

Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Senior Secondary School Certificate Examination, 2024
SUBJECT NAME BIOLOGY (Q.P. CODE 57/2/3)

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.
2	“Evaluation policy is a confidential policy as it is related to the confidentiality of the examinations conducted, Evaluation done and several other aspects. Its’ leakage to public in any manner could lead to derailment of the examination system and affect the life and future of millions of candidates. Sharing this policy/document to anyone, publishing in any magazine and printing in News Paper/Website etc may invite action under various rules of the Board and IPC.”
3	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 due marks be awarded to them. In class-XII, while evaluating two competency-based questions, please try to understand given answer and even if reply is not from marking scheme but correct competency is enumerated by the candidate, due marks should be awarded.
4	The Marking scheme carries only suggested value points for the answers These are in the nature of Guidelines only and do not constitute the complete answer. The students can have their own expression and if the expression is correct, the due marks should be awarded accordingly.
5	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. If there is any variation, the same should be zero after deliberation and discussion. 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.
6	Evaluators will mark(✓) wherever answer is correct. For wrong answer CROSS ‘X’ be marked. Evaluators will not put right (✓) while evaluating which gives an impression that answer is correct and no marks are awarded. This is most common mistake which evaluators are committing.
7	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.
8	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.



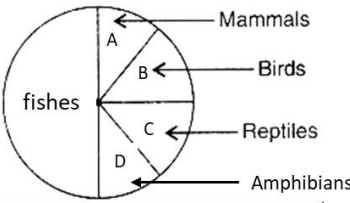
9	If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out with a note “ Extra Question ”.
10	No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
11	A full scale of marks _____ (example 0 to 80/70/60/50/40/30 marks as given in Question Paper) has to be used. Please do not hesitate to award full marks if the answer deserves it.
12	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). This is in view of the reduced syllabus and number of questions in question paper.
13	<p>Ensure that you do not make the following common types of errors committed by the Examiner in the past:-</p> <ul style="list-style-type: none"> ● 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 an answer. ● 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/not same. ● 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.
14	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.
15	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.
16	The Examiners should acquaint themselves with the guidelines given in the “ Guidelines for Spot Evaluation ” before starting the actual evaluation.
17	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.
18	The candidates are entitled to obtain photocopy of the Answer Book on request on payment of the prescribed processing fee. All Examiners/Additional Head Examiners/Head Examiners are once again reminded that they must ensure that evaluation is carried out strictly as per value points for each answer as given in the Marking Scheme.



MARKING SCHEME
Senior Secondary School Examination, 2024
BIOLOGY (Subject Code-044)
[Paper Code: 57/2/3]

