Section-D

25) a) 1 → Natality (B)
2 → Immigration (I)
3 → Mortality (D)
4 → Emigration (E)

$$N_{t+1} = N_t + \{(B+I) - (D+E)\}$$

2019

b) Determining the total no. of individuals in a population is best method but sometimes it is cumbersome.

i) measuring per cent cover or biomass. ✓
e.g. in an area with 200 parthenium plants & a single banyan tree, the latter produces more biomass

ii) determining relative densities
e.g. no. of fishes present per trap. in a river.

iii) Indirect method (without actually calculating (OR) counting them)

E.g. tiger census is based on pug marks & faecal pellets

Q26 26) a) A

b) D → Corona Radiata.
E → Zona pellucida.

Role of E (Zona pellucida) → When the sperm comes in contact with it, it induces certain changes in ~~zo~~ membrane that blocks the entry of an additional sperm. Thus it ensures that only 1 sperm fertilises an ovum.

c) The anterior portion of sperm has acrosome which contains certain enzymes (hydrolytic) that help the sperm to enter ~~ovum~~ egg cytoplasm through the zona pellucida & plasma membrane. by digesting these layers.

Once the sperm enters the cytoplasm it induces the ~~2° oocyte~~ to undergo 2nd meiotic division & results in the formation of ~~2° ovum~~ ovum (haploid) & small 2nd polar body.

d) Ampollary-Isthmic junction of fallopian tube (OR oviduct) of female reproductive system.

27) a) flower colour in snapdragon (OR) Dog flower.
R → Red (Dominant), r → white (Recessive)

Parents RR × rr
(homozygous Red) (homozygous white)

a) 2 amino acids in a polypeptide sequence are linked together via a peptide bond whose formation requires energy. For this —
i) the amino acid is ~~charged~~ Activated. in the presence of ATP (~~Charging~~ Activation of Amino Acid)
ii) This ~~charged~~ Activated Amino Acid is linked to its specific cognate ~~for~~ tRNA at its (tRNA) Amino Acid. acceptor end via a process called Aminoacylation. When 2 Amino acylated tRNAs are placed close enough, the peptide bond formation is favoured energitically.

b) In ~~b~~ prokaryotes transcription and translation take place at the same location as there ~~is~~ are no demarcated compartments like nucleus & cytosol. ~~This is the regio rea~~ In eukaryotes transcription takes place ~~at~~ in the nucleus and translation in ribosome (cytoplasm) i.e. at ~~2~~ 2 diff locations. ~~Hence~~ Also in prokaryotes, since the mRNA does not require modification to become active, even before the complete mRNA is transcribed, the translation into proteins starts. ~~Hence process of~~ In eukaryotes the 1° mRNA transcript undergoes capping, splicing, tailing to become mature. hnRNA

Due to all there reasons, process of transcription & translaⁿ are coupled in prokaryotes but not in eukaryotes.

Section-C

13) i) Penicillium notatum → Penicillin.
- It is an antibiotic. used to treat diseases.

ii) Monascus purpureus → statins.
- It is a blood cholestrol lowering agent. It reduces ~~chlorest~~ cholestrol by competing for the active site with the ~~cht~~ cholestrol synthesizing enzyme & in turn inhibiting it.

iii) Trichoderma polysporum → Cyclosporin - A.
- It is an immunosuppressive agent used by organ transplantation patients. It acts by inhibiting the activation of T lymphocytes.

14) a) At high temp. is used to cause denaturation of ds DNA and obtain 2 ss DNA.
↑ double stranded ↑ single stranded.

DNA

(word initiation not written) d

b) primers are added at the at 3' end of. Using these along with nucleotides provided in Reaction, the DNA polymerase enzyme causes extension & we get 2 ds DNA strands. (at the end of 1 PCR cycle).

(Bacterium Thermus aquaticus)

c) It is used to obtain the thermostable DNA polymerase (or Taq polymerase) enzyme. This enzyme remains stable even in high temp. Induced Denaturation.

