SECOND YEAR HIGHER SECONDARY SECOND TERMINAL EXAMINATION–

DECEMBER - 2022

SY - 2026

PART – III

BIOLOGY (BOTANY & ZOOLOGY)

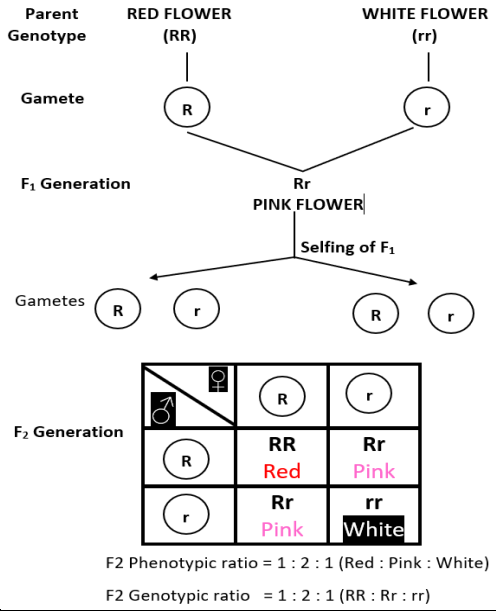
SCORING KEY (UNOFFICIAL)

	PART -A **BOTANY**	
Qn. No.	Scoring indicators	Marks
	PART - I	
	Answer any 3 questions from 1 – 5. Each carry 1 score	
1.	(c) / Sporopollenin	1
2.	(a) / *Thermus aquaticus*	1
3.	(b) / Black pepper	1
4.	Bioreactors	1
5.	Brood parasitism (Parasitism ½ Score)	1
	PART - II	
	Answer any 9 questions from 6 – 16. Each carry 2 scores	
6.	1. **Chemical method or Direct method** The steps enabling bacterial cell to take up the recombinant DNA are, Bacterial cells are treated with divalent cation such as Ca^{2+} to increase cell permeability. Then these cells are treated with recombinant DNA (rDNA) on ice. The cells and rDNA in ice are allowed to heat at 42°C (heat shock at 42°C). The content is again cooled to ice cold. 2. **Microinjection** Direct injection of rDNA into the nucleus of an animal cell is called microinjection. 3. **Biolistics or Gene Gun** Bombardment of plant cell with high velocity micro particle of gold or tungsten coated with DNA is called biolistics. 4. **Disarmed Pathogen** Use of disarmed (Noninfectious) pathogens like retroviruses are allowed to infect in order to deliver recombinant DNA. (Any two type with explanation)	1 + 1 =2
7.	Pollen release and stigma receptivity are not synchronized. Anther and stigma are at different positions.	1 + 1 =2

Qn. No.	Scoring indicators	Marks
8.	A – Plumule B – Cotyledons C – Radicle D – Root cap	½ x 4 = 2
9.	Complementary base sequences in DNA that are same when each strand is read in same direction (5'-3') are called palindromic nucleotide. Eg:- 5' -------GAATTC-------3' 3' -------CTTAAG-------5'	1 + 1 = 2
10.	(a) Bt represent *Bacillus thuringiensis* (b) It is a genetically modified cotton plant with insecticidal protein producing gene from the bacteria *Bacillus thuringiensis*. / Insect or pest resistant cotton plant developed through genetic engineering.	½ +1½ = 2
11.	Natality/ Birth rate, Mortality / Death rate, Immigration, Emigration	½ x 4 = 2
12.	(a) - pBR322 (b) - Origin of replication (ori site), selectable markers and cloning sites or recognition sites are the important features of a cloning vector.	½ +1½ = 2
13.	Lymphocytes from the patients were isolated. In vitro culturing of isolated lymphocytes. Using retroviral vector cDNA (complimentary DNA) of functional ADA gene was introduced into the lymphocyte. Lymphocyte with functional ADA gene was returned to patient's blood. Periodic infusions of genetically engineered lymphocyte into patient's blood.	½ x 4 = 2
14.	A – Mycorrhiza B – Competition C – Parasitism D – Sparrow eating seeds	½ x 4 =2
15.	(a) Logistic Growth / Verhulst-Pearl Logistic Growth / Sigmoid growth. (b) (i) - r = Intrinsic rate of natural increase. (ii) - K = Carrying capacity (Any two floral character)	1 + 1 =2
16.	(a) Silencing or inhibition of translation of specific mRNA by complimentary double stranded RNA (dsRNA) is called RNAi technology. RNA interference is cellular defence mechanism or gene regulation at translational level in eukaryotic cell. (b) Agrobacterium vector.	1 + 1 = 2
PART – III		
Answer any 3 questions from 17 – 20. Each carry 3 scores		
17.	(a) Epidermis, endothecium, middle layers and the tapetum. (b) Outer three wall layers perform the function of protection and help in dehiscence of anther to release the pollen. Tapetum nourishes the developing pollen grains.	1 + 2 =3