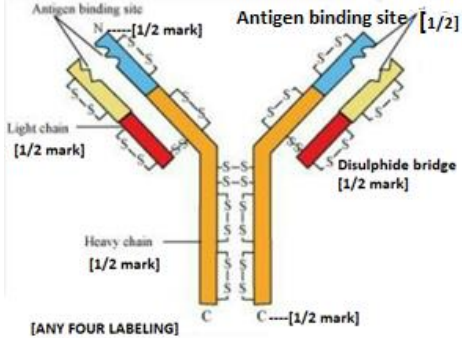
1	(A)/ Biomass of fish exceeds that of phytoplankton	1	1								
2.	(B)/ Bacterial cell	1	1								
3.	(C)/ <i>Monascus purpureus</i> – Citric Acid	1	1								
4.	(C)/ Antihistamine	1	1								
5.	(C)/ 1-(iii), 2-(iv), 3-(i), 4-(ii)	1	1								
6.	(C)/ 30 tall and 30 dwarf	1	1								
7.	(C)/ it is penetrated by the sperm cell.	1	1								
8.	(C) /0.48	1	1								
9.	(D)/Homologous structures are a result of convergent evolution.	1	1								
10.	(A)/ degenerates	1	1								
11.	(C) /anti-parallel and complementary	1	1								
12.	(D)/ 3' end of the coding strand.	1	1								
13.	(C) /Assertion (A) is true, but Reason (R) is false	1	1								
14.	(B)/ Both Assertion (A) and Reason (R) are true, but Reason (R) is <i>not</i> the correct explanation of the Assertion (A).	1	1								
15.	(A)/ Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).	1	1								
16.	(A)/ Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).	1	1								
SECTION – B											
17.	<table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td style="text-align: center;">Haemophilia</td> <td style="text-align: center;">Sickle cell anaemia</td> </tr> <tr> <td style="text-align: center;">Sex linked/X- linked recessive disorder</td> <td style="text-align: center;">Autosomal recessive disorder</td> </tr> <tr> <td style="text-align: center;">More males than females are affected.</td> <td style="text-align: center;">Affects both males and females equally.</td> </tr> <tr> <td style="text-align: center;">Carrier/unaffected female transmits the disease to some of her male offspring.</td> <td style="text-align: center;">When both the parents are carriers, the disease is transmitted to the offspring.</td> </tr> </tbody> </table> <p style="text-align: center;">(any two corresponding differences)</p>	Haemophilia	Sickle cell anaemia	Sex linked/X- linked recessive disorder	Autosomal recessive disorder	More males than females are affected.	Affects both males and females equally.	Carrier/unaffected female transmits the disease to some of her male offspring.	When both the parents are carriers, the disease is transmitted to the offspring.	1+1	2
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Carrier/unaffected female transmits the disease to some of her male offspring.	When both the parents are carriers, the disease is transmitted to the offspring.										
18	<p>(A) – Heroin/smack/diacetylmorphine</p> <p>(B) – Cardiovascular system</p> <p>(C) – Cocaine/coca alkaloid/coke/crack</p> <p>(D)–Stimulates central nervous system /produces a sense of euphoria and increased energy/hallucination.</p>	$\frac{1}{2} \times 4$	2								



19.	<ul style="list-style-type: none"> • Detritus rich in lignin and chitin– slow decomposition, rich in nitrogen and water soluble substances like sugar - decomposition rate is faster, • Warm environment – favour decomposition, low temperature – Inhibit decomposition. 	$\frac{1}{2} \times 4$	2
20.	<p>(a) Copper releasing IUDS – CuT, Cu-7, Multiload – 375 (Any two)</p> <p>Cu^+ released from IUDs suppress sperm motility, reduces fertilising capacity of sperms, increase phagocytosis of sperms (Any two)</p> <p style="text-align: center;">OR</p> <p>(b) - Unisexuality- production of unisexual flowers,</p> <ul style="list-style-type: none"> - Release and receptivity of stigma are not synchronized, either pollen is released before the stigma becomes receptive or stigma becomes receptive much before the release of pollen, - Anther and stigma are placed at different positions, so that the pollen cannot come in contact with stigma, - Self-incompatibility/genetic incompatibility, genetic mechanism and prevents self-pollen from fertilizing the ovule by inhibiting pollen germination or pollen tube growth in the pistil. <p style="text-align: right;">(Any two devices with explanation)</p>	$\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2} \times 4$	2
21.	Tumour inducing genes or virulent gene in Ti plasmid are removed hence Ti plasmid is disarmed, DNA carrying the gene of interest can be inserted into the segment.	1+1	2
SECTION - C			
22.	<p>(a)</p>  <p>(b) Dodo, Quagga, Thylacine, Steller's Sea Cow, 3 subspecies (Bali, Javan, Caspian) of tiger (or any other correct example - any two)</p>	$\frac{1}{2} \times 4$ $\frac{1}{2} + \frac{1}{2}$	3

