Section - E

Ans: (a) As 200 viable seeds are being produced 200 ovules should be present as 1 seed is formed by fertilization b/w 1 & 1 pollen grain & 1 ovule.

(b) As 200 viable seeds can be produced 200 pollen grains are required. \( \frac{200}{50} = 4 \) microspore mother cells are required as 1 pollen grain develops from 1 microspore. 4 microspore mother cell forms 4 microspores (microspore tetrad) by meiosis.

(c) 200 pollen grains are required as 1 pollen grain would fertilize one ovule to form a seed.

(d) Each pollen grain carries 2 male gametes. \( 200 \times 2 = 400 \) male gametes would be required as 200 pollen grains are required for producing 200 seeds.
Each ovule differentiates one megaspore mother cell (MMC) in micropylar region. As 200 ovules are being used 4
MMC will be required. Each MMC undergoes meiosis to form 4 megaspores out of which 2 degenerate while 1 develops into embryo sac which contains 1 egg cell.

Ans 25. At a given instant, a population is comprised of individuals of different ages. If age distribution (i.e., of individuals of particular age or age group) is plotted for a population, the resulting structure formed is called age pyramid. The shape of age pyramid reflects the growth status of population. The age pyramid contains age distribution of both $\varphi \sigma$ in same pyramid. 3 types of age pyramids are:

1. **Post-reproductive**
2. **Reproductive**
3. **Pre-reproductive**

Stable cycle
Declining cycle
Analysis of age pyramids provides information for long term planning as follows:

**Case I**
- If age pyramid is expanding, i.e., human population of that region/country is rising with time. Individuals who are pre-reproductive age group are more than in reproductive age group.
- With time, the country's population will rise. Government should take measures to control the country population like distortion of family incentive to small family couples with one child.
- Preventive sex education, one child policy, etc., otherwise, due to rising population the country's resources will deplete and not be able to support the population.

**Case II**
- In case of stable age pyramid, the population of that country will remain almost fixed and stable as the no. of individuals of pre-reproductive age group are equal to no. of individuals of reproductive age group. The government should ensure that the country's population does not rise either due to natural calamities or resource depletion. They should make plans for equal resource distribution & opportunities for all.

**Case III**
- In case of declining population age pyramid, the population will rise with time as the no. of individuals of pre-reproductive age group are less than the no. of individuals in reproductive age group. The government should try to make the population stable by encouraging couples to have more children, giving incentives to larger families, better opportunities & resources to them, otherwise with time the country's population will rise and eventually, it would lead to a fall in productivity of the country.
Ans. 1. ABO blood group in human beings is controlled by gene. It has 3 alleles: I^A, I^B, i. 

2. This gene shows multiple alleleism as 2 or more alleles control one character.

3. In red blood cells, plasma membrane contains sugar polymers that protrude from the surface and the kind of kind of sugar present is controlled by gene I.

4. I^A and I^B alleles produce slightly different kind of sugars like (sugar A + sugar B respectively), but i allele does not produce any sugar.

5. I^A and I^B are completely dominant over recessive allele i, but I^A and I^B are co-dominant w.r.t. to each other. i.e., when both alleles are present together, they both express themselves and produce their phenotypes, and both sugars are produced in the RBC.
Possible genotypes: Blood group/Phenotype.

1. $I^A I^A$ A
2. $I^A I^B$ B
3. $I^B I^B$ AB
4. $I^A I^B$ B
5. $I^B O$ O
6. $I^A O$ A

6 genotypes are possible, while only 4 phenotypes or blood groups are possible in humans.

Section A:

Euchromatin

A geneticist chooses an organism with a short life cycle because the organism will produce the offspring quickly in a short period of time. These offspring can be studied by the geneticist and can also be further mated to produce more generations of offspring.
For eg: *Drosophila melanogaster* (Fruit fly) completes its life cycle in 2 weeks. Thus it produces the offspring in very short time and geneticist can study the variations in them. If an org which has long life cycle is chosen, then it would take years to complete research.

And 3: It is the use of bioresources & traditional knowledge by multinational companies and organisations without proper authorization from countries or concerned people and without compensatory payment.

May During industrialization, air pollution (smoke, dust, SO2) caused some air pollutants settled on tree bark and converted its color from white to dark. Also due to air pollution (SO2), white lichens could not survive and they exposed the dark surfaces of the trees. The dark-brown colored moths camouflaged with the surrounding but the white colored could not camouflage and they were eaten by predators. Hence dark moths increased in numbers.
X-rays are ionising electromagnetic radiations which induce mutations in DNA. They can convert normal cells into cancer cells. They cause many genetic disorders by changing/altering DNA sequence thus changing an organism's phenotype and genotype. Through variations, mutations.

