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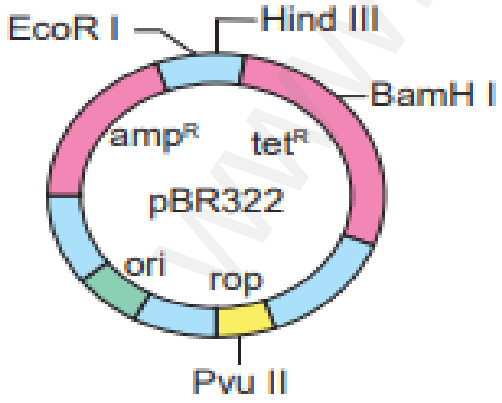
XII COMMON PUBLIC EXAMINATION, MARCH -2023 (31-03-2023)

TENTATIVE ANSWER KEY

Question type A

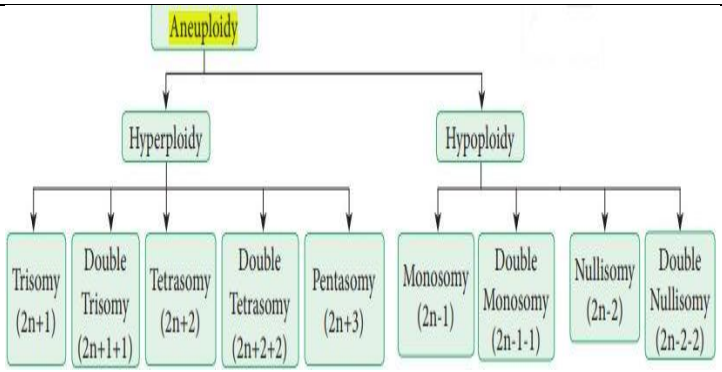
SUB: BOTANY MARKS: 70

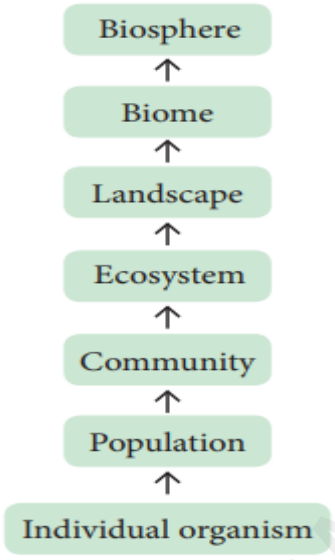
Q.NO	CONTENT	MARKS	MODE OF QUESTION
I.	**PART -I** CHOOSE THE CORRECT ANSWER	15 X 1 =15	BOOK BACK / BOOK INSIDE/ CREATIVE
1	c. (1)-(iii), (2)-(iv), (3)-(i), (4)-(ii)	1	BOOK BACK
2	a. 9:7	1	BOOK INSIDE
3	c. Dr. M. S. Swaminathan	1	BOOK INSIDE
4	d. Functional megaspore	1	BOOK INSIDE
5	c. Ozone	1	BOOK BACK
6	a. Capillary water	1	BOOK BACK
7	c. Brazil	1	BOOK BACK
8	b. Tropical African region	1	BOOK BACK
9	c. Agar	1	BOOK BACK
10	b. Blue, Red	1	BOOK INSIDE
11	b. DNA → RNA → Protein	1	BOOK BACK
12	a. Law of Segregation	1	BOOK BACK
13	c. AUG	1	BOOK BACK
14	d. Areca catechu	1	BOOK BACK
15	d. Soil	1	BOOK BACK