15) a) Ammonium Chloride (NH_4Cl)

b) So that they can measure the density after every generation of Ecoli (20 mins.) and in turn determine how many light DNA, how many hybrid DNA and heavy DNA molecules are produced. This helped them to know that the daughter DNA molecules receives one strand from mother DNA molecule & the 2nd is synthesized. (DNA Replication → semi conservative.)

c) They used Cesium chloride (CsCl) density centrifugation to differentiate b/w heavy and light DNA molecules. The 2 types of molecules formed different peaks in the centrifuge.

pollination.

17)

d) DNA Replication is semiconservative in nature. ✓

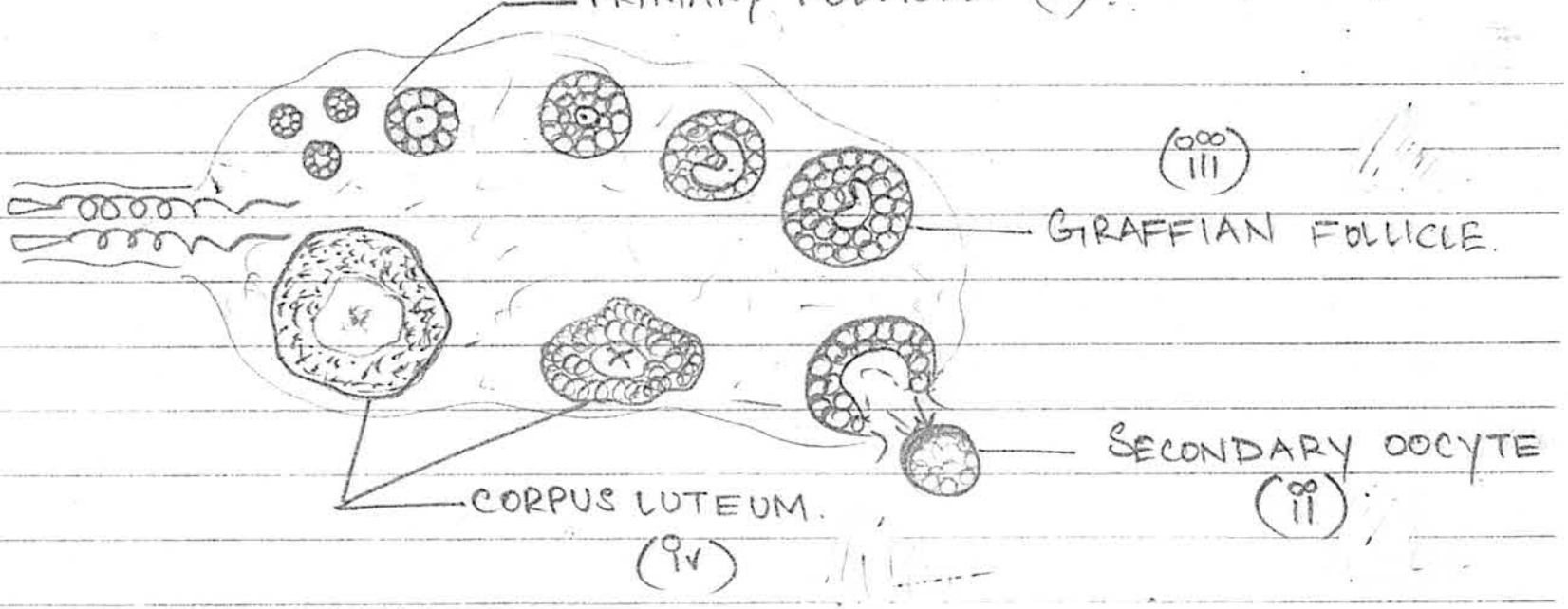
16) • In case of plants that produce hermaphrodite (or) [Bisexual] flowers, the removal of anther using forceps before the bud dehisces is necessary. This is called Emasculation.