**Section A C**

A II
1. *Parturition* is the process of delivery of fully developed foetus or infant (child birth) thru birth canal. The signals for parturition originate from fully developed foetuses and placenta.

2. These signals induce mild uterine contractions called as foetal ejection reflex.

3. These contractions trigger the release of *oxytocin* from the mother's pituitary. This acts on
uterine muscles, making the contractions stronger and stronger.

(4) These events which further induce the release of oxytocin.

(4) These chain events keep on going until the child is delivered out of the uterus through the birth canal. Soon after, the placenta is also expelled out, thru uterus.

(5) The hormones involved are estrogen, cortisol, and oxytocin.

At 12 AM (1) After triple fusion the central cell develops to form a primary endosperm cell which contains a primary endosperm nucleus.

(2) The primary endosperm cell undergoes successive cell division to form triploid endosperm which has abundant food reserves.

(3) The primary endosperm nucleus undergoes successive nuclear divisions to form free nuclear endosperm. After this, this type of endosperm development is called free nuclear endosperm. After this, cell walls are laid, and
The endosperm becomes cellular endosperm. Ex: coconut water is nuclear endosperm, while white kernel around its cellular endosperm.

The endosperm development precedes that of zygote to ensure that endosperm containing abundant food reserves is formed earlier and can nourish the developing embryo.

(1) When Darwin visited Galapagos islands, he saw various small black birds, (called Darwin’s finches) which varied in their shape of beak and feeding habit.

(2) He proposed that all birds (different species) developed from the same ancestor who was seed-eating from the same island, then flew off to other islands where, according to different environmental conditions and habitats, they were adapted to different conditions and developed.
different shapes of beaks and feeding habits. For eg:- some
became cactus eating, some insect + fruit eating.

3) Adaptive Radiation had occurred. It is defined as the
process in which different species originate from same
ancestor on same habitat starting from one point and later
radiating to different habitats.

And by Test cross will be used to find the genotype of purple
coloured flowers. As purple is dominant over white
colour in pea flowers, the offspring has a dominant
trait. In Test cross, dominant progeny is crossed
with one of the recessive parents to find its
genotype.

Here the plant & can have 2 genotypes:

1) WW (homozygous dominant) where W = dominant allele (purple)
2) Ww (heterozygous dominant) w = recessive allele (white)

The following 2 Test cross's are possible:-
1. Cross I → Parents: WW x ww

Gametes: W W w w

Punnett Square:

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So, Parents: W W x w w

Gametes: W W w w

Fertilization:

F₁: W W w w

So, All progeny’s are dominant & all have purple coloured flowers. No white coloured flowers are produced.
Cross II  
parents  
Ww x WW (recessive parent)  

F1  
Ww  ww  

Punnett square  

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Ww → Purple  
w → white  

Test cross ratio is 1:1  
where 50% are purple & 50% white.

Conclusion: If pea plant is homozygous dominant, then it will produce only purple progenies after test cross.  
But if it is heterozygous dominant it will produce
50% purple & 50% white after test cross.

AMS 15 (a) Erwin Chargaff's rule the ratio of Adenine to Thymine and Guanine to Cytosine is constant and equal to 1 for any species for ds DNA.

\[
[A] = [T] \quad \text{Thymine = 520 nucleotides.}
\]

Total nucleotides = \[A] - [T] = [G] + [C]

\[
2000 - 520 - 520 = [G] + [C]
\]

\[
2 \times 960 = [G] + [C] \Rightarrow [G] + [C] = 480
\]

\[
\text{Purines are Adenine & Guanine so } [A] + [G] = 520
\]

\[
\Rightarrow \text{Total purines} = 1000
\]
50% purple & 50% white after test cross.

AMS 15 (a) Erwin Chargaff: rule the ratio of Adenine to Thymine and Guanine to Cytosine is constant and equal to 1 for any species for ds DNA.

\[ [A] = [T] \quad \text{&} \quad [G] = [C] \]

Thymine = 520 nucleotides.

Total nucleotides = [A] - [T] = [G] + [C]

2000 - 520 - 520 = [G] + [C]

960 = [G] + [C] \quad \Rightarrow \quad \text{Guanine} \quad \text{Cytosine}

\( [G] = [C] = 960 \div 2 = 480 \)

**Purines** are Adenine & Guanine \( [A] + [G] = 520 \)

\( \frac{1000}{520} \)

**Total purines** = \( \frac{1000}{520} \)
b) DNA sequences of chain A and chain B are inserted separately into a plasmid of E. coli. Inserted into host E. coli: Polypeptide chain A and chain B produced separately in E. coli.

