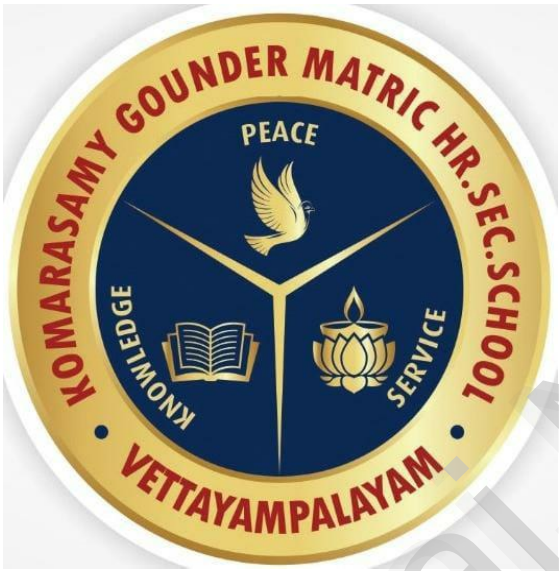
KOMARASAMY GOUNDER MAT.HR.SEC.SCHOOL

VETTAYAMPALAYAM



XII - STANDARD

Practical study material

Bio - Botany

PREPARED BY

MARIMUTHU G M.SC.,B.ED.,

PG ASSISTANT IN BOTANY

KOMARASAMY GOUNDER MAT.HR.SEC.SCHOOL

VETTAYAMPALYAM

KURUMANDHUR (PO

KOMARASAMY GOUNDER MAT.HR.SEC.SCHOOL – VETTAIYAMPALAYAM

QUESTION PAPER AND MARKS ALLOTMENT

S.NO		QUESTION	MARKS
I.IDENTIFY THE GIVEN SLIDE "A" AND GIVE ANY TWO REASONS			
I.	A1	T.S OF ANTHER AND ITS DIAGNOSTIC FEATURES	ANY ONE EXPERIMENT 2 MARKS
		IDENTIFICATION = ½ MARK	
		ANY TWO REASON = ½ MARK	
		DIAGRAM = ½ MARK	
		LABELLING = ½ MARK	
I.	A2	L.S OF ANGIOSPERMIC OVULE	
		IDENTIFICATION = ½ MARK	
		ANY TWO REASON = ½ MARK	
		DIAGRAM = ½ MARK	
		LABELLING = ½ MARK	
I.	A3	T.S OF NERIUM LEAF	
		IDENTIFICATION = ½ MARK	
		ANY TWO REASON = ½ MARK	
		DIAGRAM = ½ MARK	
		LABELLING = ½ MARK	
II.IDENTIFY THE GIVEN SPECIMEN /MODEL/PHOTOGRAPH/CHART "B" AND GIVE ANY TWO REASONS			
II.	B1	WIND POLLINATED FLOWERS – ANEMOPHILY	ANY ONE EXPERIMENT 1 MARK
		IDENTIFICATION = ½ MARK	
		ANY TWO REASONS = ½ MARK	
II.	B2	INSECT POLLINATED FLOWERS – ENTEMOPHILY	
		IDENTIFICATION = ½ MARK	
		ANY TWO REASONS = ½ MARK	

II.	B3	DICOT SEED	
		IDENTIFICATION = ½ MARK	
		ANY TWO REASONS = ½ MARK	
II.	B4	E.COLI CLONIG VECTOR (pBR 322)	
		IDENTIFICATION = ½ MARK	
		ANY TWO REASONS = ½ MARK	
II.	B5	PLANT TISSUE CULTURE – CALLUS WITH PLANTLETS	
		IDENTIFICATION = ½ MARK	
		ANY TWO REASONS = ½ MARK	
II.	B6	PYRAMID OF NUMBER	
		IDENTIFICATION = ½ MARK	
		ANY TWO REASONS = ½ MARK	
II.	B7	PYRAMID OF BIOMASS	
		IDENTIFICATION = ½ MARK	
		ANY TWO REASONS = ½ MARK	
II.	B8	PYRAMID OF ENERGY	
		IDENTIFICATION = ½ MARK	
		ANY TWO REASONS = ½ MARK	
III. ANALYSE THE GIVEN ECOLOGICAL /GENETIC PROBLEM "C" .SOLVE IT BY GIVING APPROPRIATE REASONS			
III.	C1	TO VERIFY THE MENDEL'S MONOHYBRID CROSS	ANY ONE EXPERIMENT 1 ½ MARK
		IDENTIFICATION = ½ MARK	
		SOLVE / CONSTRUCT = ½ MARK	
		REASON / ANSWER = ½ MARK	

III.	C2	ANALYSE OF SEED SAMPLE TO STUDY MENDELIAN DIHYBRID CROSS	
		IDENTIFICATION = ½ MARK	
		SOLVE / CONSTRUCT = ½ MARK	
		REASON / ANSWER = ½ MARK	
III.	C3	FLOW OF ENERGY AND TEN PERCENT LAW	
		IDENTIFICATION = ½ MARK	
		SOLVE / CONSTRUCT = ½ MARK	
		REASON / ANSWER = ½ MARK	
III.	C4	CHROMOSOMAL ABERRATION – DELETION	
		IDENTIFICATION = ½ MARK	
		SOLVE / CONSTRUCT = ½ MARK	
		REASON / ANSWER = ½ MARK	
III.	C5	CHROMOSOMAL ABERRATION – DUPLICATION	
		IDENTIFICATION = ½ MARK	
		SOLVE / CONSTRUCT = ½ MARK	
		REASON / ANSWER = ½ MARK	
III.	C6	CHROMOSOMAL ABERRATION –INVERSION	
		IDENTIFICATION = ½ MARK	
		SOLVE / CONSTRUCT = ½ MARK	
		REASON / ANSWER = ½ MARK	
III.	C7	GENETIC - LINKAGE MAP	
		IDENTIFICATION = ½ MARK	
		SOLVE / CONSTRUCT = ½ MARK	
		REASON / ANSWER = ½ MARK	

IV. WRITE THE AIM , PROCEDURE , OBSERVATION AND INFERENCE OF THE GIVEN EXPERIMENT "D"			
IV.	D1	STUDY OF POLLEN GERMINATION ON A SLIDE	ANY ONE
		AIM = ½ MARK	EXPERIMENT
		PROCEDURE = ½ MARK	1 ½ MARK
		TABLE (OBSERVATION & INFERENCE) = ½ MARK	
IV.	D2	STUDY OF pH OF DIFFERENT TYPES OF SOIL	
		AIM = ½ MARK	
		PROCEDURE = ½ MARK	
		TABLE (OBSERVATION & INFERENCE) = ½ MARK	
IV.	D3	ISOLATION OF DNA FROM PLANT MATERIALS	
		AIM = ½ MARK	
		PROCEDURE = ½ MARK	
		TABLE (OBSERVATION & INFERENCE) = ½ MARK	
V.IDENTIFY THE ECONOMICALLY IMPORTANT PLANT PRODUCT "E" .MENTION ITS BOTANICAL NAME , USEFUL PARTS & THEIR USES			
V.	E1	SESAME OR GINGELLY OIL	ANY ONE PLANT 1 ½ MARK
		IDENTIFICATION , BOTANICAL NAME = ½ MARK	
		USEFUL PARTS = ½ MARK	
		USES = ½ MARK	
	E2	RUBBER	
		IDENTIFICATION , BOTANICAL NAME = ½ MARK	
		USEFUL PARTS = ½ MARK	
		USES = ½ MARK	

	E3	FLAKED RICE OR AVAL	
		IDENTIFICATION , BOTANICAL NAME = ½ MARK	
		USEFUL PARTS = ½ MARK	
		USES = ½ MARK	
	E4	HENNA POWDER	
		IDENTIFICATION , BOTANICAL NAME = ½ MARK	
		USEFUL PARTS = ½ MARK	
		USES = ½ MARK	
	E5	ALOE GEL	
		IDENTIFICATION , BOTANICAL NAME = ½ MARK	
		USEFUL PARTS = ½ MARK	
		USES = ½ MARK	
		TOTAL = 7 ½ MARKS	
		RECORD = 1 ½ MARKS	
		SKILL = 1 MARK	
		MAXIMUM MARKS = 10 MARKS	

