   $\frac{1}{2}$

A and B are co-dominant / expressed together  $\frac{1}{2}$

$I^A I^A, I^A I$	A	}	
$I^B I^B, I^B I$	B		1
$I^A I^B$	AB		
$ii$	O		

**Q.25 Explain the application of rDNA technology to produce insulin.**

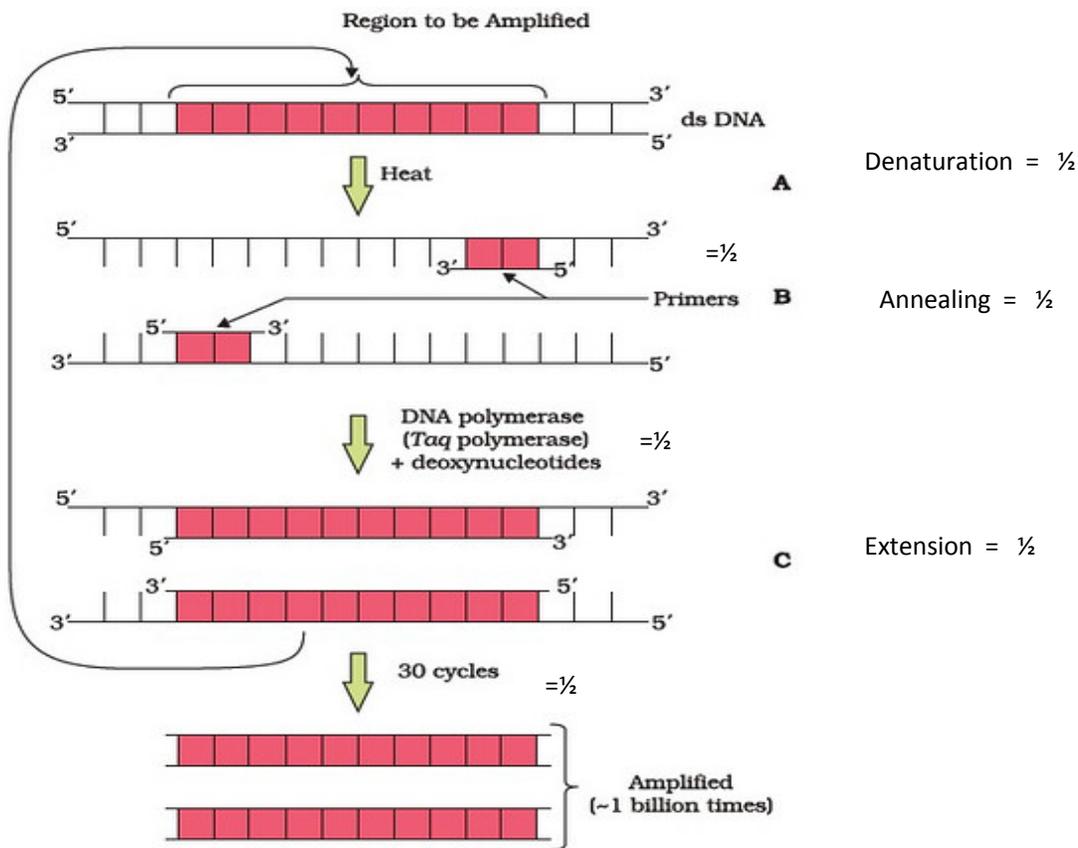
**OR**

**(a) Describe the different steps in one complete cycle of PCR.**

**(b) State the purpose of such an amplified DNA sequence.**

Ans. Human insulin is synthesised as a pro-hormone, the pro-hormone contains an extra C- peptide, the C- peptide is not present in mature insulin, and is removed during maturation, Eli-Lily-an American company prepared two DNA sequences, corresponding to A and B chains of human insulin, and introduced them in plasmids of E.coli to produce insulin chains, Chain A and B were produced separately, extracted and combined, by creating disulphide bonds  $\frac{1}{2} \times 10 = 5$

**OR**



$\frac{1}{2} \times 6 = 3$

(Same value points to be awarded in an explanation)