Joined by disulfide bonds: creating polypeptide chains extracted from E. coli using downstream processing techniques.

Mature insulin created.

In 1983, Eli Lilly, an American company produced mature insulin using recombinant DNA technology.
Sparged stirred tank bioreactor thru which sterile air bubbles are sparged. The advantage...
of this bioreactor it that it helps to \textit{I} oxygen

str. transfer area so that more oxygen can enter

the bioreactor. Thus providing more $O_2$ to the microbes so

that they can produce the biosynthetic product more

efficiently & quickly. Total biomass production rises.

\textbf{AmS \rightarrow DNA Fingerprinting.} It uses satellite & DNA showing high degree

of polymorphism as probe. It was developed by Alec

Jeffrey's. It involves Southern blot hybridisation using

radio-labelled VNTR (Variable Number of Tandem Repeats) as probe.

\textit{Principle:} It involves identifying specific sequences

of DNA (repetitive DNA sequence) which are unique for

every individual.

\textit{Steps:} (1) Isolation of DNA

(2) Fragmentation & Digestion using Restriction Endonuclease
(iii) Separating of DNA fragments using gel electrophoresis. (Biohitting)
(iv) Transferring of separated fragments to a synthetic membrane like nylon/nitrocellulose.
(v) Hybridization using labelled VNTR probe.
(vi) Detection by autoradiography.

(vii) The autoradiogram will show bands of different sizes. These bands are arranged in a characteristic pattern which is unique to an individual.

(viii) Sensitivity of this technique can be increased by using PCR (Polymerase Chain Reaction). Thus DNA from only 1 cell is required.

Ans 19 (a) Yes, I will report to authorities as consumption of performance enhancing drugs like cannabinoids is illegal and harmful for the health of students. It can lead to a psychological attachment to certain
The temporary sense of well-being perceived benefits of drugs lead to their ENCOUNTER with regular doses of drug in abruptly discontinuing to nausea, sweating, anxiety, shakiness.

(b) _Cannabis Sativa_

(c) The receptors for cannabinoids are located in the brain. These drugs affect the cardiovascular system of the body. They increase heart beat, improve performance, increase blood flow, and oxygen transfer to muscles. The produce a sense of euphoria. A sense of well-being, they may result in heat. Excess use of these drugs may result in heart attack.

**ANSO**

(1) **BOD** is the amount of oxygen consumed if all organic matter in one litre of water is oxidised by bacteria.

(2) Aerobic bacteria consume a degree decompose organic matter present in sewage. In this process they consume oxygen, and BOD of water rises. As oxygen gets depleted in water, thus killing all aquatic fish and organisms.

(3) **pH** - When most of organic matter is oxidised.
and oxygen level in water rises. Therefore, the aquatic organisms start to appear again.

(3) More polluted the water, more organic matter is present in it, hence more oxygen is required to decompose it, hence more BOD of polluted water.

(4) Higher BOD reading indicates more polluted water.

Fish and other aquatic org. killed. They appear again.

Concentration of oxygen drops to 0.

O2 level

BOD

Point of discharge of sewage

Direction of flow
Intercrossing is mating between closely related animals. Disadvantages of intercrossing are:

1. It leads to inbreeding depression and inbreeding effects.
2. It can result in the loss of genetic diversity.
3. It can lead to the fixation of recessive alleles.

Close inbreeding can be overcome by selecting the best individuals, genetic recombination, and genetic diversity in different breeds.

Mycorrhizae are mutualistic associations between fungi and plants. They help plants absorb phosphorus and provide resistance to root disease pathogens.
tolerance to salinity & drought & 1 plant growth product -ivity.

(ii) **Anabaena** - Autotrophic cyanobacteria which can fix atmospheric \( \text{N}_2 \) (in paddy fields) and convert into useful organic compounds like nitrates & they 1 organic matter in 2011, thus enriching fertility of soil.

(iii) **Rhizobium** - A symbiotic relationship btw roots of leguminous plants & rhizobium bacteria which fix atmospheric \( \text{N}_2 \) into a useful organic compounds like nitrates which are used by plants. It lives in root nodules. Thus fertility of soil.
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- Egg produces 2 types of gametes, 1 type of gametes.
- Sperm produces 2 types of gametes, 1 type of gametes.

1. In-vitro fertilization = Egg from husband, donor are taken and made to fertilize inside body in laboratory conditions. Embryo is then transferred into fallopian tube by Czifet = Zygote
2. Embryo is transferred into fallopian tube.
8 blastomeres is transferred to uterus by IUI (Intra Uterine Transfer) for further development.