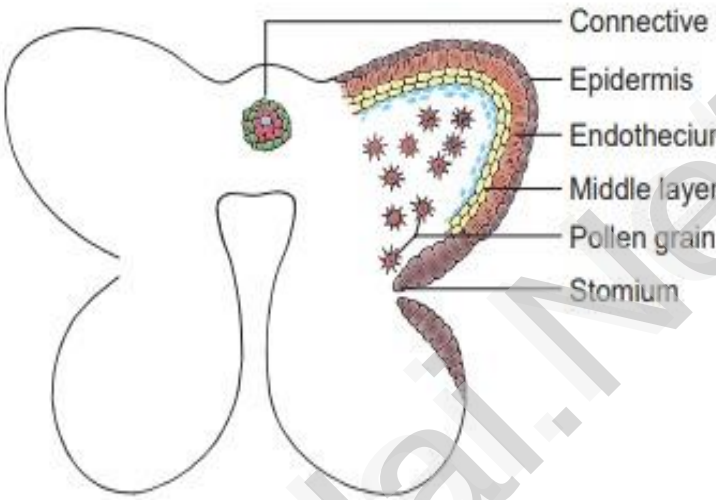
I.IDENTIFY THE GIVEN SLIDE "A " AND GIVE ANY TWO REASONS.

I.A1 – T.S OF ANTHER AND DIAGNOSTIC FEATURES

IDENTIFICATION :

The given slide "A1" is identified as T.S of Mature Anther.

T.S OF ANTHER



DIAGNOSTIC FEATURES : (ANY TWO REASON)

- **A mature anther is bilobed (dithecous) and the two lobes are joined by a connective.**
- **Each anther lobe has two pollen chambers in which pollen grains are produced.**
- **A microsporangium or pollen sac is surrounded by four wall layers. They are epidermis , endothecium, middle layers and tapetum.**
- **Centre of the microsporangium (pollen sac) is filled with haploid pollen grains.**

I.A2 L.S OF ANGIOSPERM OVULE

IDENTIFICATION :

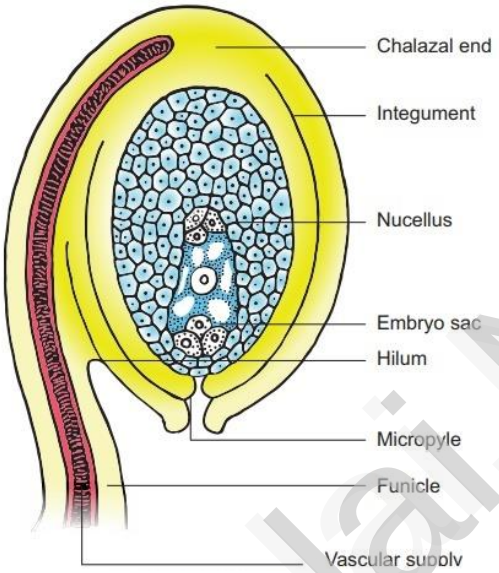
The given slide "A2 " is identified as T.S of Mature Anther.

DIAGNOSTIC FEATURES : (ANY TWO REASON)

- **Ovule or megasporangium is protected by one / two coverings called integuments.**
- **The stalk of the ovule is called funicle.**
- **The point of attachment of funicle to the body of the ovule is known as hilum.**
- **The body of the ovule is made up of a central mass of parenchymatous tissue called nucellus.**

- The integuments form a pore called micropyle and the region opposite to the micropyle is called as chalaza.
- The nucellus has a large, oval, sac like structure towards the micropylar end called embryo sac.
- A mature ovule, has 8 nuclei in its embryo sac.

L.S OF OVULE

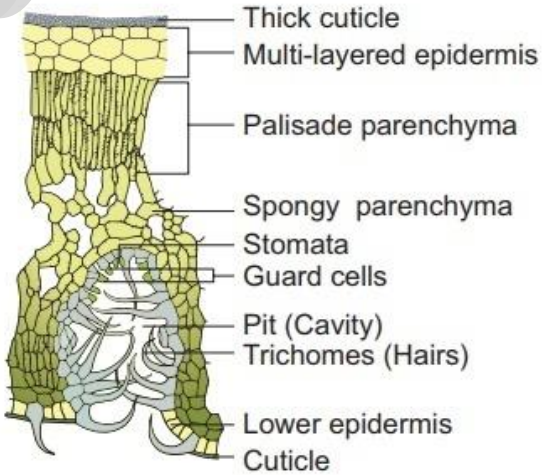


I.A3 – T.S OF NERIUM LEAF

IDENTIFICATION :

The given slide "A3" is identified as T.S of Nerium Leaf.

T.S OF NERIUM LEAF



DIAGNOSTIC FEATURES : (any two reasons)

- Presence of multilayered epidermis with thick cuticle.
- Sunken stomata are present only in the lower epidermis.
- Mesophyll is well differentiated into palisade and spongy parenchyma.
- Mechanical tissues are well developed.

II. B. PHOTOGRAPHS

II.B1 – WIND POLLINATED FOLWERS – ANEMOPHILY

IDENTIFICATION :

The given photograph "B1" is identified as Wind Pollinated Folwers – Anemophily.

DIAGNOSTIC FEATURES : (ANY TWO REASONS)

- The flowers are small, inconspicuous, colourless, odourless and nectarless.
- Anthers and stigmas are commonly exerted.
- Pollen grains are light, small, powdery and produced in large numbers.
- The stigmas are large, sometimes feathery and branched adapted to catch the pollens.

II. B2 – INSECT POLLINATED FLOWER – ENTEMOPHILY

IDENTIFICATION :

The given photograph "B2" is identified as Insect Pollinated Flower – Entemophily.

DIAGNOSTIC FEATURES : (ANY TWO REASONS)

- The flowers are showy, brightly coloured and scented.
- The flowers produce nectar or edible pollen.
- Anthers and stigmas are commonly inserted.
- Stigmas are usually unbranched and flat or lobed.

II.B3 – DICOT SEED

IDENTIFICATION :

The given photograph " B3 " is identified as Dicot Seed.

DIAGNOSTIC FEATURES : (ANY TWO REASON)

- Seeds of gram have two cotyledons and an embryonal axis.
- Each seed is covered by two seed coats
  (a) Testa – outer coat and
  (b) Tegmen – inner coat.
- The embryonal axis consists of radicle and plumule.

- The portion of the embryonal axis above the level of cotyledons is called epicotyl. It terminates into the plumule.
- The portion of the embryonal axis below the level of cotyledons is called hypocotyl. It terminates into the radicle or root tip.

II. B4 – E.COLI CLONING VECTOR (pBR 322)

IDENTIFICATION :

The given photograph " B4 " is identified as E.coli cloning vector (pBR 322)

Diagnostic Features : (ANY TWO REASONS)

- pBR 322 plasmid is a reconstructed plasmid containing 4361 base pairs and most widely used as cloning vector.
- In pBR, p denotes plasmid and B and R respectively the notes of scientists Boliver and Rodriguez who developed the plasmid.
- The number 322 is the number of plasmids developed from their laboratory.
- It contains two different antibiotic resistance genes and recognition site for several restriction enzymes (Hind III, Eco R I, Bam H I, Sal I, Pvu II, Pst I, Cla I), Ori and antibiotic resistance genes (ampR and tetR). Rop codes for the proteins involved in the replication of the plasmid.

II.B5 – PLANT TISSUE CULTURE – CALLUS WITH PLANT LETS

IDENTIFICATION :

The given photograph " B5 " is identified as Plant tissue culture – Callus with plant lets .

DIAGNOSTIC FEATURES: (ANY TWO REASONS)

- The callus is an unorganized mass of undifferentiated tissue.
- The mechanism of callus formation is that auxin induce cell elongation and cytokinin induces cell division as a result of which masses of cells are formed.
- Roots and shoots are differentiated from the callus.

