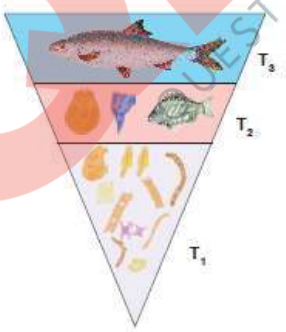
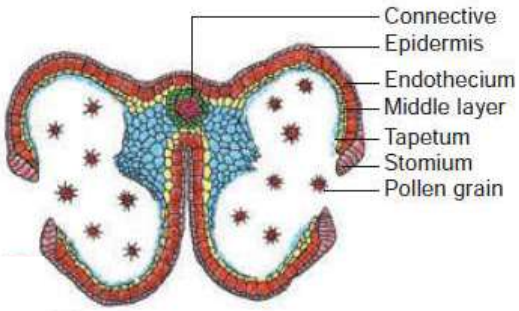
+2 COMMON PUBLIC EXAMINATION - MARCH - 2020

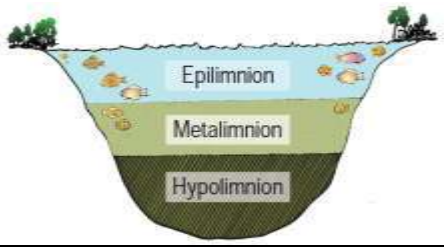
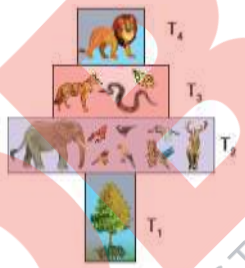
TENTATIVE ANSWER KEY

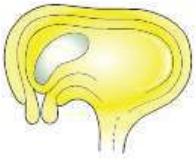
SUBJECT: XII BOTANY (PS) **MARKS : 70**

Q.NO	CONTENT		MARK
I.	**PART-I** **CHOOSE THE CORRECT ANSWER:**		**15X1=15**
	TYPE - A	**TYPE - B**	
1	a) Vitamin A, C and E	c) 2-10%	1
2	a) Eichhornia crassipes	c) (A) is correct, (R) is the incorrect explanation of (A)	1
3	d) Natural selection	a) Clean Development Mechanism (CDM)	1
4	d) Digoxin	d) Natural selection	1
5	a) Clean Development Mechanism (CDM)	a) Eichhornia crassipes	1
6	b) Hollard – Total soil water content	b) Atomita – 2	1
7	c) Connective tissue	b) Hollard – Total soil water content	1
8	c) 2-10%	a) linked genes	1
9	c) (A) is correct, (R) is the incorrect explanation of (A)	a) Vitamin A, C and E	1
10	a) Nilavembu	d) Digoxin	1
11	b) PHAs and PHB	a) Nilavembu	1
12	b) (1)-(ii), (2)-(iii), (3)-(iv), (4)-(i)	b) PHAs and PHB	1
13	a) linked genes	c) Connective tissue	1
14	b) GA_1	b) (1)-(ii), (2)-(iii), (3)-(iv), (4)-(i)	1
15	b) Atomita – 2	b) GA_1	1
II.	**PART-II** **Answer any six of the following. Question No. 24 is compulsory**		**6X2=12**
16	**Parthenocarpic fruits:** Fruit like structures may develop from the ovary without the act of fertilization. Such fruits are called parthenocarpic fruits. Example: Banana, Grapes and Papaya		$1\frac{1}{2}$ $\frac{1}{2}$
17	**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.		2

