

SOLUTIONS
Senior Secondary School Examination, 2026

BIOLOGY (Subject Code-044)

[Paper Code: 57/2/2]

Maximum Marks: 70

Q.No.	EXPECTED ANSWERS/VALUE POINTS	Marks	Total Marks
SECTION A			
1.	(B) / Infectious for dicot plant; has Ti plasmid.	1	1
2.	(C) / Soil Sample III	1	1
3.	(B) / 50% haemophilic carrier daughter, 50% colourblind carrier daughters.	1	1
4.	(D) / r – Intrinsic rate of natural increase.	1	1
5.	(D) / The complex process like cell division and cell differentiation.	1	1
6.	(D) / high degree of A and high degree of B	1	1
7.	(D) / Rice and <i>Arabidopsis</i>	1	1
8.	(D) / Artificial Passive Immunity	1	1
9.	(D) / Density Gradient Centrifugation.	1	1
10.	(B) / Share common ancestors	1	1
11.	(C) / Ethidium Bromide	1	1
12.	(B) / a – Meiosis I , b – Meiosis II , c – No division , d - Mitosis	1	1
13.	(C) / Assertion (A) is true, Reason (R) is false.	1	1
14.	(A) / Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation for Assertion (A).	1	1
15.	(A) / Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation for Assertion (A).	1	1
16.	(C) / Assertion (A) is true, Reason (R) is false.	1	1
SECTION B			
17.	(a) • Yes	$\frac{1}{2}$	

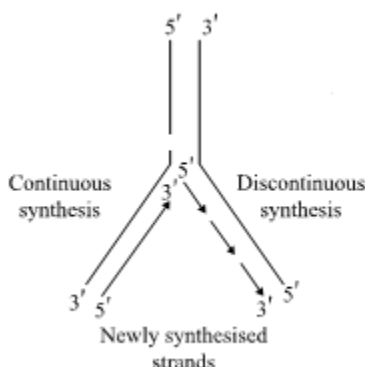
	Tall (Female) TT T T Dwarf (Male) tt t t P- parents F1- generation All Tall plant Tt F2- generation <table><tr><td>T</td><td>Tall</td><td>Tall</td></tr><tr><td></td><td>TT</td><td>Tt</td></tr><tr><td>t</td><td>Tall</td><td>Dwarf</td></tr><tr><td></td><td>Tt</td><td>tt</td></tr></table> (same cross can be justified with any other trait) The above cross shows that dwarf trait was not expressed in F₁ generation but reappears in F₂ generation showing that characters are inherited but not expressed in its phenotype. OR (b) - Expressed Sequence Tags, To identify all the genes that are expressed as RNA. - Sequence Annotation, Blind approach of simply sequencing the whole set of genome having all coding and non coding sequences. 1/2 1/2 1/2 1/2 x4 2	T	Tall	Tall		TT	Tt	t	Tall	Dwarf		Tt	tt	18.	- Fungal cell is treated with Chitinase enzyme to digest the membrane. - RNA is removed by treating with Ribonuclease. - Proteins removed by treating with protease. - Chilled ethanol is then added and purified DNA precipitates out. 1/2 x4 2	19.	<table><tr><td></td><td>Opiods</td><td>Cannabinoids</td></tr><tr><td>Receptor site in human body</td><td>Central Nervous System and Gastrointestinal Tract</td><td>Brain</td></tr><tr><td>Mode of action in human body</td><td>Depressant/Slows down body function</td><td>Effect Cardiovascular system</td></tr></table> 1/2x4 2		Opiods	Cannabinoids	Receptor site in human body	Central Nervous System and Gastrointestinal Tract	Brain	Mode of action in human body	Depressant/Slows down body function	Effect Cardiovascular system
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20.	(a) (i) Placenta (ii) - Nutrition: It facilitates the supply of nutrients to embryo. - Hormonal regulation: Acts as an endocrine gland and produces hCG /Human Chorionic Gonadotropin, hPL / Human Placental Lactogen, estrogen, progestogens. (Any two hormones) OR (b) (i) Fertilisation can only occur if the ovum and sperms are transported simultaneously to the ampullary region / use of contraceptive devices / low sperm count or poor sperm quality / absence of ovulation / lactational amenorrhea / coitus interruptus / periodic abstinence (Any other correct reason) (ii) <table><tr><td>Meiosis I in Spermatogenesis</td><td>Meiosis I in Oogenesis</td></tr><tr><td>Starts at puberty</td><td>Starts during embryonic stage</td></tr><tr><td>Results in production of two equal haploid secondary spermatocyte</td><td>Results in production of unequal haploid secondary oocyte and first polar body</td></tr></table> (Any One correct difference)	Meiosis I in Spermatogenesis	Meiosis I in Oogenesis	Starts at puberty	Starts during embryonic stage	Results in production of two equal haploid secondary spermatocyte	Results in production of unequal haploid secondary oocyte and first polar body	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}+\frac{1}{2}$ 1 1 2	
Meiosis I in Spermatogenesis	Meiosis I in Oogenesis								
Starts at puberty	Starts during embryonic stage								
Results in production of two equal haploid secondary spermatocyte	Results in production of unequal haploid secondary oocyte and first polar body								
21.	(a) - Percent cover / biomass, In an area if there are 200 carrot grass or <i>Parthenium</i> plants but only single huge banyan tree with a large canopy stating that population density of banyan is low amounts to underestimating the enormous role of Banyan. - Relative density, laboratory culture in a petri dish / fish caught per trap - Indirect estimate, tiger census in national parks and tiger reserves is often based on pug marks and fecal pellets. (Any two) OR (b) - Amazonian Rain Forests in South America has remained relatively undisturbed for millions of years. - It is less seasonal more constant and predictable. - More solar energy available in tropical areas that contributes to higher productivity and more diversity (Any two)	$\frac{1}{2} \times 4$ 1+1 2							
	SECTION C								
22.	(a) Due to immune response shown by the body/ due to ability of the body to fight against foreign agents (pathogens) (b)	1							