II.B6 – PYRAMID OF NUMBER

IDENTIFICATION :

The given photograph " B6 " is identified as Pyramid of number.

DIAGNOSTIC FEATURE :

- The number of organism that are present in successive trophic levels of an ecosystem is shown in the pyramid of numbers of a grassland ecosystem.
- There is a gradual decrease in the number of organisms in each trophic level from producers to primary consumers, then to secondary consumer, and finally to tertiary consumers.

- Therefore, pyramid of number in grassland ecosystem is always upright

II.B7 – PYRAMID OF BIOMASS

IDENTIFICATION :

The given photograph " B7 " is identified as Pyramid of Biomass.

Diagnostic Features :

- Pyramid of biomass represents the total biomass or standing crop (dry weight) of organisms in each trophic level at a particular time.
- In aquatic ecosystem, the bottom of the pyramid is occupied by the producers, which comprises very small organisms (algae and phytoplanktons) possessing the least biomass and so the value gradually increases towards the tip of the pyramid.
- Therefore, here the pyramid of biomass is always inverted in shape.

II.B8 – PYRAMID OF ENERGY

IDENTIFICATION :

The given photograph " B8 " is identified as Pyramid of Energy.

Diagnostic Features :

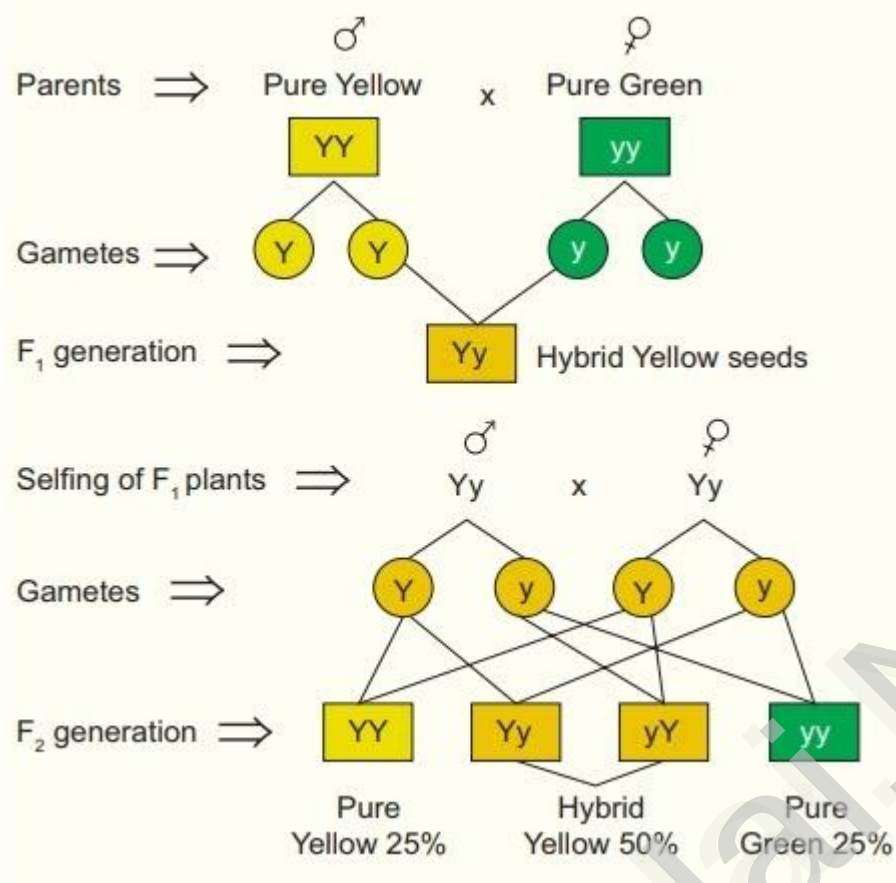
- Pyramid of energy represents the number of joules transferred from one trophic level to next.
- The bottom of the pyramid of energy is occupied by the producers.
- There is a gradual decrease in energy transfer at successive trophic levels from producers to the upper levels.
- Therefore pyramid of energy is always upright.

III.C SOLVING PROBLEMS

III.C1 – TO VERIFY THE MENDEL'S MONOHYBRID CROSS

IDENTIFICATION :

The given genetic problem " C1 " is identified as Mendel's Monohybrid Cross.



Procedure :

Make the student to work in pairs to perform the experiment. Follow the steps in given sequence.

- **Put 64 yellow beads in one beaker and 64 green beads in the other to represent male and female gametes respectively. Let the yellow bead be indicated by 'Y' and the green bead by 'y'.**
- **Take a bead from each container and place them together (it represents fertilization) on the hand towel spread before you on the table.**
- **Just like the previous step, continue to pick beads and arrange them in pairs. Thus 64 pairs of beads are obtained representing the 64 heterozygous F1 progeny.**
- **Put 32 F1 progeny in one petridish and the remaining 32 in another petridish (representing the F1 males and females).**
- **To obtain the F2 generation, the student should withdraw one bead from one beaker labelled male and one from the other beaker labelled female keeping his / her eyes closed (to ensure randomness) and put them together on the hand towel spread over the table. Continue this process till all the beads are paired. Thus 64 offsprings of F2 progeny are obtained.**

- Note the genotype (YY or Yy or yy) of each pair and their possible phenotype.
- Pool all the data and calculate the genotypic and phenotypic ratios.

Observation :

Generation	Total Number of individuals	Genotype			Phenotype(s)
		YY	Yy	yy	
F1	64	-	Heterozygous yellow	-	Yellow
	Total	-	64	-	64
F2	64	Homozygous yellow	Heterozygous yellow	Homozygous green	Yellow and green
	Total	16	32	16	64

Phenotypic Ratio : 3 : 1

F1 is Yellow = 64

F2 is Yellow : Green

48 : 16

So ,

3 : 1 or 75 % : 25 %

Genotypic Ratio : 1 : 2 : 1

F1 is Heterozygous Yellow (Yy – 64)

Inference:

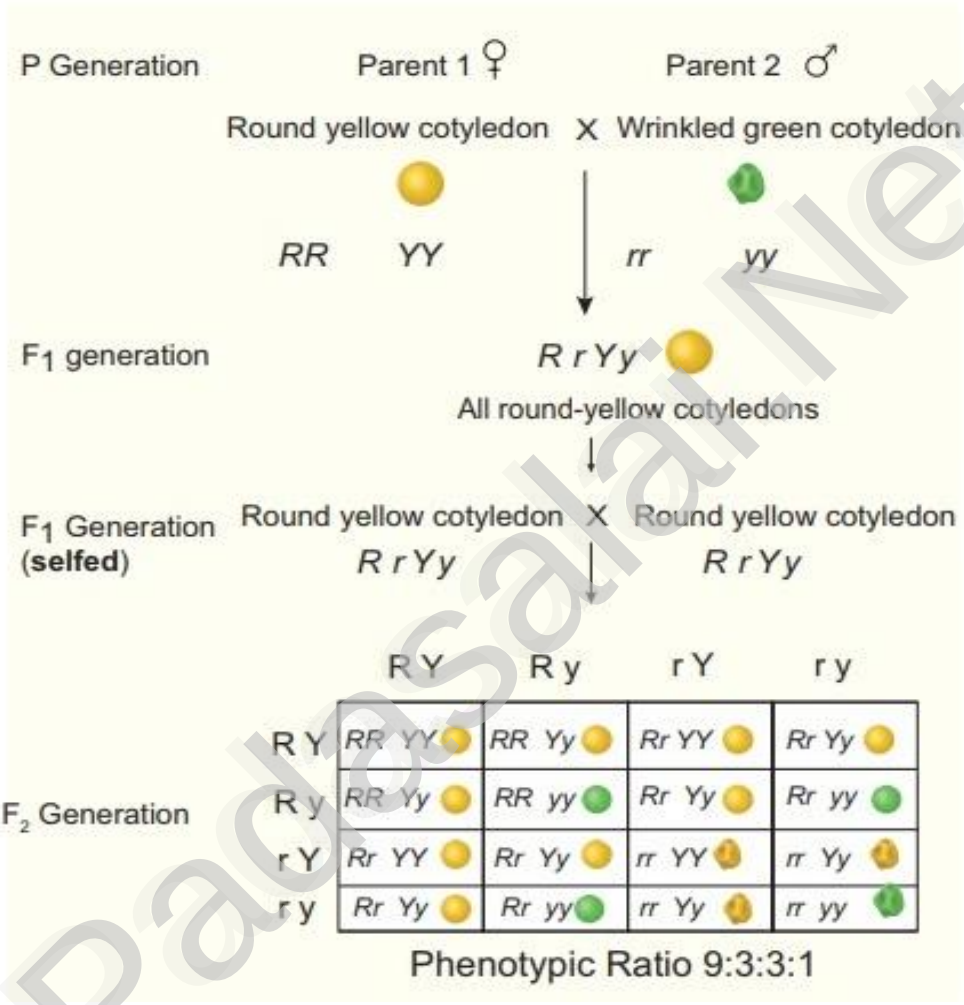
- The results are so because when the F1 individuals are crossed together to raise the F2 generation, each F1 individual produces two types of gametes: 50% having dominant allele and the remaining 50% having recessive allele.
- These gametes undergo random fusion during fertilization to produce the F2 generation.
- According to simple probability of mixing of opposite sex gametes, offsprings of three genotypes are likely to appear as follows:
  - Among these, proportion of dominant phenotype would be YY + Yy = yellow and recessive phenotype yy = green, which occur in 3 : 1 or 75% : 25% ratio. This ratio of 3 :1 in the F2 suggests that the hybrids or heterozygotes of F1 generation have two contrasting factors or alleles of dominant and recessive type. These factors, though remain together for a long time, do