Q.NO	CONTENT	MARKS	MODE OF QUESTION
II.	**PART -II** ANSWER ANY SIX OF THE FOLLOWING QUESTION NUMBER 24 IS COMPULSORY	6 X 2 = 12	BOOK BACK / BOOK INSIDE/ CREATIVE
16	**Cantharophily** Pollination by Beetle is called Cantharophily	2	BOOK BACK
17	**Mendel's experiments were rediscovered** Mendel's experiments were rediscovered by three biologists, Hugo de Vries, Carl Correns and Erich von Tschermak.	2	BOOK BACK
18	**Gene interaction** A single phenotype is controlled by more than one set of genes, each of which has two or more alleles. This phenomenon is called Gene Interaction **Classify gene interaction** • Intragenic gene interactions or Intra allelic or allelic interactions • Intergenic gene interactions or inter allelic or non-allelic interactions	2	BOOK INSIDE
19	**Gene mapping** Genes are present in a linear order along the chromosome. They are present in a specific location called locus (plural: loci). The diagrammatic representation of position of genes and related distances between the adjacent genes is called gene mapping.	2	BOOK BACK
20	PBR 322  amp^R - Ampicillin Resistance Gene tet^R - Tetracycline Resistance Gene	2	BOOK INSIDE

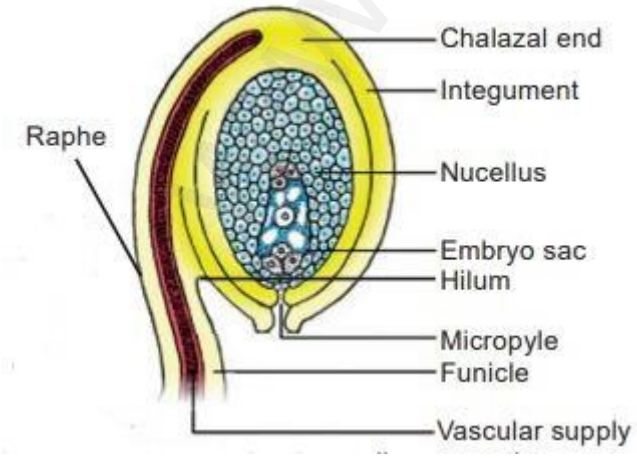
21	**somatic hybridization** The fusion product of protoplasts without nucleus of different cells is called a cybrid. Following this nuclear fusion happen. This process is called somatic hybridization.	2	BOOK INSIDE
22	**Seed ball** Seed ball is an ancient Japanese technique of encasing seeds in a mixture of clay and soil humus (also in cow dung) and scattering them on to suitable ground, not planting of trees manually	2	BOOK BACK
23	**Green Manuring** Green manuring is defined as the growing of green manure crops and use of these crops directly in the field by ploughing.	2	BOOK INSIDE
24	**Inherent capacities of living plants** 1. Redifferentiation 2. Dedifferentiation	2	BOOK INSIDE

Q.NO	CONTENT	MARKS	MODE OF QUESTION
III.	**PART -III** ANSWER ANY SIX OF THE FOLLOWING QUESTION NUMBER 33 IS COMPULSORY	6 X 3 = 18	BOOK BACK / BOOK INSIDE/ CREATIVE
25	**Differentiate Grafting and Layering** Grafting | Layering In grafting, two different plants (stock & Scion) are used to develop a new plant. | In layering, only one plant is used to develop a new plant. The new plant will support to possess the characters of both the parents or new variation can be noticed. | Variation cannot be expected. The new individual is exactly similar to a parent plant	3	BOOK BACK
26	**Types of aneuploidy**	3	BOOK BACK

