

Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Senior School Certificate Supplementary Examination, 2023
SUBJECT NAME: BIOLOGY (SUBJECT CODE 044) (PAPER CODE 57/C/1)

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 0-70 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).
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 totalling 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 totalling on the title page. ● Wrong totalling 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 un assessed portion, non-carrying over of marks to the title page, or totalling 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.

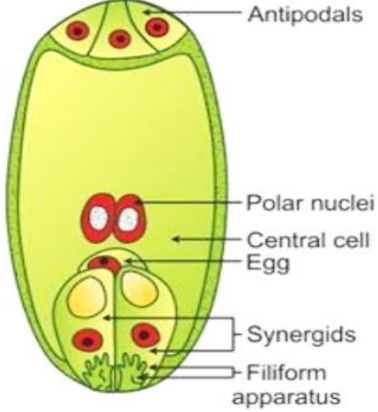
17	Every Examiner shall also ensure that all the answers are evaluated, marks carried over to the title page, correctly totalled and written in figures and words.
18	The candidates are entitled to obtain photocopy of the Answer Book on request on payment of the prescribed processing fee. All Examiners/Additional 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 Supplementary Examination, 2023
BIOLOGY (Subject Code-044)
[Paper Code: 57/C/1]

Maximum Marks:70

Q. No.	EXPECTED ANSWER / VALUE POINTS	Marks	Total Marks
	SECTION—A		
1	(a) / P-Thalamus	1	1
2	(a) / Intra Cytoplasmic sperm injection // (d) / Zygote Intra Fallopian Transfer	1 // 1	1
3	(d) / 2/16.	1	1
4	(c) / $W_1 = W_0 e^{rt}$.	1	1
5	(d) / Frederick Sanger.	1	1
6	(a) / Dhatura – Hallucinogen.	1	1
7	(c) / Consanguineous mating.	1	1
8	(b) / <i>Agrobacterium tumefaciens</i> .	1	1
9	(b) / They are small circular DNA molecules with their own origin of replication site.	1	1
10	(c) / Stabilized.	1	1
11	(b) / Aravalli Hills- Karnataka.	1	1
12	(c) / Sense and Antisense RNA.	1	1
13	(c) / (A) is true, but(R)is false.	1	1
14	(c) / (A) is true, but(R) is false.	1	1
15	(a) / Both (A) and (R) are true, and (R) is the correct explanation of (A).	1	1
16	(b) / Both (A) and (R) are true, but(R) is not the correct explanation of (A).	1	1
	SECTION B		
17	Features of male flowers: Well exposed stamen, so that pollens are easily dispersed into wind current / light and non-sticky pollen grains, so that they are easily transported in wind current. Features of female flowers: Large often feathery stigma and style wave in the wind , to easily trap air borne pollen grains/ numerous flowers packed into an inflorescence, to easily trap air borne pollen grains. (Or any other features with correct justification)	$\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$	2

18	<p>A molecule that can act as a genetic material must fulfil the following criteria:</p> <ul style="list-style-type: none"> -It should be able to generate its replica (Replication). -It should be stable chemically and structurally. -It should provide the scope for slow changes (mutation) that are required for evolution. -It should be able to express itself in the form of 'Mendelian characters'. 	$\frac{1}{2} \times 4$	2
19	<p>(a) Bone marrow</p> <p>(b) T- Lymphocytes, Maturation/ Proliferation/become antigen sensitive / become effector cells.</p>	1 $\frac{1}{2} + \frac{1}{2}$	2
20	<p>(a)</p> <p>(i) Transgenic animals are designed to allow the study of gene regulation and effects of gene on the normal functions of the body/ The result obtained by introducing gene from other species that alter the formation of any growth like factors(such as insulin like growth factor) is used to know its biological role.</p> <p>(ii) Transgenic animals are made more sensitive to toxic substances and when exposed to these substances the effect is studied to get results in lesser time.</p> <p style="text-align: center;">OR</p> <p>(b)</p> <ul style="list-style-type: none"> -Made crops more tolerant to abiotic stresses (cold, drought, salt, heat). -Reduced reliance on chemical pesticides (pest-resistant crops). -Helped to reduce post-harvest losses. -Increased efficiency of mineral usage by plants (this prevents early exhaustion of fertility of soil). -Enhanced nutritional value of food, e.g., golden rice, i.e., Vitamin 'A' enriched rice. -In addition to these uses, GM has been used to create tailor-made plants to supply alternative resources to industries, in the form of starches, fuels and pharmaceuticals. <p style="text-align: right;">(Any Four applications)</p>	1 1 $\frac{1}{2} \times 4$	2