not contaminate or mix with each other. They separate or segregate at the time of gamete formation so that a gamete carries only one factor, either dominat or recessive.

III. C2 – ANALYSIS OF SEED SAMPLE TO STUDY MENDELIAN DIHYBID CROSS

IDENTIFICATION :

The given genetic problem "C2" is identified as Analysis Of Seed Sample To Study Mendelian Dihybid Cross.



PROCEDURE:

- **Take a lot of about 160 Pea seeds or plastic beads in a tray.**
- **Separate out yellow round, yellow wrinkled, green round and green wrinkled and put them in separate petridishes.**
- **Note down the number of seeds in each plate and find out their approximate ratio.**

OBSERVATION:

Present your finding in the form of a table.

Total number of seeds observed	Number of Round seeds	Number of yellow wrinkled seeds	Number of green round seeds	Number of green wrinkled seed
160	90	30	30	10

Phenotypic ratio : 9 : 3 : 3 : 1

Yellow round	Yellow wrinkled	Green round	Green wrinkled
9	3	3	1

Inference:

- **The ratio of yellow round : yellow wrinkled : Green round : green wrinkled is approximately 9 : 3 : 3 : 1**
  which is exactly the same as obtained by Mendel for a dihybrid cross.
- **This indicates that the contrasting genes for seed colour and seed shape show an independent assortment in the population of pea seeds.**

III. C3 – FLOW OF ENERGY AND TEN PERCENT LAW

IDENTIFICATION :

The given ecological problem " C3" is identified as Flow of energy and ten percent law.

Problem :

Analyse the food chain given below and find out the amount of energy received by the organism in third trophic level.

Sun

⬇ Grass receives 30,000. J of energy from sun

Grass ⟶ Rabbit ⟶ Snake ⟶ Eagle

Given: The amount of energy in the producers, i.e. grass = 30,000 J.

Solution:

Grass	⟶ Rabbit	⟶ Snake	⟶ Eagle
T1	T2	T3	T4
Producer	Primary Consumer	Secondary Consumer	Tertiary Consumer

T1 – Grass (Producer) = 30,000 J of energy

T2 – Rabbit (Primary Consumer) = 3000 J of energy

T3 – Snake (Secondary Consumer) = 300 j of energy

According to the ten percent law, during the transfer of energy, only about 10% of the energy flows from each trophic level to the next lower trophic level. So 10% of energy from T1 gets transferred to T2

So , T2 - Rabbit (primary consumer) receives $30000 \times \frac{10}{100} = 3000$ J

Similarly, 10% of energy from T2 gets transferred to T3

So ,

T3 – Snake (Secondary consumer) receives $3000 \times \frac{10}{100} = 300$ J

Answer:

1. The third tropic level T3 – (Snake) receives 300 J of energy.

III. C4 – CHROMOSOMAL ABERRATION – DELETION

IDENTIFICATION :

The given Chromosomal Aberration "C4" is identified as deletion .

PROBLEM:

- **Given below is the representation of a kind of chromosomal aberration such as deletion,**
- **To understand the abnormality in the chromosomal structure in an organism.**

PRINCIPLE:

- **To study about the chromosomal aberration which can occur due to ionizing radiations or chemicals.**
- **On the basis of breaks and reunions in the chromosomal segment different types of aberrations can be recognized.**

REQUIREMENTS:

- **Copper wire,**
- **Alphabets marked (A to H) yellow colour beads denotes gene, and red colour bead without alphabet denote centromere.**
- **Using this materials make different kinds of chromosomal segments with specific gene sequence, that can be given to the students and asked to analyse the aberration involved in it.**

PROCEDURE:

- **Make a normal chromosome model using copper wire and yellow beads and place it on the table.**

- In the model chromosome with gene sequence A to H, along with centromere (red bead).
- For Deletion - Give yellow colour beads without one or more marked alphabets A to H (The lack of any one or more beads denotes deletion type of chromosomal aberration).

Chromosomal Aberration – Deletion

REASONS:

- The deletion of the chromosomal segement A and D.
- When there is a loss of a segment of the genetic material in a chromosome it is called deletion.

SIGNIFICANCE:

- Most of the deletions lead to death of an organism.

III. C5 – CHROMOSOMAL ABERRATION – DUPLICATION

IDENTIFICATION :

The given Chromosomal Aberration "C5" is identified as Duplication.

PROBLEM:

- Given below is the representation of a kind of chromosomal aberration such duplication ,
- Identify and give reasons for identification. Also mentions its significance.

AIM:

To understand the abnormality in the chromosomal structure in an organism.

PRINCIPLE:

- To study about the chromosomal aberration which can occur due to ionizing radiations or chemicals.
- On the basis of breaks and reunions in the chromosomal segment different types of aberrations can be recognized.

REQUIREMENTS:

- Copper wire,
- Alphabets marked (A to H) yellow colour beads denotes gene, and red colour bead without alphabet denote centromere.
- Using this materials make different kinds of chromosomal segments with specific gene sequence, that can be given to the students and asked to analyse the aberration involved in it.

PROCEDURE:

- Make a normal chromosome model using copper wire and yellow beads and place it on the table. In the model chromosome with gene sequence A to H, along with centromere (red bead).
- For Duplication – Give yellow colour beads with addition of one or more marked alphabets A to H (The repetition of one or more beads denotes duplication type of chromosomal aberration).

REASONS:

- When a segment of a chromosome is present more than once in a chromosome, then it is called duplication (Tandem duplication).
- The order of the genes in a chromosome is A, B, C, D, E, F, G, H and I. Due to aberration, the genes B and C are duplicated and the sequence of genes becomes A, B, C, B, C, D, E, F, G, H and I. (Refer figure 13b)

SIGNIFICANCE:

Some duplications are useful in the evolution of the organism

III. C6 – CHROMOSOMAL ABERRATION – INVERSION

IDENTIFICATION :

The given Chromosomal Aberration "C6" is identified as Inversion.

PROBLEM:

- Given below is the representation of a kind of chromosomal aberration such as inversion.
- Identify and give reasons for identification. Also mentions its significance.

AIM:

To understand the abnormality in the chromosomal structure in an organism.

PRINCIPLE:

- To study about the chromosomal aberration which can occur due to ionizing radiations or chemicals.
- On the basis of breaks and reunions in the chromosomal segment different types of aberrations can be recognized.