23.	<p>- Predators act as conduits for energy transfer across trophic levels.</p> <p>for example→</p> <p>Grass → Goat → Lion / Lion (Predator) transfers the energy fixed by plants and the Ecosystem. (or any other correct example)</p> <p>- Predators keep prey populations under control.</p> <p>e.g. Cactus feeding predator (moth) control the spreading of the prickly pear cactus.</p> <p>(or any other correct example)</p> <p>- Predators help in maintaining species diversity by reducing the intensity of competition among competing prey species.</p> <p>e.g. extinction of more than 10 species of invertebrates due to removal of starfish <i>Pisaster</i> (predator) (or any other correct example)</p>	<p>$\frac{1}{2} + \frac{1}{2}$</p> <p>$\frac{1}{2} + \frac{1}{2}$</p> <p>$\frac{1}{2} + \frac{1}{2}$</p>	3
24.	<p>(a) Disorder is caused due to the deletion of gene coding for adenosine deaminase.</p> <p>(b) Bone marrow transplantation, enzyme replacement therapy, gene therapy (any two)</p> <p>(c) The gene isolated from bone marrow cells producing ADA, if introduced into cells at early embryonic stage could be a permanent cure.</p>	<p>1</p> <p>$\frac{1}{2} + \frac{1}{2}$</p> <p>$\frac{1}{2} + \frac{1}{2}$</p>	3
25.	<p>- In vitro fertilization (IVF)-ova and sperms collected from donor induced to form zygote under simulated conditions in laboratory followed by embryo transplant,</p> <p>- Zygote intra fallopian transfer (ZIFT)-zygote upto 8 blastomeres transferred to fallopian tube,</p> <p>- Intra uterine transfer (IUT)- embryos with more than 8 blastomeres transferred uterus,</p> <p>- Gamete intra fallopian transfer (GIFT)- transfer of an ovum collected from donor into the fallopian tube of another female who can produce one but can provide suitable environment for further development,</p> <p>- Intra-cytoplasmic sperm injection (ICSI)-the sperm is directly injected into the ovum,</p> <p>- Artificial insemination (AI)- sperm collected from male is artificially introduced into female. (any 3 techniques with explanation)</p>	1x3	3
26.	<p>(a) (i)</p> <ul style="list-style-type: none"> • Karyotype - 44 + XXY/47-XXY/AA+XXY, • Genetic disorder - Klinefelter's syndrome 	$\frac{1}{2} + \frac{1}{2}$	