• In plants that produce unisexual flowers, this process is not required. (∵ the selected female, flower will only have pistil & ∵ no self-pollination)

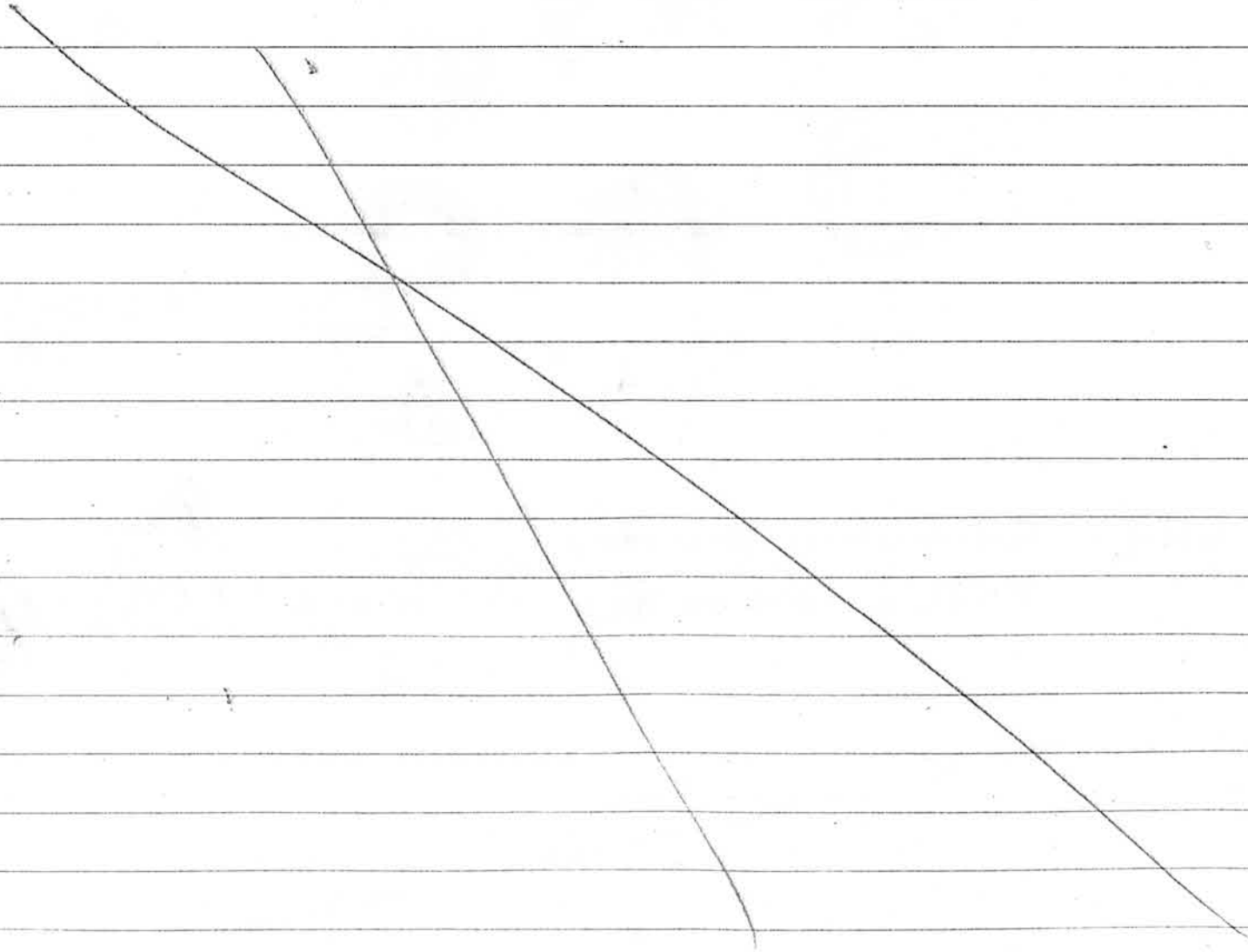
• In both kinds of flowers it is imp. to protect the stigma from contamination by unwanted pollen. This is done by bagging.

In this the flower is covered by bag made of butter paper until the stigma becomes receptive. After the stigma becomes receptive, the bag is removed, the stigma is dusted with desirable pollen grains obtained from male flower and flowers rebagged for further development of fruits.