REQUIREMENTS:

- Copper wire,
- Alphabets marked (A to H) yellow colour beads denotes gene, and red colour bead without alphabet denote centromere.
- Using this materials make different kinds of chromosomal segments with specific gene sequence, that can be given to the students and asked to analyse the aberration involved in it.

PROCEDURE:

- Make a normal chromosome model using copper wire and yellow beads and place it on the table.
- In the model chromosome with gene sequence A to H, along with centromere (red bead). For Inversion – Give yellow colour beads which marked alphabets from A to H as in normal chromosome. (There is no addition or deletion of beads (A to H) given, so the students can construct the inverted segment of the chromosome using the given beads).

REASONS:

- When the order of genes in a chromosomal segment is reversed due to rotation by an angle of 180°, it is called inversion.
- The order of genes in a chromosome is A, B, C, D, E, F, G, H and I. Due to aberration, the sequence of genes become A, D, C, B, E, F, G, H and I

SIGNIFICANCE:

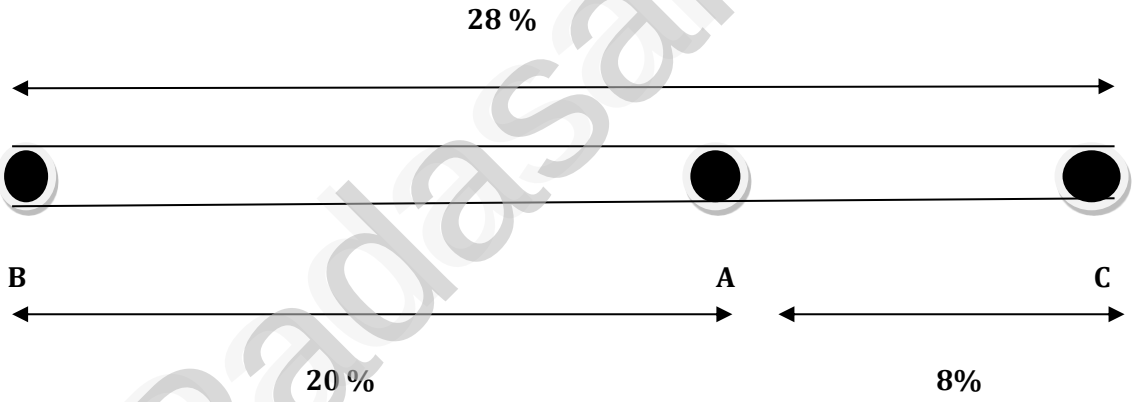
Sometimes inversion is responsible for evolution of the organism.

III. C7 – GENETIC LINKAGE MAP

IDENTIFICATION :

The given Genetic problem "C6" is identified as Genetic Linkage map.

SOLUTION :



AIM:

To understand the frequency of recombination between the gene pairs on the same chromosome.

PRINCIPLE:

To analyse the relative distance between the various genes and map their position in the chromosome, which is called genetic or linkage maps.

REQUIREMENTS:

- Different kinds of linkage / genetic maps can be constructed by giving the students the relative distance between the linked genes of a chromosome.

- A diagrammatic representation can be drawn showing the location and arrangement of genes and their relative distance between them.

SOLVE THE PROBLEM :

PROBLEM:

There are three linked genes A, B and C in a chromosome. Percentage of crossing over (recombination frequency) between A and B is 20, B and C is 28 and A and C is 8. What is the sequence of genes on the linkage map?

REASONS:

- The frequency of crossing over is directly proportional to the relative distance of the genes on the chromosomes.
- More crossing over = More distance between two genes and Less crossing over = Less distance between the two genes.
- In the above problem, the sequence of the genes on the linkage map is B, A, C.

IV.EXPERIMENTS

IV.D1 - STUDY OF POLLEN GERMINATION ON A SLIDE

AIM:

To study the pollen germination on a slide.

PROCEDURE:

- Prepare a nutrient solution by dissolving 1 gm. of sucrose / 1 gm. of boric acid in 100 ml. of distilled water.
- Take a clean cavity slide and put a few drops of nutrient solution in the cavity of the slide.
- Dust a few pollen grains from the stamen of a mature flower on it.
- View the slide in the microscope after 5 minutes and then observe it regularly for about half an hour.

OBSERVATION:

- In nutrient medium, the pollen grains germinate.
- The tube cell enlarges and comes out of the pollen grain through one of the germ pores to form a pollen tube.
- The tube nucleus descends to the tip of the pollen tube. The generative cell also passes into it. It soon divides into two male gametes.

INFERENCE:

- Different stages of germinating pollens are observed.
- Some pollens are in their initial stage of germination while others have quite long pollen tube containing tube nucleus and two male gametes.

IV.D2 – STUDY OF pH OF DIFFERENT TYPES OF SOIL

AIM:

To study pH of different types of soil.

PROCEDURE:

- Dissolve one tablespoon or 1 gram of soil from each soil sample in 100 ml of distilled water in separate beakers.
- Stir the solutions well and keep aside for half an hour to settle down the suspended particles.
- Filter off each solution separately in different test tubes. Dip a small piece of broad range pH paper on each of the solution.
- Match the colour of the pH paper with the colour scale given on the pH paper booklet. This gives an approximate pH.

OBSERVATION:

Record the pH of different soil samples in the observation table.

S.NO	SOIL SAMPLE	pH value
	Sandy loam	5.9

INFERENCE:

Thus the pH value of different soil samples required for plant growth can be determined

IV.D3 – ISOLATION OF DNA FROM PLANT MATERIALS

Aim:

To isolate DNA from available plant materials such as spinach leaves, fresh green pea seeds, green papaya, etc.

Procedure:

- Take a small amount of plant material and grind it in a mortar with a little amount of water and sodium chloride.
- Make it into a solution and filter it.
- To this filterate, add liquid soap solution or any detergent solution and mix it with a glass rod.
- Then tilt the test tube and add chilled ethanol and leave it aside in the stand. After half-an-hour we can observe the precipitated DNA as fine threads.
- DNA that separates can be removed by spooling.

Observation:

DNA appears as white precipitate of very fine threads on the spool.

Inference:

Thus DNA can be isolated from the plant cell nucleus by this technique.

V.E.ECONOMIC IMPORTANCE OF PLANTS

E1 – SESAME OR GINGELLY OIL

IDENTIFICATION :

The given plant product " E1" is identified as Sesame or Gingelly oil.

BINOMIAL NAME :

Sesamum indicum

PART OF THE PLANT USED :

Seeds

USES :

- Sesame oil is mostly used for culinary purposes .
- Lower grades are used in manufacture of soaps , in paint industries , as a lubricant and as an illuminant.

E2 – RUBBER

IDENTIFICATION :

The given plant product " E2" is identified as Rubber.

BINOMIAL NAME :

Hevea brasiliensis

PARTS OF THE PLANT USED :

Latex

USES :

- Rubber is used in the manufacture of footwear , wire and cable insulations , rain coat , sports goods , erasers , adhesives , rubber bands , house holds and hospital goods and shock absorbers.
- Concentrated latex is used for making gloves and balloons.
- Foamed latex is used in the manufacture of cushions , pillows and life – belts.

E3 – FLAKED RICE OR AVAL

IDENTIFICATION :

The given plant product " E3" is identified as Flaked Rice Or Aval.

BINOMIAL NAME :

Oryza sativa

PARTS OF THE PLANT USED :

Seeds

USES :

- Flaked rice (aval) is used as breakfast cereals or as snacks.

E4 – HENNA POWDER

IDENTIFICATION :

The given plant product " E4" is identified as Henna Powder.

BINOMIAL NAME :

Lawsonia inermis

PARTS OF THE PLANT USED :

Leaves

USES :

- An orange dye "Henna " obtained from leaves and young shoots is used to dye skin , hair and fingernails.
- It is also used for colouring leather , tails of horses and hair.

E5 – ALOE GEL

IDENTIFICATION :

The given plant product " E5" is identified as Aloe gel.