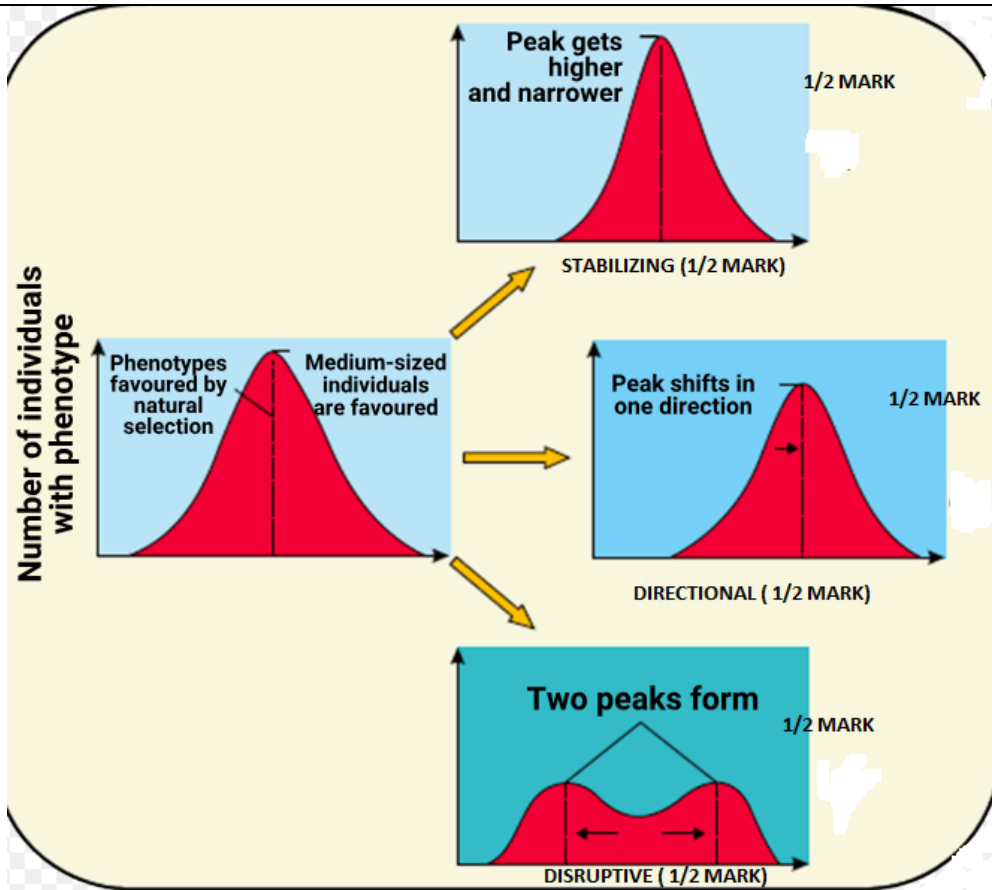
21	<p style="text-align: center;">(½ mark to be awarded for every correct difference)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;"></th> <th style="width: 33%;">Follicular phase</th> <th style="width: 33%;">Luteal Phase</th> </tr> </thead> <tbody> <tr> <td>(a) Days of their occurrence in the cycle</td> <td>6th -13th /6th -14th day</td> <td>15th -28th/15th -29th day</td> </tr> <tr> <td>(b) Stage of the follicle</td> <td>Development of Primary follicle into Graafian follicle</td> <td>Transformation of Graafian follicle into Corpus Luteum</td> </tr> <tr> <td>(c) Hormones influencing the phases</td> <td>LH/FSH/Estrogen</td> <td>Progesterone</td> </tr> <tr> <td>(d) State of endometrium</td> <td>Regeneration of endometrium through proliferation.</td> <td>Endometrium further proliferate and thickens.</td> </tr> </tbody> </table>		Follicular phase	Luteal Phase	(a) Days of their occurrence in the cycle	6 th -13 th /6 th -14 th day	15 th -28 th /15 th -29 th day	(b) Stage of the follicle	Development of Primary follicle into Graafian follicle	Transformation of Graafian follicle into Corpus Luteum	(c) Hormones influencing the phases	LH/FSH/Estrogen	Progesterone	(d) State of endometrium	Regeneration of endometrium through proliferation.	Endometrium further proliferate and thickens.	<p>½</p> <p>½</p> <p>½</p> <p>½</p>	2
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SECTION –C																		
22.	<p>(a)</p>  <p style="text-align: center;">Mature Embryo Sac</p> <p style="text-align: center;">(½ mark each for any 4 correct labellings)</p> <p>(b) Guide pollen tube into synergids.</p>	<p>½ × 4</p> <p>1</p>	3															
23	<p>(a) Male fruit fly has XY and female fowl has ZW sex chromosomes, they produce two different types of gametes in terms of sex chromosomes, while female fruit fly has XX and male fowl has ZZ sex chromosomes and they produce same type of gametes in terms of sex chromosomes.</p> <p>(b) Females are diploid and produces egg by meiosis, males are haploid produces sperm by mitosis, Unfertilized eggs develop into male by</p>	<p>½×3</p> <p>½×3</p>																

parthenogenesis(so do not have a father and will not have sons) and fertilized eggs develop into female.