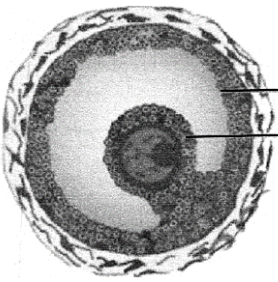
	(c) Physical barrier, Skin on our body prevents entry of pathogens / Mucus coating (of respiratory, gastrointestinal, urinogenital tract) help in trapping microbes entering our body. - Physiological barrier, Acid from stomach / saliva in the mouth / tears from eyes – all prevent microbial growth. - Cellular barrier, Neutrophils and monocytes in the blood as well as macrophages in tissues can phagocytose and destroy microbes. - Cytokine barrier, Virus infected cell secrete proteins interferons that protect non-infected cells from further viral infection (Any Two)	$\frac{1}{2} \times 4$	3
23.	(a) - Amniocentesis - Some of the amniotic fluid of the developing foetus is taken to analyse the fetal cells and dissolved substances. - Advantage: It tests the presence of certain genetic disorders /down syndrome / haemophilia / sickle cell anaemia / determine the survivability of the foetus - Disadvantage: to determine the sex of unborn child and if found female may lead to female foeticide. (b) Saheli is different from other pills in term of: - Composition: It is non-steroidal. - Advantage: Once a week pill / low side effects /high contraceptive value	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	3
24.	- Autogamy, pollen grains from one flower fall on the stigma of the same flower. - Geitonogamy, Transfer of pollen grains from anther of one flower to stigma of another flower of same plant. - Xenogamy, Transfer of pollen grains from anther of one flower to stigma of another flower of another plant.	$\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$	3
25.	(a) Genetic Code: It is the sequence of three nitrogenous bases (codon) on mRNA that directs the sequence of amino acids during synthesis of proteins. (b) To provide complementarity between nucleotides and amino acids / to support the notion that change in nucleic acids was responsible for change in amino acids in proteins / to establish the correlation between genetic information and protein synthesis / to constitute a combination of four bases to code twenty amino acids. (c) As a codon from bacteria to human code for the same amino acid.	1 1 1	3
26.	(a) Propagation of large number of plants in short duration, new plants are genetically identical to the original plants from which they have grown, production of disease free plants. (Any two) (b) Tomato, Banana, Apple (Any other two correct examples)	1+1 $\frac{1}{2} + \frac{1}{2}$	3
27.	(a) <i>Drosophila melanogaster</i> (b) - They could be grown on simple synthetic medium in the laboratory.	1	