17) a)



b) LH (~~+~~ Luteinizing Hormone (LH)
Follicle stimulating Hormone (FSH).



18)

19)

18) Technique. ⟶ ~~Ratio~~ Tissue culture.
property of plant cells ⟶ Totipotency.

~~Due to the~~ The ability of a plant cell (or) explant to give rise to the whole plant is totipotency.

- An explant is taken & grown in a special nutrient medium under sterile conditions in vitro.
- The nutrient medium has a carbon source, sucrose & vitamins, minerals, auxins, cytokinin, etc.
- Due to totipotency the explant gives rise to the whole plant that is genetically & morphologically identical to the original plant from which it was grown. (Hence called somaclones).

19) - During pre-industrilization period, there was/ ~~was~~ pollution. As a result lichens were found on tree trunks, making them look white. (lichens are not found in polluted Areas)?
- White ~~wrong~~ winged moth camouflaged & was not easily detected by ~~pla~~ predators. This was not so with the dark winged moths that could be easily seen against a white background.

- As a result white winged moths were abundant.
- After industrialization due to pollution there were no lichens.
- In the dark background, the dark winged moths got camouflaged and outgrew the white winged moths.
- This shows that due to natural selection, only the one able to adapt to environment better was chosen.
- But none of the varieties were eradicated completly

21)

20) In mutation breeding -

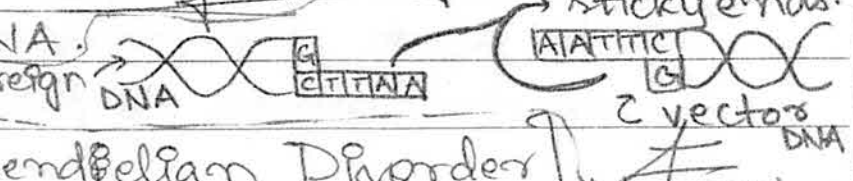
- The chosen plant is exposed to radiation to cause mutation. Via mutation, one can introduces changes in the genotype. to manipulate phenotypic expression. (here disease resistance)
- The plant is screened for the desirable disease resistance character.
- The plant is used commercially (OR) inbreeded

22)

In mungbean, resistance against yellow mosaic virus & powdery mildew was introduced using mutation breeding.

21) The restriction endonuclease cuts the DNA strand at a specific point, slightly away from the centre of palindromic sequence but b/w the same 2 bases on opposite strands. This results in the formation of overhanging portions called sticky ends. on both the strands. They are they can form H-bonds with complementary cut counterparts.

They facilitate the action of DNA ligase to join the foreign DNA with vector DNA.



22) a) Phenylketonuria (Disease) [Mendelian Disorder]
- Retardation in mental development.
- Reduction in hair & skin pigmentation.

b) Klinefelter's Syndrome [Chromosomal Disorder]
- The male is sterile.
- Development of ~~female~~ feminine character (Development of Breasts → Gynaecomastia).

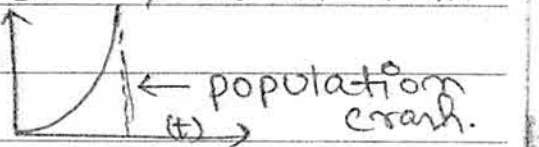
23) i) K → Carrying Capacity.
Nature has sufficient resources to support maximum possible number (OR) Growth (of a particular species), beyond which no growth occurs. This is called the carrying capacity of nature (for a particular species).

24

ii) b curve. (Verhulst Pearl logistic growth curve)
- the growth of popul resources are never unlimited (food and space)

iii) Curve – a
This is be The role of predator is to keep the prey species populations under control. Since

no predators are present in the habitat, the deer population will increase. But resources in nature (food and space) are not ~~limi~~ unlimited. At a point of time food and space will not be available, and this will lead to deer population crash



24) 99.9 % of nucleotide bases in all the ~~bases~~ people are same. It is 0.1 % differences that makes every person unique in phenotypic appearence.