And 8  Many Fresh water animals cannot regulate a constant internal environment i.e. ___.

maintain ___ cont (osmotic concentration of their body fluids for homeostasis). Their osmotic conc of their body fluids depend on osmotic conc of the surrounding water body i.e. they are conformers. Here marine environments have high salt conc. i.e. osmotic conc is very high. Freshwater fish will die in salty conditions as water will from their body to outside & they will not be able to absorb water.

9. (1) Protein/quality & content
(2) Oil/yield & content
(3) Vitamin/ content
(4) Micronutrient & mineral content

10. (a) LAB → Lactic acid & ___ and converts milk to curd.
(b) Saccharomyces cerevisiae → Yeast ferments bread
(c) Propionibacterium Sharranii → Swiss cheese has holes because this bacteria produces CO₂ which make these holes.

Aspergillus niger → Citric acid

Section-D

12(a) Swachh Bharat Abhiyan is very imp for the nation as day by day pollution is taking in our country. Air pollution by automobiles which release toxic fumes & gases in the air are harmful for human beings as they can cause lung disease, cancer, etc.

Dangerous chemicals like effluents from industries & pesticides & fertilizers from farms are dumped in rivers, ponds, etc. where they cause accelerated eutrophication causing pond to turn to land, algal bloom which leads to death of organisms. These chemicals leach into the water ground supply & cause many diseases in humans. Dumping of garbage in open burial grounds & burning them releases toxic & gases which are harmful to humans. If strict laws are not implement, then the
health of humans and animals/plants will be severely affected. For example, nitrates in drinking water can cause blue baby syndrome. Mercury → minamata disease, Cd → itai-itai disease.

(2) 2 problems are:

1. Garbage separation should not be burned (as it releases poisonous gases) or stored in open burial grounds (as it serves as breeding grounds for rats and flies). In sanitary landfills, the chemicals may seep into the water supply and cause pollution. To maintain cleanliness, garbage should be separated into biodegradable, non-biodegradable & recyclable parts. Avoid e-wastes (old computers, mobiles) etc.

2. Automobile pollution from automobiles releases toxic air pollutants & poisonous fumes which cause air pollution & cancers & other diseases in humans. I would face the problem of this contamination in cases of lead break...
petrol & diesel or more safer CNG. Also for sanitary disposal of faecal matter in most & as it may contaminate air, water & food supply causing diseases like amoebic dysentery, typhoid, cholera, cholera, ascariasis. It would difficult for me to convince convince the people to dispose use eco-san toilets for sanitary disposable of human waste. Also, I would have to convince convince municipality to build eco-san toilets for poor.

1) I would encourage poor people to segregate their garbage into biodegradable, non-biodegradable & recyclable parts. E-waste should be sent to recycling plants where recycling is done in safe & environmental safe manner. Vegetable & fruit & other dead organic waste would be used as manure after decomposition. Paper, etc. will be recycled.

2) I would encourage people to put catalytic converter
safer & more effective fuel. It would help in building closer toilets which are sustainable disposal of human waste. They are using dry composting toilets. They are cost-effective, hygienic, practical for efficient to dispose human waste. The left behind slurry can be used as manure & on for biogas production.
1. WHETHER ALL THE QUESTIONS ATTEMPTED BY THE CANDIDATE ARE EVALUATED BY THE EXAMINER
   YES

2. IS THERE ANY UNASSESSSED PORTION OF ANSWER LEFT OUT, IF YES THE QUESTION NO. AND AFTER ASSESSMENT THE MARKS AWARDED.
   NO

3. WHETHER MARKING SCHEME WAS FOLLOWED PROPERLY WHILE EVALUATING THE ANSWER BOOK AND MARKS ARE AWARDED AS PER MARKING SCHEME TO EACH QUESTION.
   YES

4. WHETHER MARKS ALLOTTED FOR ANSWERS ARE POSTED CORRECTLY ON THE COVER PAGE AND TOTAL OF MARKS ON COVER PAGE IS CORRECT.
   YES

5. WHETHER A/BOOKS HAS BEEN EVALUATED AS PER THE QUESTION PAPER SET AS PRESCRIBED IN THE A/BOOKS OF THE CANDIDATES.
   YES

6. WHETHER A/BOOK CAN BE UPLOADED ON THE NET.
   YES/NO

7. I ALSO CERTIFY THAT INFORMATION GIVEN ABOVE IS BEST OF MY KNOWLEDGE AND IF ANYTHING FOUND INCORRECT I WILL BE RESPONSIBLE FOR THAT.

Signature of the Examiner

Name of Examiner

Ex No. for 2015 Exam

Name of School

Mobile No.