(Consider given points if flow chart is drawn)

3

24



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

($\frac{1}{2}$ mark for each figure with correct labelling)

3

25

(a)

'R' Strain	'S' Strain
Non-Virulent	Virulent
No polysaccharide coat	Have polysaccharide coat

($\frac{1}{2}$ mark for any one difference)

$\frac{1}{2}$

(b)

S strain \longrightarrow Inject into mice \longrightarrow Mice die

R strain \longrightarrow Inject into mice \longrightarrow Mice live

S strain (heat killed) \longrightarrow Inject into mice \longrightarrow Mice live

S strain (heat killed)+ R stain \longrightarrow Inject into mice \longrightarrow Mice die

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

Conclusion: He concluded that the R strain bacteria had somehow been transformed by the heat-killed S strain bacteria / Some 'transforming principle' transferred from heat killed S strain and transform R strain into S strain.

$\frac{1}{2}$

3

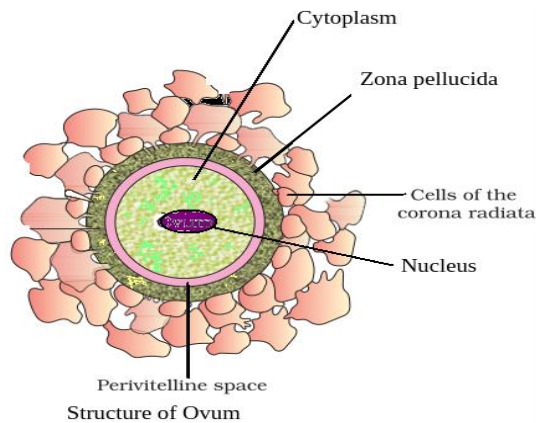
26	<p>(a) Abiotic components (water, soil, sunlight), Biotic components {Phytoplanktons (producers), Zooplanktons, free swimming forms, bottom dwellers and decomposers (Fungi, Bacteria, Flagellates)}</p> <p>Conversion of inorganic into organic material with the help of the radiant energy of the sun by autotroph like phytoplanktons (Productivity), Consumptions of autotrophs by heterotrophs like zooplanktons /free swimming forms / bottom dwellers (flow of energy), decomposition and mineralization of the dead organic matter, to release them back for reuse by the autotrophs. (Cycling of nutrients)</p> <p style="text-align: center;">OR</p> <p>(b) (i) The Mediterranean orchid <i>Ophrys</i> employs ‘sexual deceit’ to get pollination done by a species of bee, one petal of its flower bears an uncanny resemblance to the female of the bee in size colour and markings, The male bee is attracted to what it perceives as a female ‘pseudocopulates’ with the flower, and during this process is dusted with pollen from the flower and transfer them to another flower. (ii) Brood parasitism, the parasitic bird lays its eggs in the nest of its host and lets the host incubate them.</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2} \times 4$</p> <p>$\frac{1}{2} \times 4$</p> <p>$\frac{1}{2} + \frac{1}{2}$</p>	<p>3</p>
27	<ul style="list-style-type: none"> • Penicillin • Alexander Fleming while working on <i>Staphylococci</i> bacteria, once observed a mould growing in one of his unwashed culture plates around which <i>Staphylococci</i> could not grow, He found out that it was due to a chemical produced by the mould and he named it Penicillin after the mould <i>Penicillium notatum</i>. • Alexander Fleming, Ernest Chain , Howard Florey. (1/2 mark each for any two correct names) 	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2} \times 3$</p> <p>$\frac{1}{2} + \frac{1}{2}$</p>	<p>3</p>
28	<p>(a) Gel electrophoresis, to separate DNA fragments.</p> <p>(b) (i) Agarose gel, to separate DNA fragments according to their size through sieving effect. (ii) Stained with Ethidium bromide followed by exposure to UV light which can be seen as orange coloured DNA band, Separated DNA bands are cut out from the gel and extracted from gel piece.</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
	SECTION-D		
29	<p>(i)</p> <p>(a) Recombinant DNA technology</p> <p style="text-align: center;">OR</p> <p>(b) Bacterial- Lysozyme, Fungal- Chitinase</p> <p>(ii)</p> <p>Scientist at Eli Lilly company prepared two DNA sequences , corresponding to A and B peptide chains of human insulin, and introduced them in plasmids of E. coli to produce insulin chains ,Chains A and B were produced separately, extracted , and combined by creating disulfide bonds to form human insulin.</p>	<p>1</p> <p>$\frac{1}{2} + \frac{1}{2}$</p> <p>$\frac{1}{2} \times 6$</p>	4
30	<p>(i)</p> <p>(a) Biodiversity increases as we move from arctic towards tropics/ biodiversity decreases as we move from tropics towards arctic</p> <p style="text-align: center;">OR</p> <p>(b) X- Columbia Y- India/ South America</p> <p style="text-align: right;">(Or any other correct name)</p> <p>(ii) Tropics harbor more biological diversity:</p> <ul style="list-style-type: none"> -Speciation is generally a function of time unlike temperate regions subjected to frequent glaciations in the past tropical latitudes have remained relatively undisturbed for millions of years and thus had a long evolutionary time for species diversification. -Tropical environments are less seasonal relatively more constant and predictable which promote niche specialization and lead to a greater species diversity. -There is more solar energy available in the tropics which contributes to higher productivity that contributes indirectly to greater diversity. 	<p>1</p> <p>$\frac{1}{2} \times 2$</p> <p>1×3</p>	4
	SECTION E		