	<p>(ii) Gynaecomastia/development of breast, Sterile Individuals, , overall masculine development (any two symptoms)</p> <p>(iii) Failure of segregation of chromatids or chromosomes/non-disjunction of chromatids or chromosomes during cell division or gametogenesis.</p> <p style="text-align: center;">OR</p> <p>(b) DNA fingerprinting is the basis of paternity testing, high degree of polymorphism in DNA, the polymorphisms are inheritable.</p> <p style="text-align: center;">//</p> <p>Isolation of DNA and amplification by PCR, Digestion of DNA, Separation of DNA fragments by electrophoresis, blotting and hybridisation, detection of hybridised fragments by autoradiography, matching the DNA bands of father and child.</p>	<p>$\frac{1}{2} + \frac{1}{2}$</p> <p>1</p> <p>1x3</p> <p>$\frac{1}{2} \times 6$</p>	<p>3</p>												
27.	<p>(a) Population size grows exponentially, compete for resources only some survive and grow and others or weaker perish, organisms with favourable variations survive and reproduce called survival of the fittest, favourable variations get accumulated over a period of time and get naturally selected so that new forms arise.</p> <p>(b) Microbes divide fast with shorter life span and, variations can be observed in larger population within short time.</p>	<p>$\frac{1}{2} \times 4$</p> <p>$\frac{1}{2} + \frac{1}{2}$</p>	<p>3</p>												
28.	<p>(a)</p> <table border="1" data-bbox="256 1485 1225 1868"> <thead> <tr> <th></th> <th>Humoral immune response</th> <th>Cell-Mediated immune response</th> </tr> </thead> <tbody> <tr> <td>(i)</td> <td>Mediated by B-lymphocytes</td> <td>Mediated by T- lymphocytes</td> </tr> <tr> <td>(ii)</td> <td>Antibodies are produced by B-lymphocytes in the blood.</td> <td>T- cells do not secrete antibodies but help B-cells to produce them.</td> </tr> <tr> <td>(iii)</td> <td>This is not responsible for graft rejection.</td> <td>This is responsible for the graft rejection.</td> </tr> </tbody> </table> <p style="text-align: center;">(any two corresponding differences)</p> <p>(b)</p>		Humoral immune response	Cell-Mediated immune response	(i)	Mediated by B-lymphocytes	Mediated by T- lymphocytes	(ii)	Antibodies are produced by B-lymphocytes in the blood.	T- cells do not secrete antibodies but help B-cells to produce them.	(iii)	This is not responsible for graft rejection.	This is responsible for the graft rejection.	<p>$\frac{1}{2} + \frac{1}{2}$</p>	<p>3</p>
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	 <p style="text-align: center;">(any correct four labels)</p>	$\frac{1}{2} \times 4$	3
SECTION - D			
29.	<p>(a)</p> <ul style="list-style-type: none"> • Macrophages, • virus replication (RNA genome) <p>(b) • Enzyme-linked immuno-sorbent assay (ELISA) / Polymerase Chain Reaction (PCR)</p> <ul style="list-style-type: none"> • Treatment available – Antiviral drugs that are only partially effective as they only prolong the life of the patient. <p>(c) Making blood HIV safe in blood banks, use of only disposable needles and syringes in hospitals, free distribution of condoms, controlling drug abuse, advocating safe sex, regular check-ups for HIV susceptible population. (Any two)</p> <p style="text-align: center;">OR</p> <p>(c) This is because of drastic reduction of helper T-lymphocytes that are responsible to fight infections, person become immune-deficient, unable to protect oneself from other bacterial or viral or fungal or parasitic infection.</p>	$\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ 1+1 1 $\frac{1}{2}$ $\frac{1}{2}$	4
30.	<p>(a) Sertoli cells in seminiferous tubule, induces release of some factors which induce spermiogenesis.</p> <p style="text-align: center;">OR</p> <p>(a) LH acts on Leydig cells, and stimulates the synthesis and secretion of androgens for spermatogenesis.</p> <p>(b) (i) Spermatogonia $\xrightarrow{\text{mitosis/differentiation}}$ Primary Spermatocyte</p> <p style="padding-left: 40px;">(ii) Primary Spermatocyte $\xrightarrow{\text{meiosis I}}$ Secondary Spermatocyte</p> <p style="padding-left: 80px;">$\xrightarrow{\text{meiosis II}}$ Spermatid</p> <p>(c) Rete testis, vasa efferentia</p>	1+1 1+1 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$	4
SECTION - E			

31.	<p>(a) (i)</p> <ul style="list-style-type: none"> • Since Sulphur is component of protein so they used radioactive Sulphur to label protein coat of the virus • Since Phosphorus is the component of the DNA so they used radioactive Phosphorus to label DNA. <p>(ii) (1) To remove viral coats from bacteria or <i>E.coli</i> by agitating..</p> <p>(2) The viral particles were separated from bacteria or <i>E.coli</i> by spinning in a centrifuge.</p> <p>(iii) - No radioactive S^{35} detected in the cells but detected in the supernatant in case of radioactive S^{35} labelled protein capsule of bacteriophage</p> <p>- Radioactive P^{32} detected in cells but not in the supernatant in case of viruses having radioactive P^{32} labelled DNA.</p> <p>(iv) DNA is the genetic material.</p> <p style="text-align: center;">OR</p> <p>(b) (i)</p> <ul style="list-style-type: none"> • Initiation-DNA dependent RNA polymerase attaches at 3'-end of the DNA template using sigma factor. • Elongation- by using nucleotide triphosphates as substrate polymerization in template dependent fashion occurs by following rule of complementarity. • Termination-on reaching terminator region polymerase binds with rho factor leads to separation of nascent RNA and polymerase. <p>(ii) (1) one in prokaryotes</p> <p>(2) three in eukaryotes</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>1</p> <p>1</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	5
32.	<p>(a) (i)</p> <ul style="list-style-type: none"> • DNA is a hydrophilic molecule and cannot pass through the cell membrane. • A bacterial cell is made competent by treating the bacterial cell with a specific concentration of a divalent cation such as calcium, 	<p>1</p> <p>$\frac{1}{2} + \frac{1}{2}$</p>	