<table>
<tr><th>Qn. No.</th><th>Scoring indicators</th><th>Marks</th></tr>
<tr><td>18.</td><td>Develop abiotic stress (cold, drought, salt & temperature) resistant plants.
Develop pest resistant plants.
Develop plants with reduced post-harvest losses.
Develop plants with enhanced nutritional value of food.
Develop plants with increased efficiency of mineral usage.
(Any three uses)</td><td>1+1+1= 3</td></tr>
<tr><td>19.</td><td><table><tr><th>Wind</th><th>Water</th><th>Insect</th></tr><tr><td>Pollen grains are light and non-sticky.
Single ovule present.</td><td>Pollen grains are large ribbon like.
Pollen grains have mucilage covering,</td><td>Pollen grains are sticky.
Flowers are large, colourful fragrant.</td></tr></table></td><td>½ x 6= 3</td></tr>
<tr><td>20.</td><td>(a) Polymerase Chain Reaction (PCR).
(b) Denaturation, Annealing, and Extension
(c)Artificially synthesized small oligonucleotide sequence complimentary to the regions of DNA.</td><td>1+1+1= 3</td></tr>
</table>

	PART -B **ZOOLOGY**	
Qn. No.	Scoring indicators	Marks
	PART - I	
	Answer any 3 questions from 1 – 6. Each carry 1 score	
1.	Vas deferens	1
2.	Uses – Used to test the presence of genetic disorders. Misuses - sex-determination of foetus, increasing chance of female foeticides.	½ + ½ = 1
3.	Down's Syndrome	1
4.	A – DNA B – Histone octomer	½ + ½ = 1
5.	(b) Adaptive radiation	1
	PART - II	
	Answer any 9 questions from 6 – 16. Each carry 2 scores	
6.	(a) X – Acrosome Y – Tail (b) Acrosome is filled with enzymes that help fertilisation of the ovum / Help in fertilization. Tail facilitate sperm motility / Motility.	½ x 4 =2
7.	(b) / Seminal vesicles is a part of female reproductive system. Seminal vesicles is a part of male reproductive system.	1 + 1 = 2
8.	(a) Corpus luteum secretes large amounts of progesterone / Help to maintain the endometrium by producing progesterone. (b) Sertoli cells provide nutrition to the germ cells.	1 + 1 = 2
9.	(a) Tubectomy. (b) Small part of the fallopian tube is removed or tied up so the sperm doesn't reach the ampulla. / Fallopian tube is removed or tied up in order to prevent fertilization.	½ +1½ = 2
10.	Yes In co-dominance the F1 generation resembles (show both characters) both parents. In human blood group both alleles (I^A and I^B) in the AB blood group are expressed.	½ +1½ = 2