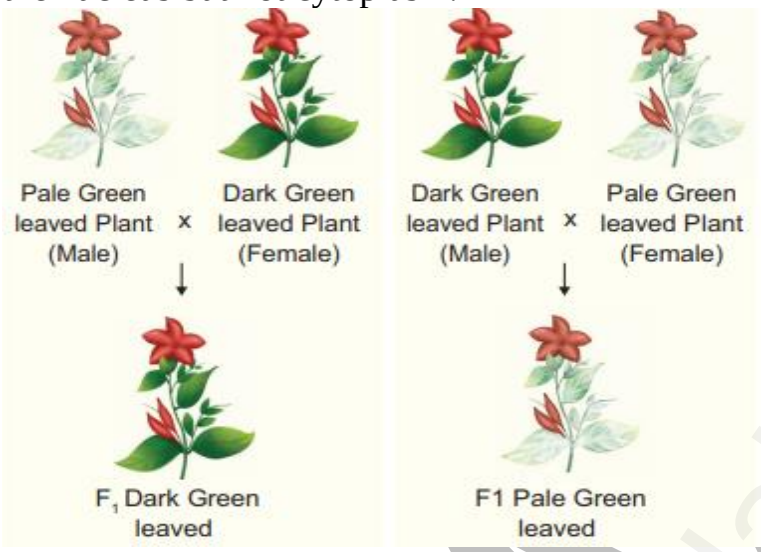
			
27	**Capping** Modification at the 5' end of the primary RNA transcript (hn RNA) with methylguanosine triphosphate is called capping. **Tailing** The 3' end of hnRNA is cleaved by an endonuclease and a string of adenine nucleotides is added to the 3' end of hnRNA (pre mRNA) is known as Poly (A) tail - Polyadenylation. This process is called tailing	3	BOOK BACK
28	**GM Food - Benefits** • High yield without pest • 70% reduction of pesticide usage • Reduce soil pollution problem • Conserve microbial population in soil **Risks - believed to** • Affect liver, kidney function and cancer • Hormonal imbalance and physical disorder • Anaphylactic shock (sudden hypersensitive reaction) and allergies. • Adverse effect in immune system because of bacterial protein. • Loss of viability of seeds show in terminator seed technology of GM crops.	3	BOOK BACK
29	**Afforestation Objectives** • To increase forest cover, planting more trees, increases O2 production and air quality. • Rehabilitation of degraded forests to increase carbon fixation and reducing CO2 from atmosphere. Raising bamboo plantations. • Mixed plantations of minor forest produce and	3	BOOK INSIDE

	medicinal plants. • Regeneration of indigenous herbs / shrubs. • Awareness creation, monitoring and evaluation. • To increase the level and availability of water table or ground water and also to reduce nitrogen leaching in soil and nitrogen contamination of drinking water thus making it pure not polluted with nitrogen. • Nature aided artificial regeneration. **(Any three points)**		
30	**Ecological hierarchy** The interaction of organisms with their environment results in the establishment of grouping of organisms which is called ecological hierarchy **Level of Ecological hierarchy**  	3	BOOK BACK
31	**Microbial innoculants increase the soil fertility** They are efficient in fixing nitrogen, solubilising phosphate and decomposing cellulose. They are designed to improve the soil fertility, plant growth, and also the number and biological activity of beneficial microorganisms in the soil. They are eco-friendly organic agro inputs and are more efficient and cost effective than chemical fertilizers..	3	BOOK BACK

32	**Pyramid of energy is always upright** The bottom of the pyramid of energy is occupied by the producers. There is a gradual decrease in energy transfer at successive tropic levels from producers to the upper levels. Therefore, the pyramid of energy is always upright.	3	BOOK BACK
33	**Differentiate Embryoids Artificial seeds** Embryoids: Somatic embryogenesis is the formation of embryos from the callus tissue directly and these embryos are called Embryoids or from the in vitro cells directly form pre-embryonic cells Artificial seeds: Artificial seeds or synthetic seeds (synseeds) are produced by using embryoids (somatic embryos) obtained through in vitro culture	3	BOOK INSIDE

Q.NO	CONTENT	MARKS	MODE OF QUESTION
IV.	**PART –IV** ANSWER ALL THE QUESTION	5 X 5 = 25	BOOK BACK / BOOK INSIDE CREATIVE
34 (a)	**Structure of ovule**  	5	BOOK BACK

34 (b)	**Significance of Plant Succession** • Succession is a dynamic process. Hence an ecologist can access and study the seral stages of a plant community found in a particular area. • The knowledge of ecological succession helps to understand the controlled growth of one or more species in a forest. • Utilizing the knowledge of succession, even dams can be protected by preventing siltation. • It gives information about the techniques to be used during reforestation and afforestation. • It helps in the maintenance of pastures. • Plant succession helps to maintain species diversity in an ecosystem. • Patterns of diversity during succession are influenced by resource availability and disturbance by various factors. • Primary succession involves the colonization of habitat of an area devoid of life. • Secondary succession involves the reestablishment of a plant community in disturbed area or habitat. • Forests and vegetation that we come across all over the world are the result of plant succession. **(Any Five points)**	5	BOOK INSIDE
35 (a)	**Inheritance of chloroplast gene** Chloroplast Inheritance It is found in 4 O' Clock plant (Mirabilis jalapa). In this, there are two types of variegated leaves namely dark green leaved plants and pale green leaved plants. When the pollen of dark green leaved plant (male) is transferred to the stigma of pale green leaved plant (female) and pollen pale green leaved plant is transferred to the stigma of dark green leaved plant, the F1 generation of both crosses must be identical as per Mendelian inheritance. But in the reciprocal cross the F1 plant differs from each other. In each cross, the F1 plant reveals the character of the plant which is used as female plant. This inheritance is not through nuclear gene. It is due	5	BOOK BACK