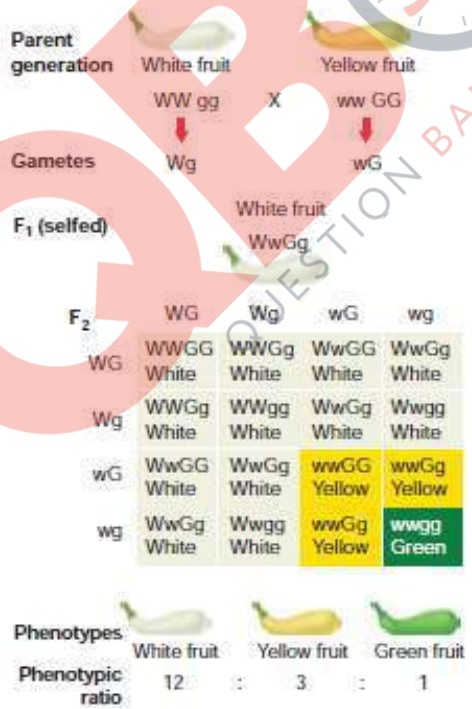
18	(a) Single crossing over (b) RF= $\frac{2}{4} \times 100 = 50\%$	**1** **1**
19	**Bioremediation:** It is defined as the use of microorganisms or plants to clean up environmental pollution. It is an approach used to treat wastes including wastewater, industrial waste and solid waste. Bioremediation process is applied to the removal of oil, petrochemical residues, pesticides or heavy metals from soil or ground water.	**2**
20	**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**
21	**Phytoremediation** method is involved in the removal of cadmium from the contaminated soil. **Definition:** Use of plants to bring about remediation of environmental pollutants. Example: ❖ Rice and *Eichhornia* (water hyacinth) tolerate cadmium by binding it to their proteins. ❖ Soyabean and tomato manage to tolerate presence of cadmium poisoning by isolating cadmium and storing into few group of cells and prevent cadmium affecting other cells.	**1** **1**
22	In pond ecosystem, the bottom of the pyramid is occupied by the producers, which comprise very small organisms possessing the least biomass and so, the value gradually increases towards the tip of the pyramid. Therefore, the pyramid of biomass is always inverted in shape.  	**2**
23	**Benefits of seed treatment** ❖ Prevents spread of plant disease. ❖ Protects seed from seedling blights. ❖ Improves germination. ❖ Provides protection from storage insects.	**2**
24	❖ Curcumin extracted from turmeric is responsible for the yellow colour. ❖ Curcumin is a very good anti-oxidant which may help fight various kinds of cancer. ❖ It has anti-inflammatory, anti-diabetic, anti-bacterial, anti-fungal and antiviral activities. ❖ It stops platelets from clotting in arteries, which leads to heart attack.	**1** **1**

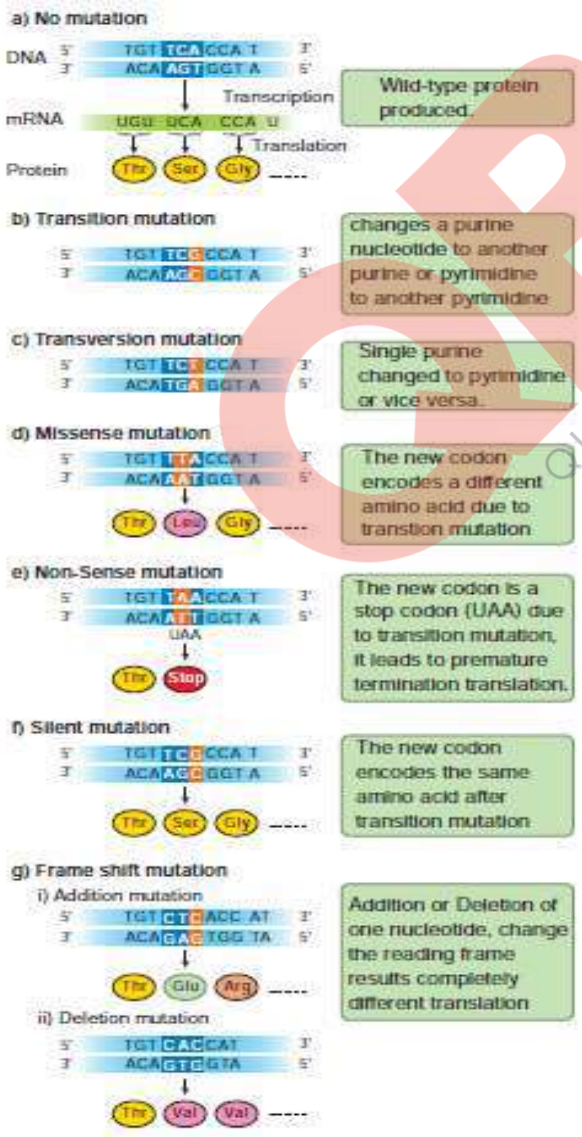
<table>
<tr><td>III.</td><td>PART-III
Answer any six of the following. Question No. 33 is compulsory</td><td>6X3=18</td></tr>
<tr><td>25</td><td>T. S. of mature anther:
 