31

(a)

(i)



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

($\frac{1}{2}$ mark each for any three correct labelling)

During fertilisation a sperm comes in contact with the zona pellucida layer of the ovum and induces changes in the membrane that block the entry of additional sperms, The secretions of the acrosome help the sperm enter into the cytoplasm of the ovum through the zona pellucida and the plasma membrane, This induces the completion of the meiotic division of the secondary oocyte , and results in the formation of a second polar body and a haploid ovum (ootid), the haploid nucleus of the sperms and that of the ovum fuse together to form a diploid zygote.

$\frac{1}{2} \times 5$

(ii)

If sperm carrying X chromosomes fertilize egg child born will be a female baby, If sperm carrying Y chromosome fertilize the egg child born will be a male baby.

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

OR

(b)

(i)

-Educating them about safe and hygienic sexual practices and sexually transmitted diseases.

-Educating people in marriageable age group about the birth control measures pre-natal and post-natal care of the mother and significance of breastfeeding.

-Sex education should be provided to the school going children so as to discourage myths and misconceptions about sex related aspects.

-A legal ban on the checking of the gender of the foetus.

-Create awareness about sex-abuse and drawbacks of population explosion.

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

	<p>-Proper infrastructural and professional facilities to attain reproductive health standards (Any other correct recommendation)</p> <p style="text-align: right;">(Any Four Points)</p> <p>(ii)</p> <p>(1) 'A'-X, 'B'-P</p> <p>(2)</p> <ul style="list-style-type: none"> 'A'- Vasectomy , small part of vas deferens is removed or tied up 'B'-Tubectomy, small part of fallopian tube is removed or tied up 	<p>$\frac{1}{2} + \frac{1}{2}$</p> <p>5</p> <p>$\frac{1}{2} + \frac{1}{2}$</p> <p>$\frac{1}{2} + \frac{1}{2}$</p>										
32	<p>(a)</p> <ul style="list-style-type: none"> In case of Pea plant <div style="text-align: center;"> <p>VV X vv (Violet) (White)</p> <p>↓</p> <p>F₁ Vv(violet)</p> <p>↓</p> <p>Selfing</p> <p>F₂</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Gametes(Male/Female)</td> <td style="text-align: center;">(v)</td> <td style="text-align: center;">(v)</td> </tr> <tr> <td style="text-align: center;">(v)</td> <td style="text-align: center;">VV Violet</td> <td style="text-align: center;">Vv Violet</td> </tr> <tr> <td style="text-align: center;">(v)</td> <td style="text-align: center;">Vv Violet</td> <td style="text-align: center;">vv White</td> </tr> </table> <p>Phenotype- Violet:White 3 : 1</p> <p>It shows Complete dominance</p> <ul style="list-style-type: none"> In case of Snapdragon flower / Dogflower / <i>Antirrhinum</i> <div style="text-align: center;"> <p>RR X rr (Red) (White)</p> <p>↓</p> </div> </div>	Gametes(Male/Female)	(v)	(v)	(v)	VV Violet	Vv Violet	(v)	Vv Violet	vv White	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>	
Gametes(Male/Female)	(v)	(v)										
(v)	VV Violet	Vv Violet										
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	<p>F₁ Rr(Pink) ↓ Selfing</p> <p>F₂</p> <p>Gametes(Male/Female)</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td style="text-align: center;">(R)</td> <td style="text-align: center;">(r)</td> </tr> <tr> <td style="text-align: center;">(R)</td> <td style="text-align: center;">RR Red</td> <td style="text-align: center;">Rr Pink</td> </tr> <tr> <td style="text-align: center;">(r)</td> <td style="text-align: center;">Rr Pink</td> <td style="text-align: center;">rr White</td> </tr> </table> <p>Phenotype- Red:Pink:White 1 :2 :1</p> <p>One Allele is incompletely dominant over the other allele/ Incomplete dominance.