	- Complete their life cycle in about two weeks. - Single mating produces large number of progeny flies. - Clear differentiation of sexes – male and female flies are easily distinguishable. - Has many types of hereditary variations that can be seen under low power microscopes. / (Any other correct reason) (Any Four)	$\frac{1}{2} \times 4$	3			
28.	(a) To prove that formation of life was preceded by chemical evolution/ organic molecules can form spontaneously from inorganic molecules (b) - Gases used: CH₄, NH₃, H₂, Water vapours. - Source of energy - Electric discharge	1 1 1	3			
SECTION D						
29.	(a) Water, Soil, sunlight, temperature, organic substances, inorganic substances (Any two) (b) <table border="1"><thead><tr><th>Role of producers</th><th>Role of decomposers</th></tr></thead><tbody><tr><td>Conversion of inorganic molecules into organic material with the help of sunlight through the process of photosynthesis</td><td>Break down of dead and decayed organic material into simpler inorganic substances through the process of decomposition</td></tr></tbody></table> (c) Food Chain : Phytoplanktons → zooplanktons → Fish Trophic Levels : producers/ Primary consumer/ Secondary consumer/ 1st trophic level 2nd trophic level 3rd trophic level OR (c) Some energy is dissipated and lost as heat to the environment / only 10% of energy being transferred to the next trophic level.	Role of producers	Role of decomposers	Conversion of inorganic molecules into organic material with the help of sunlight through the process of photosynthesis	Break down of dead and decayed organic material into simpler inorganic substances through the process of decomposition	$\frac{1}{2} + \frac{1}{2}$
Role of producers	Role of decomposers					
Conversion of inorganic molecules into organic material with the help of sunlight through the process of photosynthesis	Break down of dead and decayed organic material into simpler inorganic substances through the process of decomposition					

	- Endonuclease: Make cuts at specific positions within DNA strand.	$\frac{1}{2}$	4
	SECTION E		
31.	(a) (i) • Disease : Acquired Immuno Deficiency Syndrome /AIDS • Causative Agent : Human Immuno deficiency Virus / HIV (ii) - After getting the entry into the body of the person virus enters macrophages - RNA genome of the virus replicates to form viral DNA with the help of enzyme reverse transcriptase - The viral DNA gets incorporated into the host cell's DNA and directs the infected cells to produce virus particles. - Simultaneously HIV enters into helper T-lymphocytes (T_H) and produce progeny viruses which attack other T-lymphocytes leading to weakened immune system. // (iii) - By Sexual contact with infected person. - Transfusion of contaminated blood and blood products. - Sharing of infected needles by intravenous drug abusers. - Infected mother to her child through placenta. (Any Two) OR (b) (i) They reduce our dependence on toxic chemicals and pesticides / They create a system where insects called pests are not eradicated but kept at manageable level by complex system of checks and balances / No negative	1 1 $\frac{1}{2} \times 4$ $\frac{1}{2} + \frac{1}{2}$ 1	