BINOMIAL NAME :

Aloe vera

PARTS OF THE PLANT USED :

Leaves

USES :

- Aloe gel is used as skin tonic.
- Because of its cooling effect and moisturing characteristics , it is used in the preparation of creams , lotions , shampoos , shaving creams and allied products.
- It is used in gerontological applications for rejuvenation of ageing skin.

KOMARASAMY GOUNDER MAT.HR.SEC.SCHOOL

VETTAYAMPALAYAM

BIO - ZOOLOGY

12th STANDARD

PRACTICAL MANUAL

PREPARED BY

MARIMUTHU G M.SC.,B.ED.,

PG ASSISTANT IN BOTANY

KOMARASAMY GOUNDER MAT.HR.SEC.SCHOOL

VETTAIYAMPALAYAM

KURUMANDHUR

KOMARASAMY GOUNDER MAT.HR.SEC.SCHOOL – VETTAYAMPALAYAM

QUESTION PAPER AND MARKS ALLOTEMENT

S.NO		QUESTION	MARKS
I.ANALYSE THE GIVEN SAMPLES I,II,III FOR FERMENTATION PROCESS.WRITE THE AIM , PRINCIPLE , PROCEDURE , AND INFERENCE OF THE EXPERIMENT			
I.		FERMENTATION BY YEAST	2 ½ MARKS
		PROCEDURE = 1 MARK	
		EXPERIMENT = 1 MARK	
		RESULT = ½ MARK	
II.	i)	ANALYSE THE GIVEN WATER SAMPLES (I , II , III) FOR COLOUR AND pH .TABULATE YOUR RESULTS AND FIND OUT WHICH IS SUITABLE FOR CONSUMPTION.	
		AIM = ½ MARK	ANY ONE EXPERIMENT (i OR ii OR iii) 2 MARKS
		PRINCIPLE = ½ MARK	
		PROCEDURE = ½ MARK	
		OBSERVATION & INFERENCE = ½ MARK	
		OR	
	ii)	MARK THE LOCATION OF THE GIVEN WILDLIFE SANCTUARY AND NATIONAL PARKS IN INDIA MAP .ADD A NOTE ITS LOCATION AND SIGNIFICANCE (ANY TWO SANCTUARIES OR NATIONAL PARKS)	
		MARKING ON THE MAP & LOCATION = ½ MARK	
		ANY TWO SIGNIFICANCE = ½ MARKS	
		2 WILDLIFE SANCTURIES AND NATIONAL PARKS (2 X 1 = 2)	
		OR	
	iii)	MENTION ANY 4 MENDELIAN TRAITS IN YOUR BODY AND WRITE THEIR PHENOTYPE & GENOTYPE	
		EACH MENDELIAN TRAITS CHARACTERS ½ MARK 4 X ½ = 2 MARKS	

III.	IDENTIFY THE GIVEN SLIDE "A " .GIVE ANY TWO DIAGNOSTIC FEATURES WITH DIAGRAM		
III.	A1	HUMAN SPERM	ANY ONE
		IDENTIFICATION & DIAGRAM & PARTS = ½ MARK	EXPERIMENT
		ANY TWO DIAGNOSTIC FEATURE = ½ MARK	1 MARKS
III.	A2	HUMAN OVUM	
		IDENTIFICATION & DIAGRAM & PARTS = ½ MARK	
		ANY TWO DIAGNOSTIC FEATURE = ½ MARK	
III.	A3	PARAMECIUM - CONJUGATION	
		IDENTIFICATION & DIAGRAM & PARTS = ½ MARK	
		ANY TWO DIAGNOSTIC FEATURE = ½ MARK	
III.	A4	Entamoeba histolytica	
		IDENTIFICATION & DIAGRAM & PARTS = ½ MARK	
		ANY TWO DIAGNOSTIC FEATURE = ½ MARK	
III.	A5	T.S OF THYMUS GLAND	
		IDENTIFICATION & DIAGRAM & PARTS = ½ MARK	
		ANY TWO DIAGNOSTIC FEATURE = ½ MARK	
III.	A6	T.S OF LYMPH NODE	
		IDENTIFICATION & DIAGRAM & PARTS = ½ MARK	
		ANY TWO DIAGNOSTIC FEATURE = ½ MARK	
IV.	IDENTIFY THE GIVEN PICTURE " B" .WRITE ANY 2 COMMENTS.		
IV.	B1	tRNA	ANY ONE
		IDENTIFICATION = 1 MARK	EXPERIMENT
		ANY TWO COMMENTS = 1 MARK	1 MARK

IV.	B2	HOMOLOGOUS ORGANS	
		IDENTIFICATION = 1 MARK	
		ANY TWO COMMENTS = 1 MARK	
IV.	B3	ANALOGOUS ORGANS	
		IDENTIFICATION = 1 MARK	
		ANY TWO COMMENTS = 1 MARK	
IV.	B4	ANIMAL CLONING – DOLLY (SHEEP)	
		IDENTIFICATION = 1 MARK	
		ANY TWO COMMENTS = 1 MARK	
IV.	B5	HUMAN INSULIN PRODUCTION - FLOW CHART	
		IDENTIFICATION = ½ MARK	
		FLOW CHART = ½ MARK	
		ANY TWO COMMENTS = 1 MARK	
V.	IDENTIFY THE CHROMOSOMAL ABNORMALITY IN "C" .WRITE ANY 2 CHARACTERISTICS FEATURES		
	C1	NORMAL HUMAN KARYOTYPE	ANY ONE EXPERIMENT 1 MARK
		IDENTIFICATION = ½ MARK	
		ANY CHARACTERISTIC FEATURES = ½ MARK	
	C2	AUTOSOMAL ANOMALY – PATAU'S SYNDROME	
		IDENTIFICATION = ½ MARK	
		ANY CHARACTERISTIC FEATURES = ½ MARK	
	C3	SEX CHROMOSOMAL ANOMALY – TURNER'S SYNDROME	
		IDENTIFICATION = ½ MARK	
		ANY CHARACTERISTIC FEATURES = ½ MARK	
	OR		

V.	ANALYSE AND IDENTIFY THE GENETIC DISEASE IN THE PEDIGREE CHART GIVEN IN "C". WRITE ANY 2 COMMENTS		
	C4	X – LINKED DISEASE – HAEMOPHILIA	
		ANALYSE & IDENTIFICATION = ½ MARK	
		ANY TWO COMMENTS = ½ MARK	
	C5	AUTOSOMAL DISEASE – SICKLE CELL ANEMIA	
		ANALYSE & IDENTIFICATION = ½ MARK	
		ANY TWO COMMENTS = ½ MARK	
		TOTAL = 7 ½ MARKS	
		RECORD = 1 ½ MARKS	
		SKILL = 1 MARK	
		MAXIMUM MARKS = 10 MARKS	

I. FERMENTATION BY YEAST

PROCEDURE

- Take 2ml of the given samples I, II and III in three clean test tubes (labelled as 1,2 and 3) respectively.
- Add 2ml of yeast solution in all the test tubes and plug the tubes with cotton wool.
- Wait while fermentation takes place and note the time taken.
- Appearance of effervescence in the test tube indicates that fermentation has taken place.
- Remove the cotton wool and pass the gas through a delivery tube into a test tube containing lime water.
- The lime water turns milky indicating that the gas evolved during fermentation is carbon dioxide.

EXPERIMENT :

The given experiment is identified , analyzed and the results are displayed to the external examiner .

OBSERVATION :

S.NO	SAMPLE	TIME TAKEN	INFERENCE
1.	I	Appearance of effervescence quickly	Simple sugar is present
2.	II	Appearance of effervescence slowly	Complex sugar is present
3.	III	No appearance	No fermentation

RESULTS :

Yeast has an enzyme which catalyses the fermentation process.

1. to given sample I is simple sugar is present .it is fermentation quickly.
2. to given sample II complex sugar is present . It is fermentation slowly.
3. to given sample III ,NO APPERANCE .It is no fermentation.