</p> <p style="text-align: center;">OR</p> <p>(b)</p> <p>(i)</p> <ul style="list-style-type: none"> • Heterogenous nuclear RNA • Eukaryotic cell • RNA polymerase-II <p>(ii)</p> <ul style="list-style-type: none"> • Yes • hn RNA it is subjected to a process called <u>splicing</u> where the introns are removed and exons are joined in a defined order , In <u>capping</u> an unusual nucleotide (methyl guanosine triphosphate) is added to the 5'-end of hnRNA , In <u>tailing</u> adenylate residues (200-300) are added at 3'-end. • mRNA <p>(iii)</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">mRNA</td> <td style="text-align: center;">tRNA</td> </tr> <tr> <td style="text-align: center;">Provide template for protein synthesis</td> <td style="text-align: center;">Act as adaptor molecule/ brings amino acids and read genetic code</td> </tr> </table>		(R)	(r)	(R)	RR Red	Rr Pink	(r)	Rr Pink	rr White	mRNA	tRNA	Provide template for protein synthesis	Act as adaptor molecule/ brings amino acids and read genetic code	<p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2 × 3</p> <p>1/2</p> <p>1/2 × 3</p> <p>1/2</p> <p>1</p>	<p>5</p>
	(R)	(r)														
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(r)	Rr Pink	rr White														
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33	<p>(a)</p> <p>(i) Cancer cells appears to have lost the property of contact inhibition as a result they continue to divide to form mass of cells(tumor).</p>	1														

<p>(ii) When proto-oncogenes are activated under certain conditions it could lead to oncogenic transformation of the cells .</p> <p>(iii)</p> <ul style="list-style-type: none"> • X-rays/ UV rays/ Nicotine / Caffeine/ Tobacco smoke/ Oncogenic viruses • Damage DNA which causes neoplastic transformation. <p>(iv)</p> <table border="1"> <thead> <tr> <th>Benign tumors</th> <th>Malignant tumors</th> </tr> </thead> <tbody> <tr> <td>Remain confined to their original location</td> <td>Not remain confined to their original location/ Show property of metastasis</td> </tr> <tr> <td>Cause little damage</td> <td>Damage surrounding tissue and starve normal cells by competing for vital nutrients</td> </tr> </tbody> </table> <p style="text-align: center;">(1 mark for each correct difference)</p> <p style="text-align: center;">OR</p> <p>(b) (i)</p> <ul style="list-style-type: none"> • To make it less polluting • Steps for sewage treatment <p>-Primary treatment- physical removal of floating debris through sequential filtration and sedimentation</p> <p>- secondary treatment/ biological treatment</p> <p>- primary effluent is passed to large aeration tank where it is constantly agitated and air is pumped into it</p> <p>-This allow vigorous growth of aerobic microbes into floc which significantly reduces organic matter or BOD</p> <p>-flocs are allowed to settle in settling tank this sediment is called activated sludge</p> <p>- major part of sludge is pumped into anaerobic sludge digester to produce biogas</p> <p>(ii) Ganga Action plan, Yamuna action plan ,To build a large number of sewage treatment plants so that only treated sewage may be discharged into the rivers.</p> <p style="text-align: center;">(Any two points to be considered)</p>	Benign tumors	Malignant tumors	Remain confined to their original location	Not remain confined to their original location/ Show property of metastasis	Cause little damage	Damage surrounding tissue and starve normal cells by competing for vital nutrients	<p>1</p> <p>½</p> <p>½</p> <p>1+1</p> <p>1</p> <p>½ × 6</p> <p>½ +½</p>	
Benign tumors	Malignant tumors							
Remain confined to their original location	Not remain confined to their original location/ Show property of metastasis							
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		5						