11.	(a) Incomplete Dominance (b)  F2 Phenotypic ratio = 1 : 2 : 1 (Red : Pink : White) F2 Genotypic ratio = 1 : 2 : 1 (RR : Rr : rr)	½ +1½ = 2
12.	Sex determination in Drosophilla is male heterogamety type. Sex determination is XX- XY type. The male has one X- chromosome and one Y- chromosome. The female has two X- chromosome. The female individual determines the sex of the offsprings. (Representation of cross reg. sex determination give full Scores)	½ x 4 =2
13.	(a) Griffith Experiments. (b) R strain bacteria had been transformed by the heat-killed S strain bacteria / 'Transforming principle' transferred from the heat-killed S strain bacteria transformed R strain into S strain.	1 + 1 = 2
14.	**Homologous Organs**: Thorn in Bougainvillea and Tendril in Cucurbits. Fore limbs of Man, Cheetah, Whale, Bat. **Analogous Organs**: Wings of Butterfly and Birds. Flippers of Penguins and Dolphins	1 + 1 = 2
15.	The law states that, in a randomly mating large population, the allele frequency of various kinds of genes remains constant generation after generation. / The gene pool i.e., total genes and their alleles in a population remains constant. Gene flow, genetic drift, mutation, genetic recombination and natural selection (Any two factors)	1 + 1 = 2
16.	**A Diseases** / **B Organisms**: Malaria – Plasmodium Filariasis – Wuchereria Common cold – Rhinovirus Ring worm disease – Trichophyton	½ x 4 =2

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<tr><td></td><td>PART – III</td><td></td></tr>
<tr><td colspan="3">Answer any 3 questions from 17 – 20. Each carry 3 scores</td></tr>
<tr><td>17.</td><td>(a) a – Spermatogenesis b – Oogenesis
(b)
<table>
<tr><th>Spermatogenesis</th><th>Oogenesis</th></tr>
<tr><td>It is the process of formation of sperms.</td><td>It is the process of formation of ovum.</td></tr>
<tr><td>It starts at puberty.</td><td>It starts at the embryonic stage</td></tr>
<tr><td>Meiosis - I in the primary spermatocytes is continuous.</td><td>Meiosis - I in the primary oocytes is not continuous</td></tr>
<tr><td>Four sperms are formed from a primary spermatocyte.</td><td>Only one ovum is formed from a primary oocyte.</td></tr>
<tr><td>Sterile cells called polar bodies are not formed.</td><td>Sterile cells called Polar bodies are formed.</td></tr>
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(Any four differences)</td><td>1+2 =3</td></tr>
<tr><td>18.</td><td>(a) IUI - INTRA UTERINE INSEMINATION
Semen collected from the male partner is artificially introduced into the uterus of the female.
(b) ZIFT - ZYGOTE INTRA FALLOPIAN TRANSFER
Transfer of zygote or early embryo with up to 8 blastomere.
Zygote/Embryo is transferred into the fallopian tube.
(c) GIFT - GAMETE INTRA FALLOPIAN TRANSFER
GIFT is done if the female individual cannot produce ovum.
Ovum from a donor female is collected and transferred into the fallopian tube.
(d) MTP - MEDICAL TERMINATION OF PREGNANCY
Intentional or voluntary termination of pregnancy before full term.
(Expansion with any two explanation)</td><td>1+1+1 =3</td></tr>
<tr><td>19.</td><td>Splicing:
In splicing from hnRNA, introns are removed and exons are joined together.
Capping:
An unusual nucleotide of methyl guanosine triphosphate is added to the 5’end of hnRNA.
Tailing (Polyadenylation):
The adenylate residues (200-300) are added at 3’end called poly A tailing.</td><td>1+1+1 =3</td></tr>
<tr><td>20.</td><td>(a) DNA replication / Replicating Fork
(b) 1. DNA dependent DNA polymerase
The enzyme that catalyse the polymerisation of deoxyribonucleotides.
It catalyse the polymerisation of DNA in 5’ – 3’ direction only.
2. DNA ligase - The DNA fragments are joined together to form a new strand by DNA ligase</td><td>1+1+1 =3</td></tr>
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