INFERENCE :

The variation in the time taken for fermentation to take place in the different sugar solutions indicates that the simple sugars like glucose are fermented much quicker than the complex sugars.

II. (i) DETERMINATION OF COLOUR AND pH IN THE GIVEN WATER SAMPLES

AIM :

To investigate the colour and pH in the given water samples I, II ,III and thereby determining the quality of water for consumption.

PROCEDURE :

- Observe and tabulate the colour of the water samples I , II and III taken in test tubes against a white background.
- Take the three different water solutions in separate test tubes and label them.
- A piece of pH paper is dipped into the sample and compared with that of the colour on the pH chart.
- The approximate pH value of the samples is thus determined and the results tabulated.

OBSERVATION :

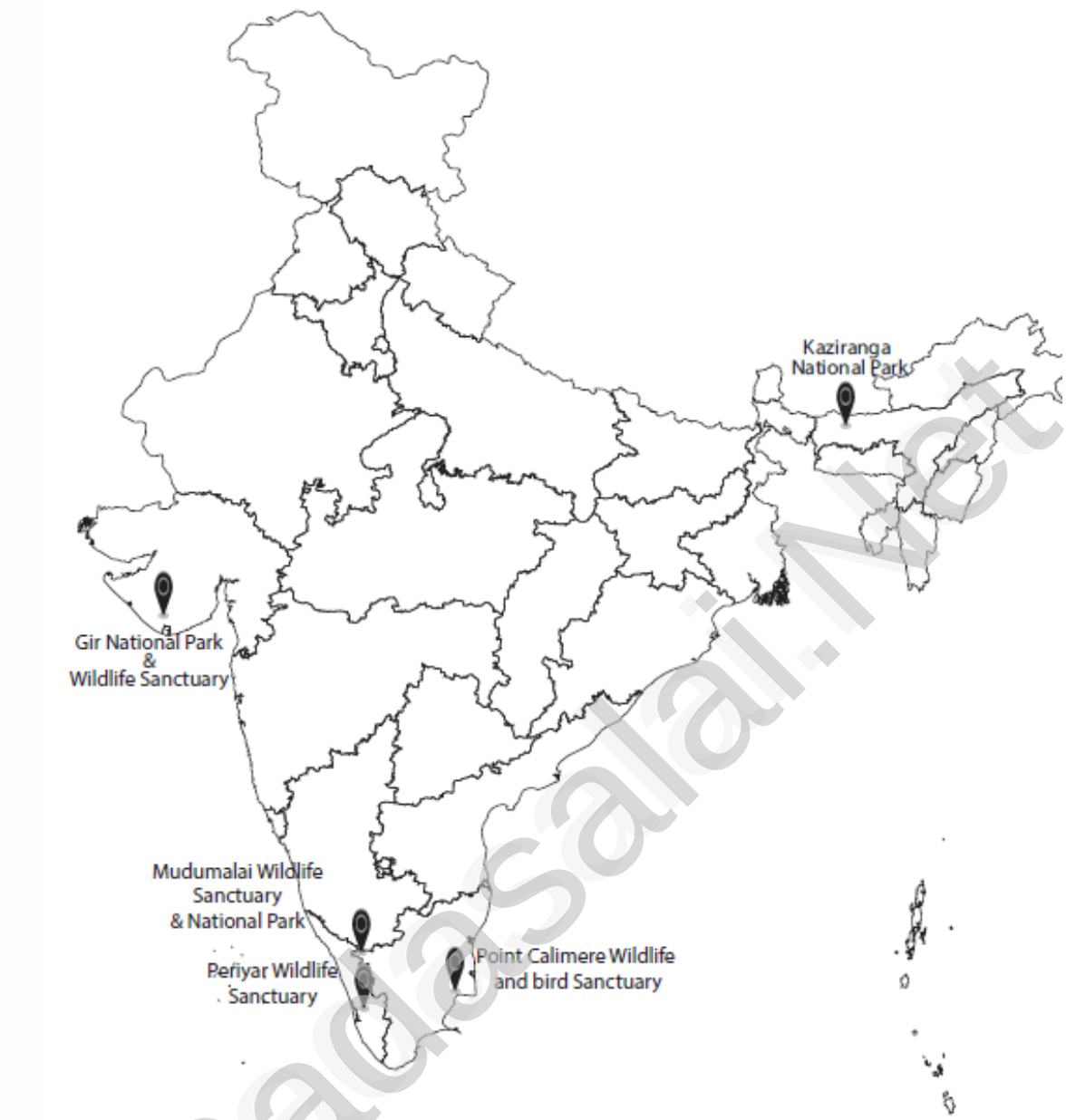
S.NO	SAMPLE	COLOUR OF THE SAMPLE	P^H OF THE SAMPLE
1.	I	Colour less (Rain water)	7
2.	II	Green colour (River water)	6.5
3.	III	Brown colour (pond water)	8

INFERENCE

1. To given sample I is found to be PH 7 is neutral in nature , it is fit for consumption.
2. To given a sample II is found to be PH 6.5 is acidic in nature. It is not suitable for consumption .
3. To given sample III is found to be PH 8 is alkaline nature,it is not suitable for consumption.

OR

II. (ii) MARKING OF WILDLIFE SANCTUARY AND NATIONAL PARKS IN INDIA MAP



1. KAZIRANGA NATIONAL PARK :

- **LOCATION:**

  Golaghat and Nagaon districts of Assam

- **SIGNIFICANCE: (ANY TWO SIGNIFICANCE)**
  - **Kaziranga National park's 430 square kilometer area sprinkled with elephant-grass meadows, swampy lagoons, and dense forests is home to more than 2200 Indian one-horned rhinoceros, approximately 2/3rd of their total world population.**
  - **The park is the breeding ground of elephants, wild water buffalo, and swamp deer.**

- Over the time, the tiger population has also increased in Kaziranga, and that's the reason why Kaziranga was declared as Tiger Reserve in 2006.

2. POINT CALIMERE WILDLIFE AND BIRD SANCTUARY :

- **LOCATION:**

  Point Calimere (Kodiakkarai), Nagapattinam (dt)

- **SIGNIFICANCE: (ANY TWO SIGNIFICANCE)**
  - It was created for the conservation of near threatened species, Black buck antelope, an endemic mammal species of India.

3. GIR NATIONAL PARK AND WILDLIFE SANCTUARY LOCATION:

Talala Gir in Gujarat

SIGNIFICANCE: (ANY TWO SIGNIFICANCE)

- Gir is the only natural habitat of world popular Asiatic Lions.
- It covers total area of 1412 square kilometers of which 258 Km forms the core area of the National Park.
- The Sambar is counted largest Indian Deer.
- The Gir forest is also known for the Chowsingha – the world's only four horned antelope.
- The Jackal, striped Hyena and Indian Fox are some of the smaller carnivores found in Gir Forest.

4. PERIYAR WILDLIFE SANCTUARY :

- **LOCATION:**

  Kerala

SIGNIFICANCE: (ANY TWO SIGNIFICANCE)

- Apart from Elephants, the other animals to be seen in the Periyar sanctuary are Gaur, Wild Pigs, Sambar, Barking Deer, Mouse Deer, Dole or Indian Wild Dog and very rarely, a Tiger.
- There are, now, an estimated 40 tigers here.

5. MUDUMALAI WILDLIFE SANCTUARY AND NATIONAL PARK

- **LOCATION:**

  Nilgiri hills, Nilgiri District, TamilNadu (Shares boundary with the states of Karnataka and Kerala).

SIGNIFICANCE : (ANY TWO SIGNIFICANCE)

- The protected area is home to several endangered and vulnerable species including Indian elephant, Bengal tiger, Gaur and Indian leopard.
- There are at least 266 species of birds in the sanctuary, including critically endangered Indian white-rumped vulture and longbilled vulture.