	impact on plants mammals birds fish or non – target insects (Any other correct reason) (ii) (1) A Bacterium: <i>Bacillus thuringensis</i>, controls butterfly caterpillars, larvae eat the spores and toxin is released in the gut of larvae thus killing it (2) A Fungi: <i>Trichoderma</i> are free living fungi common in root ecosystem, effective biocontrol agents against several plant pathogens. (3) Virus: Baculoviruses under genus <i>Nucleopolyhedrovirus</i> , shows species specific , narrow spectrum insecticidal application.	$\frac{1}{2} \times 3$ $\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2} \times 3$	5																					
32.	(a) (i) • Structure - Replication fork • Process - DNA Replication (ii) • Source of Energy - Deoxyribo nucleoside triphosphates • Enzymes - DNA dependent - DNA polymerase / helicase / topoisomerase / permease / DNA Ligase (iii) • According to the template strand with polarity 3' – 5' - new DNA is synthesized continuously but in the strand with polarity 5' - 3' - new DNA is synthesized in short fragments • Continuous synthesis, discontinuous synthesis. (iv)  Newly synthesised strands (Any Two correct labelling) OR (b) (i) By crossing the given tall garden pea plant with a recessive parent / Test Cross (I) <table style="margin-left: auto; margin-right: auto;"> <tr> <td>TT</td> <td>X</td> <td>tt</td> </tr> <tr> <td>dominant phenotype</td> <td></td> <td>homozygous recessive</td> </tr> <tr> <td>(Genotype unknown)</td> <td></td> <td></td> </tr> </table> <table style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td>t</td> <td>t</td> </tr> <tr> <td>T</td> <td>Tt</td> <td>Tt</td> </tr> <tr> <td>T</td> <td>Tt</td> <td>Tt</td> </tr> </table> Result : All pea plants are tall Interpretation : Unknown plant is homozygous (II) <table style="margin-left: auto; margin-right: auto;"> <tr> <td>Tt</td> <td>X</td> <td>tt</td> </tr> </table>	TT	X	tt	dominant phenotype		homozygous recessive	(Genotype unknown)				t	t	T	Tt	Tt	T	Tt	Tt	Tt	X	tt	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ 1 $\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$ 1 $\frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$	
TT	X	tt																						
dominant phenotype		homozygous recessive																						
(Genotype unknown)																								
	t	t																						
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	dominant phenotype (Genotype unknown) homozygous recessive <table> <tr> <td></td> <td>t</td> <td>t</td> </tr> <tr> <td>T</td> <td>Tt</td> <td>Tt</td> </tr> <tr> <td>t</td> <td>tt</td> <td>tt</td> </tr> </table> Result : 50% pea plants are tall and 50% plants are dwarf Interpretation : Unknown plant is heterozygous (ii) (1) 1:2:1 ratio suggests incomplete dominance (2) 3:1 ratio suggests complete dominance		t	t	T	Tt	Tt	t	tt	tt	1/2 1/2+1/2 1/2 1/2	5
	t	t										
T	Tt	Tt										
t	tt	tt										
33.	(a) (i) Stigma has the ability to recognise the right or compatible and wrong or incompatible type of pollen (ii) - Compatible pollen grain germinates on the stigma to produce pollen tube that grows through the tissues of stigma and style and reaches to the ovary - Generative cell divides into two male gametes while moving through style and Pollen tube enters the ovule through the micropyle and then enters one of the synergids through the filiform apparatus - The pollen tube releases the two male gametes in the cytoplasm of Synergid and one male gamete moves towards the egg cell and fuses with its nucleus forming a zygote (syngamy) - The other male gamete moves towards the two polar nuclei present in the central cell and fuses with them to form Primary Endosperm Nucleus / PEN (triple fusion). (Since syngamy and triple fusion both occur in embryo sac so it is termed as Double Fertilization) OR (b) (i) During menstrual phase in the menstrual cycle of human female endometrium lining of the uterus and its blood vessels which forms liquid comes out through vagina and flow lasts for 3-5 days. (ii) As the regeneration of endometrium through proliferation takes place. (iii) Graafian follicle ruptures to release secondary oocyte, remaining part of graafian follicle transforms into corpus luteum (iv)	1 1x4 1 1 1+1										

	 Antrum Secondary oocyte	$\frac{1}{2} + \frac{1}{2}$	5
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