The human genome has a large amount of repetitive DNA wherein a ~~part~~ repeating sequence is repeated many a times. It shows a high degree of polymorphism since the DNA obtained from any cell will also have the same degree of polymorphism, a small sample of tissue can be used for DNA tests. Since these high degrees of polymorphism are inherited by offsprings from parents, DNA fingerprinting can also used as a tool for paternity disputes.

(can help determine paternity)

Steps of DNA fingerprinting:-

(i) Isolation of Genetic material (DNA)

(ii) Obtaining fragments of DNA by action of restriction endonucleuse.

(iii) transferring (blotting) of fragments into a synthetic sheet of nitrocellulose (OR) nylon.

(iv) hybridisation using radiolabelled probe (VNTR)

(v) Obtaining the pattern of bands by autoradiography.

Section - B

6) Thalassemia → Autosomal recessive trait

→ The parents should be heterozygous for the gene for the offspring to be affected.

Genotype : A^TA^t × A^TA^t (Parents)

♀ ♂

T → Dominant gene
t → Recessive gene.
A → Autosomes.

Cause :- Mutation (OR) Deletion of one (OR) more genes responsible for production of globin chains that constitute haemoglobin molecules.

This results in reduced synthesis of either α (OR) β globin chains.

α Thalassemia → Mutation (OR) Deletion of HBA1 and HBA2 genes on chromosome 16.

β Thalassemia → Mutation of HBB gene on chromosome 11.

7) Ahmed Khan's company produced Polyblend using modified recyled plastic waste. Polyblend was mixed with bitumen that is used to lay roads. This mixture enhanced the water repellant properties of bitumen & also increased road life by a factor of 3.

8) i) Surgery → Removing tumour cells surgically.
ii) Radiotherapy → Irradiating tumour cells with radiation (to destroy them)
iii) Chemotherapy → Chemotherauptic Drugs.
iv) α - Interferons → given to activate immune system.

9) NPP = GPP − R.
- ~~NPP — net pri~~ GPP → Gross primary productivity
- The total biomass produced by plants during photosynthesis. A part of it is used by plants for respiration.
- R → Respiratory losses
- NPP → Net primary productivity.

* The recent studies show that

→ NPP.

✓ It is the available biomass for use by consumers.

- Productivity → rate of biomass production per unit area per unit time {(kcal m^{-2}) yr^{-1}}.
- 2° productivity → Rate of ~~bio~~ new biomass (organic matter) produced by consumers.

✓ NPP = GPP − R

~~GPP = Productivity~~ Productity (P) = (SP + GPP.

SP → secondary productivity

(OR) ✓ P = SP + GPP.

✓ NPP = (P − SP) − R.

10) It states that 2 closely related species competing for the same resources can never exist together indefinitely. The competitively superior species will eliminate the inferior one. *This is true only if resources are limiting. The studies also show that 2 competing species can avoid competition by resource partitioning They do so by adopting diff. behavioural patterns (OR) diff. foraging times, etc.

11) a → Sporogenous tissue.

Funcn :- Each cell of sporogenous tissue has the ability to produce a microspore tetrad and so each cell ~~acts as~~ is a potential pollen mother cell (OR) microspore mother cell. (PMC)

b → Tapetum.

Funcn :- It provides nutrition to the developing pollen grains.

12) Yes.

- Semen can be frozen and transported from one place to where females are housed.
- Semen can be frozen and stored for later use.
- The frozen semen can be used to inseminate many female mates.

Section – A

1) In 1938, Coelacanth was caught in a lake in South Africa after it was thought to have become extinct. There are called lobefins & they evolved to become first amphibians that lived in water & also on land. We have no specimens of there left today.

2) The interpherons are a part of cytokine barrier. They are released by virus infected cells to protect the normal cells from further viral infection.
- They are also used in the treatment of cancer.

3) (a) Dominance
(b) Incomplete dominance.

4) The signals of parturition originate from fully developed foetus and the placenta of the female

P.T.O → for Q.5

5) cryIAc and cryIIAb (Gene name written in Italics).