	the chloroplast gene found in the ovum of the female plant which contributes the cytoplasm during fertilization since the male gamete contribute only the nucleus but not cytoplasm.  		
35 (b)	**RNA Editing** Transcriptional RNA Processing in plants Chemical modification such as base modification, nucleotide insertion or deletions and nucleotide replacements of mRNA results in the alteration of amino acid sequence of protein that is specified is called RNA editing. This results in the change in the protein coding sequence of RNA following transcription. The coding properties of the RNA transcript is changed. The genetic information encoded in the chloroplast genome is altered by post transcriptional phenomenon which is site – specific (C → U) in chloroplast of higher plants – RNA editing occurs in plant mitochondria and chloroplast. In plant cells RNA editing by pyrimidine transitions occurs in mitochondria and plastids (chloroplast). There are two main types of RNA editing. (1) Substitution editing – Alteration of individual nucleotide bases. Mitochondria and chloroplast RNA plants. (2) Insertion / Deletion editing – Nucleotides are added or deleted from the total number of bases.	5	BOOK BACK
36 (a)	**Applications of Biotechnology** • Biotechnology is one of the most important applied interdisciplinary sciences of the 21st	5	BOOK BACK

	century. It is the trusted area that enables us to find the beneficial way of life. • Biotechnology has wide applications in various sectors like agriculture, medicine, environment and commercial industries. • This science has an invaluable outcome like transgenic varieties of plants e.g. transgenic cotton (Bt-cotton), rice, tomato, tobacco, cauliflower, potato and banana. • The development of transgenics as pesticide resistant, stress resistant and disease resistant varieties of agricultural crops is the immense outcome of biotechnology. • The synthesis of human insulin and blood protein in E.coli and utilized for insulin deficiency disorder in human is a breakthrough in biotech industries in medicine. • The synthesis of vaccines, enzymes, antibiotics, dairy products and beverages are the products of biotech industries. • Biochip based biological computer is one of the successes of biotechnology. • Genetic engineering involves genetic manipulation, tissue culture involves aseptic cultivation of totipotent plant cell into plant clones under controlled atmospheric conditions. • Single cell protein from Spirulina is utilized in food industries. • Production of secondary metabolites, biofertilizers, biopesticides and enzymes. • Biomass energy, biofuel, Bioremediation, phytoremediation for environmental biotechnology. **(Any Five points)**		
36 (b)	**The steps involved in protoplast culture** **i. Isolation of protoplast**: Small bits of plant tissue like leaf tissue are used for isolation of protoplast. The leaf tissue is immersed in 0.5% Macrozyme and 2% Onozuka cellulase enzymes dissolved in 13% sorbitol or mannitol at pH 5.4. It is then incubated over-night at 25°C. After a gentle teasing	5	BOOK INSIDE