Purpose –used to ligate with a vector for further cloning/ detection of bacteria or virus by amplification of their DNA/detection of HIV in AIDS patient/to detect mutation in genes in suspected cancer patients. (any two= 1+1)

**Q.26 (a) Describe in sequence the process of microsporogenesis in angiosperms.**

**(b) Draw a labelled diagram of a two celled final structure formed.**

OR

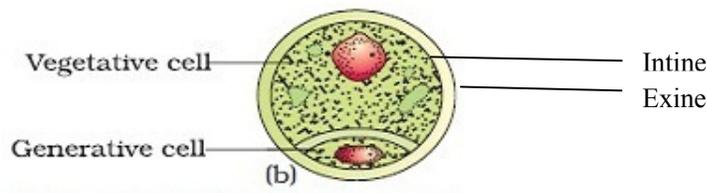
**(a) Draw a sectional view of a seminiferous tubule of human. Label sertoli cell, spermatogonia and leydig cell on it and write their functions.**

**(b) Explain the role of pituitary and sex hormones in the process of spermatogenesis.**

Ans. (a) Microsporogenesis-Each microspore mother cell divides meiotically, to form 4 haploid cells or tetrad, each microspore divides into two unequal cells- large vegetative cell and smaller generative cell; at this 2- celled stage the pollen grains are shed. Sometimes the generative cell divides mitotically to give rise to two haploid male gametes, that are shed at 3 - celled stage

$\frac{1}{2} \times 6 = 3$

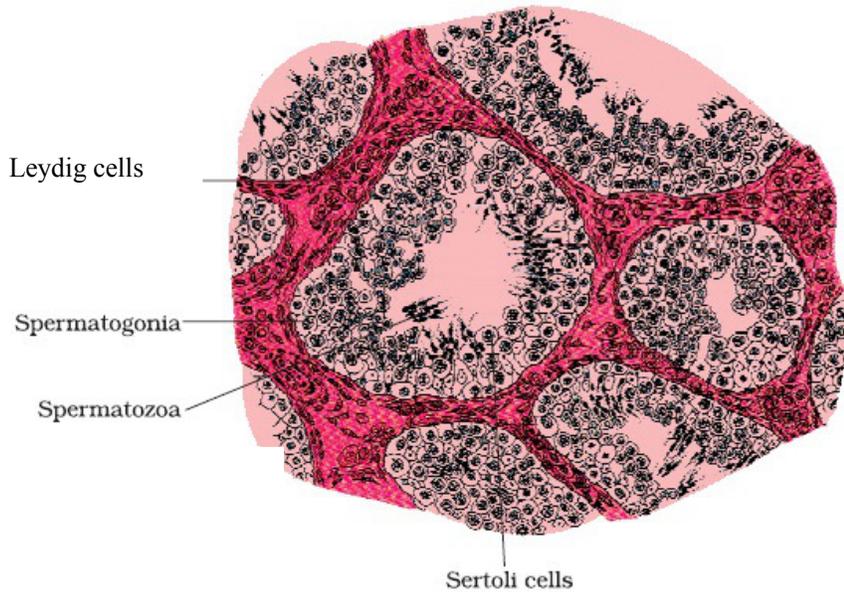
b)



Labelling –exine, intine, vegetative cell, generative cell

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

OR



Label sertoli cells, spermatogonia, Leydig cells

$\frac{1}{2} \times 3 = 1 \frac{1}{2}$

Functions –Sertoli cells -secrete factors which help in the process of spermiogenesis/ provide nutrition to germ cells

$\frac{1}{2}$

Spermatogonia-divide to produce spermatids /sperms

$\frac{1}{2}$

Leydig cells-synthesis or secretion of androgens/testosterone

$\frac{1}{2}$

b) Pituitary hormones– LH/luteinising hormone- acts on Leydig cells and stimulates synthesis and secretion of androgens,

FSH/follicle stimulating hormone- acts on sertoli cells and simulates secretion of some factor that help in spermiogenesis

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

Sex hormone –(Androgen/testosterone) stimulate process of spermatogenesis

1