</td><td>DIAGRAM-2
PARTS-1</td></tr>
<tr><td>26</td><td>In 1907, E. Baur reported a lethal gene in snapdragon (Antirrhinum sp.). It is an example for recessive lethality. In snapdragon there are three kinds of plants.
❖ Green plants with chlorophyll. (CC)
❖ Yellowish green plants with carotenoids are referred to as pale green, golden or a urea plants (Cc)
❖ White plants without any chlorophyll. (cc)</td><td>1
1
1</td></tr>
<tr><td>27</td><td>Difference between linkage and crossing over:
<table>
<tr><th>Linkage</th><th>Crossing over</th></tr>
<tr><td>The genes present on chromosome stay close together</td><td>It leads to separation of linked genes</td></tr>
<tr><td>It involves same chromosome of homologous chromosome</td><td>It involves exchange of segments between non-sister chromatids of homologous chromosome.</td></tr>
<tr><td>It reduces new gene combinations</td><td>It increases variability by forming new gene combinations. lead to formation of new organism</td></tr>
</table></td><td>1
1
1</td></tr>
<tr><td>28</td><td>Features that are required to facilitate cloning into a vector:
❖ Origin of replication (ori): This is a sequence from where replication starts and piece of DNA when linked to this sequence can be made to replicate within the host cells.
❖ Selectable marker: In addition to ori the vector requires a selectable marker, which helps in identifying and eliminating non transformants and selectively permitting the growth of the transformants.
❖ Cloning sites: In order to link the alien DNA, the vector needs to have very few, preferably single, recognition sites for the commonly used restriction enzymes.</td><td>1
1
1</td></tr>
<tr><td>29</td><td>Applications of somatic embryogenesis:
❖ Somatic embryogenesis provides potential plantlets which after hardening period can establish into plants.
❖ Somatic embryoids can be be used for the production of synthetic seeds.
❖ Somatic embryogenesis is now reported in many plants such as Allium sativum, Hordeum vulgare, Oryza sativa, Zea mays, possible in any plant.</td><td>1
1
1</td></tr>
</table>

30	**Thermal Stratification:** It is usually found in aquatic habitat. The change in the temperature profile with increasing depth in a water body is called thermal stratification. **Epilimniotn:** The upper layer of warmer water. **Metalimnion:** The middle layer with a zone of gradual decrease in temperature. **Hypolimnion:** The bottom layer of colder water.  	**1** **1** **1**
31	In a forest ecosystem the pyramid of number is somewhat different in shape, it is because the base (T1) of the pyramid occupies large sized trees (Producer) which are lesser in number. Herbivores (T2) (Fruit eating birds, elephant, deer) occupying second trophic level, are more in number than the producers. In final trophic level (T4), tertiary consumers (lion) are lesser in number than the secondary consumer (T3) (fox and snake). Therefore, the pyramid of number in forest ecosystem looks spindle shaped.  	**2** **1**
32	**Specific uses of Remote sensing:** ❖ Helps predicting favourable climate, for the study of spreading of disease and controlling it. ❖ Mapping of forest fire and species distribution. ❖ Tracking the patterns of urban area development and the changes in Farm land or forests over several years ❖ Mapping ocean bottom and its resources	**3 (ANY THREE)**
33	**Three main types of artificial selection method:** ❖ Mass selection ❖ Clonal selection ❖ Pureline selection **Mass selection: (ANY ONE)** ❖ Large number of plants of similar phenotype or morphological characters are selected and their seeds are mixed together to constitute a new variety. ❖ After repeated selection for about five to six years, selected seeds are multiplied and distributed to the farmers. ❖ The only disadvantage of mass selection is that it is difficult to	**1** **2**