	<p>which increases efficiency with which the DNA enters through pores in its cell wall/This creates certain transient pores in its cell and increases the efficiency of the cell to take up DNA.</p> <p>(ii) (1) Separation of DNA fragments .</p> <p>(2) DNA fragments are negatively charged molecules, they can be separated according to their size by forcing them to move toward the anode under an electric field through agarose gel.</p> <p>(3) To stain the DNA to visualize by exposure to UV radiation.</p> <p style="text-align: center;">OR</p> <p>(b) (i) Specific Bt toxin gene <i>cry IAc/cry II Ab</i>, isolated from <i>Bacillus thuringiensis</i> bacteria and incorporated into the cotton plant to provide resistance to bollworm.</p> <p>(ii) <i>Bacillus thuringiensis</i> forms toxic insecticidal protein or Bt toxin protein during a particular growth phase, Bt toxin protein exist as inactive pro-toxin, on ingestion by the bollworm inactive toxin is converted into active form due to alkaline pH of the gut, activated toxin binds to the surface of the mid-gut epithelial cells, create pores and causes cell swelling, lysis and death of the insect.</p>	<p>$\frac{1}{2} + \frac{1}{2}$</p> <p>1</p> <p>$\frac{1}{2} + \frac{1}{2}$</p> <p>1</p> <p>1+1</p> <p>$\frac{1}{2} \times 6$</p>	<p>5</p>
<p>33.</p>	<p>(a) (i)</p> <ul style="list-style-type: none"> Pollen tube passes down the style, generative cell divides mitotically into two male gametes and male gametes are discharged into the embryo sac through the micropyle, <p>-One of the male gamete + Egg/ovum \rightarrow Zygote (2n)/zygote is diploid, Process is known as syngamy.</p> <p>-Other male nucleus (n) + secondary nucleus (2n) \rightarrow PEN/Primary Endosperm Nucleus(3n)/PEN is triploid, this is known as triple fusion,</p> <p style="text-align: right;">(Ploidy of zygote and PEN)</p> <p>Since two types of fusion (syngamy and triple fusion) in an embryo sac called double fertilization.</p> <ul style="list-style-type: none"> Filiform apparatus of synergids guide entry of the pollen tube (at the micropylar end). <p>(ii) To provide assured nutrition to the developing embryo.</p> <p style="text-align: center;">OR</p> <p>(a) (i)</p> <ul style="list-style-type: none"> Ampullary-isthmic junction/ampulla of fallopian tube , A sperm comes in contact with zona pellucida (layer of ovum), the secretion of the acrosome of the sperm helps the sperm to enter into the cytoplasm of the ovum, this induces completion of meiosis II to form haploid ovum (ootid), haploid nucleus of the sperm and of the ovum fuse together to form the diploid zygote. 	<p>$\frac{1}{2} + \frac{1}{2}$</p> <p>$\frac{1}{2} + \frac{1}{2}$</p> <p>$\frac{1}{2} + \frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>1</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2} \times 4$</p>	

	<p>On contact of sperm with zona pellucida induces changes in the membrane of the ovum that blocks the entry of the additional sperms.</p> <p>(ii)</p> <ul style="list-style-type: none"> • Blastocyst • Trophoblast layer of the blastocyst gets attached to the endometrium, inner cell mass gets differentiated into an embryo, the uterine cells divide rapidly and blastocyst gets embedded in the endometrium of the uterus. 	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2} \times 3$</p>	<p>5</p>
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