	of cells, protoplasts are obtained, and these are then transferred to 20% sucrose solution to retain their viability. They are then centrifuged to get pure protoplasts as different from debris of cell walls. **ii. Fusion of protoplast:** It is done through the use of a suitable fusogen. This is normally PEG (Polyethylene Glycol). The isolated protoplast are incubated in 25 to 30% concentration of PEG with Ca++ ions and the protoplast shows agglutination (the formation of clumps of cells) and fusion. **iii. Culture of protoplast:** MS liquid medium is used with some modification in droplet, plating or micro-drop array techniques. Protoplast viability is tested with fluorescein diacetate before the culture. The cultures are incubated in continuous light 1000-2000 lux at 25°C. The cell wall formation occurs within 24-48 hours and the first division of new cells occurs between 2-7 days of culture. iv. Selection of somatic hybrid cells: The fusion product of protoplasts without nucleus of different cells is called a cybrid. Following this nuclear fusion happen. This process is called somatic hybridization		
37 (a)	**Solution to water crisis** Rainwater harvesting is the accumulation and storage of rain water for reuse in-site rather than allowing it to run off. Rainwater can be collected from rivers, roof tops and the water collected is directed to a deep pit. The water percolates and gets stored in the pit. RWH is a sustainable water management practice implemented not only in urban area but also in agricultural fields, which is an important economical cost effective method for the future. **Advantage of water crisis** • Promotes adequacy of underground water and water conservation. • Mitigates the effect of drought.	5	BOOK BACK

	• Reduces soil erosion as surface run-off is reduced. • Reduces flood hazards. • Improves groundwater quality and water table / decreases salinity. • No land is wasted for storage purpose and no population displacement is involved. • Storing water underground is an eco friendly measure and a part of sustainable water storage strategy for local communities. **(Any Five points)**		
37 (b)	**Types of hydrophytes** Hydrophytes The plants which are living in water or wet places are called hydrophytes. According to their relation to water and air, they are sub divided into following categories: i) Free floating hydrophytes, ii) Rooted- floating hydrophytes, iii) Submerged floating hydrophytes, iv) Rooted -submerged hydrophytes, v) Amphibious hydrophytes. **i. Free floating hydrophytes:** These plants float freely on the surface of water. They remain in contact with water and air, but not with soil. Examples: Eichhornia, Pistia and Wolffia (smallest flowering plant). **ii. Rooted floating hydrophytes:** In these plants, the roots are fixed in mud, but their leaves and flowers are floating on the surface of water. These plants are in contact with soil water and air. Examples: Nelumbo, Nymphaea, Potomogeton and Marsilea. Lotus seeds showing highest longevity in plant kingdom. **iii. Submerged floating hydrophytes:** These plants are completely submerged in water and not in contact with soil and air. Examples: Ceratophyllum and Utricularia.	5	BOOK BACK

	iv. Rooted- submerged hydrophytes: These plants are completely submerged in water and rooted in soil and not in contact with air. Examples: Hydrilla, Vallisneria and Isoetes. **v. Amphibious hydrophytes (Rooted emergent hydrophytes):** These plants are adapted to both aquatic and terrestrial modes of life. They grow in shallow water. Examples: Ranunculus, Typha and Sagittaria.		
38 (a)	**New breeding techniques** NBT are a collection of methods that could increase and accelerate the development of new traits in plant breeding. These techniques often involve genome editing, to modify DNA at specific locations within the plants to produce new traits in crop plants. The various methods of achieving these changes in traits include the following. • Cutting and modifying the genome during the repair process by tools like CRISPR /Cas. • Genome editing to introduce changes in few base pairs using a technique called Oligonucleotide directed mutagenesis (ODM). • Transferring a gene from an identical or closely related species (cisgenesis) • Organising processes that alter gene activity without altering the DNA itself (epigenetic methods).	5	BOOK BACK
38 (b)	**Economic importance of Rice** Rice is the easily digestible calorie rich cereal food which is used as a staple food in Southern and North East India. Various rice products such as Flaked rice (Aval), Puffed rice / parched rice (Pori) are used as breakfast cereal or as snack food in different parts of India. Rice bran oil obtained from the rice bran is used in culinary and industrial purposes. Husks are used as fuel, and in the manufacture of packing material and fertilizer.	5	BOOK BACK

	Economic importance of Teak It is one of best timbers of the world. The heartwood golden yellow to golden brown when freshly sawn, turning darker when exposed to light. Known for its durability as it is immune to the attack of termites and fungi. The wood does not split or crack and is a carpenter friendly wood. It was the chief railway carriage and wagon wood in India. Ship building and bridge-building depends on teakwood. It is also used making boats, toys, plywood, door frames and doors.		BOOK INSIDE