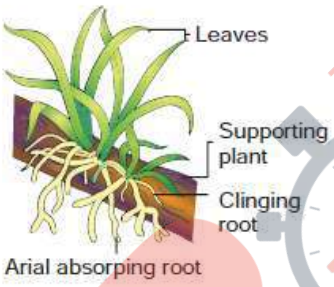
	distinguish the hereditary variation from environmental variation. **Pureline selection:** ❖ Johannsen in 1903 coined the word pureline. ❖ Repeated self-pollination from a single homozygous individual. Hence, a variety formed by this method shows more homozygosity with respect to all genes. ❖ Disadvantage of this type is that the new genotypes are never created and they are less adaptable and less stable to the environmental fluctuations. **Clonal Selection:** ❖ Based on their phenotypic appearance, clonal selection is employed to select improved variety from a mixed population (clones). ❖ The selected plants are multiplied through vegetative propagation to give rise to a clone. The genotype of a clone remains unchanged for a long period of time.	
IV.	**PART-IV**	**5X5=25**
34 a	**Types of Ovules** The ovules are classified into six main types based on the orientation, form and position of the micropyle with respect to funicle and chalaza. Most important ovule types are orthotropous, anatropous, hemianatropous and campylotropous.	**1**
	Orthotropous: In this type of ovule, the micropyle is at the distal end and the micropyle, the funicle and the chalaza lie in one straight vertical line. Examples: Piperaceae, Polygonaceae 	**1**
	Anatropous: The body of the ovule becomes completely inverted so that the micropyle and funiculus come to lie very close to each other. This is the common type of ovules found in dicots and monocots. 	
	Hemianatropous: In this, the body of the ovule is placed transversely and at right angles to the funicle. Example: Primulaceae. 	**1**
	Campylotropous: Th e body of the ovule at the micropylar end is curved and more or less bean shaped. Th e embryo sac is slightly curved. All the three, hilum, micropyle and chalaza are adjacent to one another, with the micropyle oriented towards the placenta. Example: Leguminosae 	**1**
	Amphitropous: The distance between hilum and chalaza is less. The curvature of the ovule leads to horse-shoe shaped nucellus. Example: some Alismataceae. 	
	Circinotropous: Funiculus is very long and surrounds the ovule. Example: Cactaceae 	**1**

b	**Dominant Epistasis:** The gene that suppresses or masks the phenotypic expression of a gene at another locus is known as **epistatic**. The gene whose expression is interfered by non-allelic genes and prevents from exhibiting its character is known as **hypostatic**. When both the genes are present together, the phenotype is determined by the epistatic gene. **Example:** In the summer squash the fruit colour locus has a dominant allele 'W' for white colour and a recessive allele 'w' for coloured fruit. 'W' allele is dominant that masks the expression of any colour. In another locus hypostatic allele 'G' is for yellow fruit and its recessive allele 'g' for green fruit. In the first locus the white is dominant to colour where as in the second locus yellow is dominant to green. When the white fruit with genotype WWgg is crossed with yellow fruit with genotype wwGG, the F1 plants have white fruit and are heterozygous (WwGg). When F1 heterozygous plants are crossed they give rise to F2 with the phenotypic ratio of 12 white : 3 yellow : 1 green. Since W is epistatic to the alleles 'G' and 'g', the white which is dominant, masks the effect of yellow or green. Homozygous recessive ww genotypes only can give the coloured fruits (4/16). Double recessive 'wwgg' will give green fruit (1/16). The Plants having only 'G' in its genotype (wwGg or wwGG) will give the yellow fruit(3/16).	**3** **2**
35 a	**Point mutation:** It refers to alterations of single base pairs of DNA or of a small number of adjacent base pairs **Types of point mutations:** Point mutation in DNA are categorised into two main types. They are base pair substitutions and base pair insertions or deletions. Base substitutions are mutations in which there is a change in the DNA such that one base pair is replaced by another.	**1**



	It can be divided into two subtypes: **transitions and transversions**. Addition or deletion mutations are actually additions or deletions of nucleotide pairs and also called base pair addition or deletions. Collectively, they are termed indel mutations (for insertion-deletion). Substitution mutations or indel mutations affect translation. Based on these different types of mutations are given below. **Missense or non-synonymous mutations:** The mutation that changes one codon for an amino acid into another codon for that same amino acid are called Synonymous or silent mutations. The mutation where the codon for one amino acid is changed into a codon for another amino acid is called Missense or non-synonymous mutations. **Nonsense mutation**: The mutations where codon for one amino acid is changed into a termination or stop codon is called Nonsense mutation. **Frameshift mutations:** Mutations that result in the addition or deletion of a single base pair of DNA that changes the reading frame for the translation process as a result of which there is complete loss of normal protein structure and function are called Frameshift mutations  	**1** **1** **1** **1**

b.	**Biopiracy:** Biopiracy can be defined as the manipulation of intellectual property rights laws by corporations to gain exclusive control over national genetic resources, without giving adequate recognition or remuneration to the original possessors of those resources. Examples: U.S. Patent and Trademarks Office to American companies on turmeric, 'neem' and, most notably, 'basmati' rice. All three products are indigenous to the Indo-Pak subcontinent. **Biopiracy of Neem:** The people of India used neem and its oil in many ways to controlling fungal and bacterial skin infections. Indian's have shared the knowledge of the properties of the neem with the entire world. Pirating this knowledge, the United States Department of Agriculture (USDA) and an American MNC (Multi Nation Corporation) W.R.Grace in the early 90's sought a patent from the European Patent Office (EPO) on the "method for controlling of diseases on plants by the aid of extracted hydrophobic neem oil". The patenting of the fungicidal and antibacterial properties of Neem was an example of biopiracy but the traditional knowledge of the Indians was protected in the end. **Biopiracy of Basmati:** On September 2, 1997, the U.S. Patent and Trademarks Office granted Patent on "basmati rice lines and grains" to the Texas-based company Rice Tec. This broad patent gives the company several rights, including exclusive use of the term 'basmati', as well proprietary rights on the seeds and grains from any crosses. The patent also covers the process of breeding RiceTec's novel rice lines and the method to determine the cooking properties and starch content of the rice grains. India had periled the United States to take the matter to the WTO as an infringement of the TRIPS agreement, which could have resulted in major embarrassment for the US. Hence voluntarily and due to few decisions take by the US patent office, Rice Tec had no choice but to lose most of the claims and most importantly the right to call the rice "Basmati". In the year 2002, the final decision was taken. Rice Tec dropped down 15 claims, resulting in clearing the path of Indian Basmati rice exports to the foreign countries. The Patent Office ordered the patent name to be changed to 'Rice lines 867'.	**2** **$1\frac{1}{2}$** **$1\frac{1}{2}$**
36 a	**Applications of Plant Tissue Culture:** ❖ Improved hybrids production through somatic hybridization. ❖ Somatic embryoids can be encapsulated into synthetic seeds (synseeds). These encapsulated seeds or synthetic seeds help in conservation of plant biodiversity. ❖ Production of disease resistant plants through meristem and shoot tip culture. ❖ Production of stress resistant plants like herbicide tolerant, heat tolerant plants. ❖ Micropropagation technique to obtain large numbers of plantlets of both crop and tree species useful in forestry within a short span of time and all through the year. ❖ Production of secondary metabolites from cell culture utilized in pharmaceutical, cosmetic and food industries.	**5 (ANY FIVE)**

b	**Epiphytes** The plants which are found growing on other plants without harming them are called epiphytes. They are commonly found in tropical rain forest. **Morphological adapdation:** The epiphytic higher plant (Orchids) gets its nutrients and water from the atmosphere with the help of their hygroscopic roots which contain special type of spongy tissue called **Velamen.** So it prepares its own food and does not depend on the host. They use the host plant only for support and does not harm it in any way. ❖ Many orchids, ferns, lianas, hanging mosses, *Peperomia*, money plant and *Usnea* (Lichen) are some of the examples of epiphytes. ❖ Spanish Moss –*Tillandsia* grows on the bark of Oak and Pine trees.  	**2** **2** **1**
37 a	**Mechanism of decomposition** Decomposition is a step wise process of degradation mediated by enzymatic reactions. Detritus acts as a raw material for decomposition.. ❖ **Fragmentation:** The breaking down of detritus into smaller particles by detritivores like bacteria, fungi and earth worm is known as fragmentation. These detritivores secrete certain substances to enhance the fragmentation process and increase the surface area of detritus particles. ❖ **Catabolism:** The decomposers produce some extracellular enzymes in their surroundings to break down complex organic and inorganic compounds in to simpler ones. This is called catabolism ❖ **Leaching or Eluviation:** The movement of decomposed, water soluble organic and inorganic compounds from the surface to the lower layer of soil or the carrying away of the same by water is called leaching or eluviation. ❖ **Humification:** It is a process by which simplified detritus is changed into dark coloured amorphous substance called humus. It is highly resistant to microbial action, therefore decomposition is very slow. It is the reservoir of nutrients. ❖ **Mineralisation:** Some microbes are involved in the release of inorganic nutrients from the humus of the soil, such process is called mineralisation.	**1** **1** **1** **1** **1**

		
b	**Effects of Ozone depletion** ❖ Increases the incidence of cataract, throat and lung irritation and aggravation of asthma or emphysema, skin cancer and diminishing the functioning of immune system in human beings. ❖ Juvenile mortality of animals. ❖ Increased incidence of mutations. ❖ In plants, photosynthetic chemicals will be affected and therefore photosynthesis will be inhibited. Decreased photosynthesis will result in increased atmospheric CO2 resulting in global warming and also shortage of food leading to food crisis. ❖ Increase in temperature changes the climate and rainfall pattern which may result in flood / drought, sea water rise, imbalance in ecosystems affecting flora and fauna.	**1** **1** **1** **1** **1**
38 a	**Modern Methods of Seed Protection:** **1. Seed Treatment** In agriculture and horticulture, seed treatment or seed dressing is a chemical, typically antimicrobial or antifungal, with which seeds are treated (or dressed) prior to planting. **Benefits of seed treatment** ❖ Prevents spread of plant disease. ❖ Protects seed from seedling blights. ❖ Improves germination. ❖ Provides protection from storage insects. ❖ Controls soil insects. **2. Seed Hardening** Seed hardening is a physiological preconditioning of the seed by soaking of seed in water or chemical solution for definite duration in proper ratio (Seed : Solution) and shade drying to bring back the seed to original moisture content.	**1** **1**

	Benefits: ❖ It increases the yield, root growth and vigour of seed germination ❖ The uniformity of seedling emergence. ❖ Flowering occurs 2-3 days earlier ❖ Uniform seed set and maturity ❖ Exposes the seed to drought tolerance. **3. Seed Pelleting** Seed pelleting increases the weight, size and shape of seeds by allowing percale maturing and spacing of seed in the field. **4. Seed coating** Seed coating is a thicker form of covering of seed and may contain fertilizer, growth promoters, rhizobium inoculum, nutritional elements and repulsive agents. **5. Bio Priming of Seeds** Bio-Priming is a process of biological seed treatment that refers to combination of seed hydration (physiological aspect of disease control) and inoculation (biological aspect of disease control) of seed with beneficial organism to protect seed.	**1** **1** **1**
b	**Preparation of Organic Pesticide:** ❖ Mix 120g of hot chillies with 110 g of garlic or onion. Chop them thoroughly. ❖ Blend the vegetables together manually or using an electric grinder until it forms a thick paste. ❖ Add the vegetable paste to 500 ml of warm water. Give the ingredients a stir to thoroughly mix them together. ❖ Pour the solution into a glass container and leave it undisturbed for 24 hours. If possible, keep the container in a sunny location. If not, at least keep the mixture in a warm place. ❖ Strain the mixture. Pour the solution through a strainer, remove the vegetables and collect the vegetable-infused water and pour into another container. This filtrate is the pesticide. Either discard the vegetables or use it as a compost. ❖ Pour the pesticide into a squirt bottle. Make sure that the spray bottle has first been cleaned with warm water and soap to get rid it of any potential contaminants. Use a funnel to transfer the liquid into the squirt bottle and replace the nozzle. ❖ Spray your plants with the pesticide. Treat the infected plants every 4 to 5 days with the solution. After 3 or 4 treatments, the pest will be eliminated. If the area is thoroughly covered with the solution, this pesticide should keep bugs away for the rest of the season.	**5**

MARK ANALYSIS

(WITHOUT CHOICE)

PART	Questions	Total Questions	Book Back Questions	Interior Questions	Total Marks
I	1 Mark	15	2	13	15
II	2 Marks	9	-	9	18
III	3 Marks	9	-	9	27
IV	5 Marks	10	1	9	50
Total Marks		43	7	103	110
Percentage			6.36%	93.63%	100%