OR

II. (iii) HUMAN MENDELIAN TRAITS

ANY FOUR MENDELIAN TRAITS :

Traits	Possible alleles	Your phenotype	No	%	Your genotype	No	%
1.Hair curl	Curly (H) Straight (h)	Straight (h)	14	93.3 %	Recessive (h)	14	93.3 %
2. Tongue rolling	Roller (T) Non roller (t)	Roller (T)	6	40 %	Dominant (T)	6	40 %
3. Earlobes	Free lobe (F) Attached (f)	Attached (f)	13	86.6 %	Recessive (f)	13	86.6 %
4. Handedness	Right (R) Left (L)	Right (R)	15	100 %	Dominant (R)	15	100 %
5.Shape of the face	Oval (O) Square (o)	Square (o)	9	60 %	Recessive (o)	9	60 %

III. A1 – HUMAN SPERM

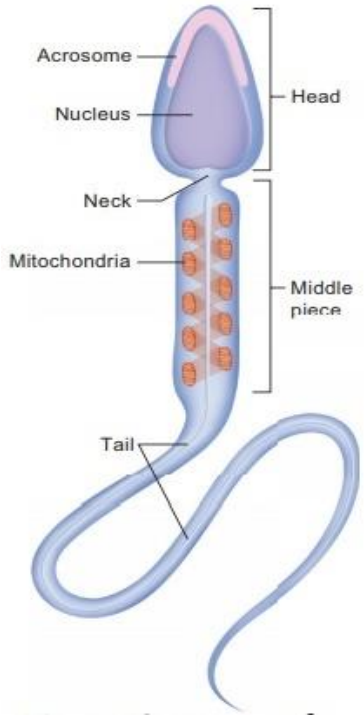
IDENTIFICATION :

The given slide "A1 " is identified as Human Sperm.

COMMENTS : (ANY TWO)

- The human sperm is microscopic, flagellated and a motile male gamete.
- The sperm is composed of a head, neck, middle piece and a tail.
- The head comprises of acrosome and nucleus.
- The middle piece possesses mitochondria which produces energy in the form of ATP molecules.
- The tail is the longest part and is slender and tapering.

DIAGRAM :

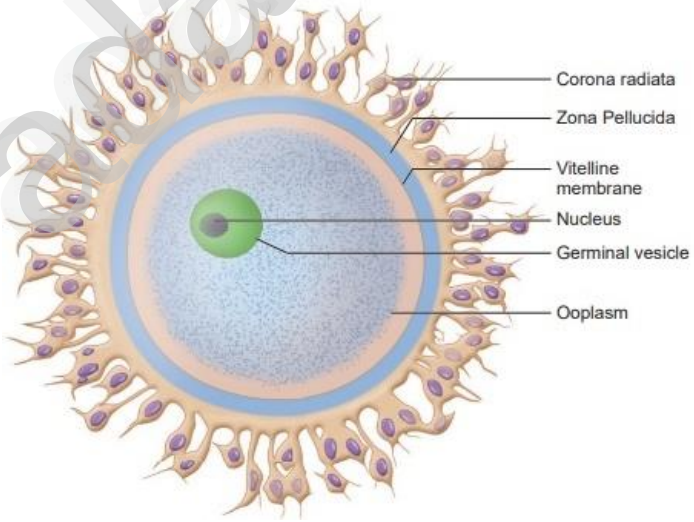


III. A2 - HUMAN OVUM

IDENTIFICATION :

The given slide" A2" is identified as human ovum.

DIAGRAM :



COMMENTS : (ANY TWO)

- **Human ovum is microscopic, non-cleidoic and a alecithal female gamete.**

- The ovum is surrounded by three coverings namely vitelline membrane, zona pellucida and corona radiata.
- The cytoplasm of the egg is called ooplasm and contains a large nucleus called the germinal vesicle.
- The narrow space between the vitelline membrane and zona pellucida is known as perivitelline space.

III.A3 - PARAMECIUM – CONJUGATION

IDENTIFICATION :

The given slide "A3" is identified as Paramecium – Conjugation.

COMMENTS : (ANY TWO)

- Conjugation is a form of sexual reproduction, wherein two individuals called conjugants mutually exchange nuclear material and then get separated.
- The pellicle and cytoplasm at the point of contact is broken and a protoplasmic bridge is formed.
- The large pronucleus acts as female pronucleus and the smaller nucleus acts as male pronucleus.
- The male pronucleus moves through the protoplasmic bridge and fuses with the female pronucleus to form the diploid nucleus.

III.A4 – Entamoeba histolytica

IDENTIFICATION :

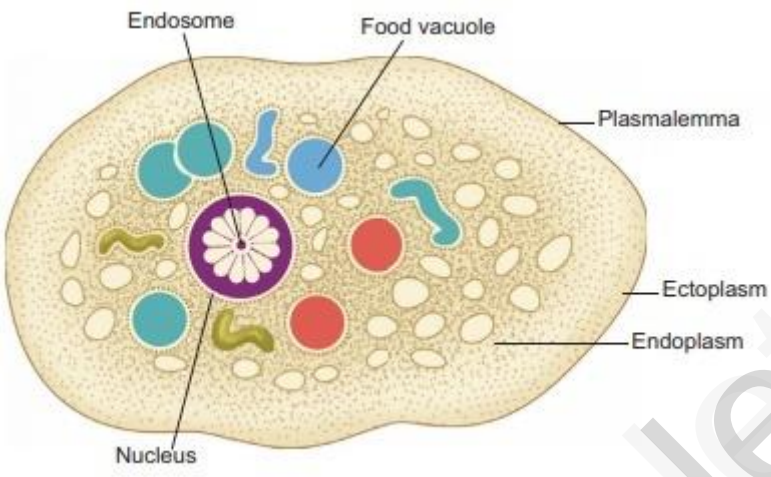
The given slide "A4 " is identified as *Entamoeba histolytica.*

COMMENTS : (ANY TWO)

- Entamoeba is an endoparasitic protozoan which causes amoebiasis or amoebic dysentery.
- It lives in the lumen of the large intestine and feeds on the epithelial cells.
- The infective stage of this parasite is the trophozoite.

The symptoms of amoebiasis are ulceration, bleeding, abdominal pain and stools with excess mucus.

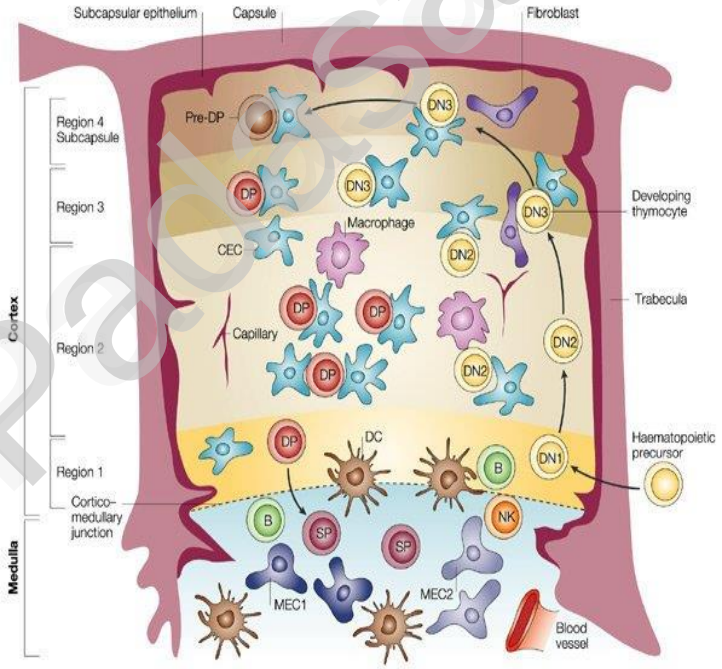
DIAGRAM :



III.A5 – T.S OF THYMUS GLAND

IDENTIFICATION :

The given slide"A5" is identified as thymus gland – T.S.



COMMENTS :

- **Thymus is a primary lymphoid bilobed organ located behind the sternum and above the heart.**
- **It has many lobules separated from each other by connective tissue called septa.**
- **Each lobule is differentiated into an outer cortex and inner medulla.**
- **Thymus gland is mainly involved in proliferation and maturation of T – cells (thymus dependent cell) and secretion of thymosin hormone.**

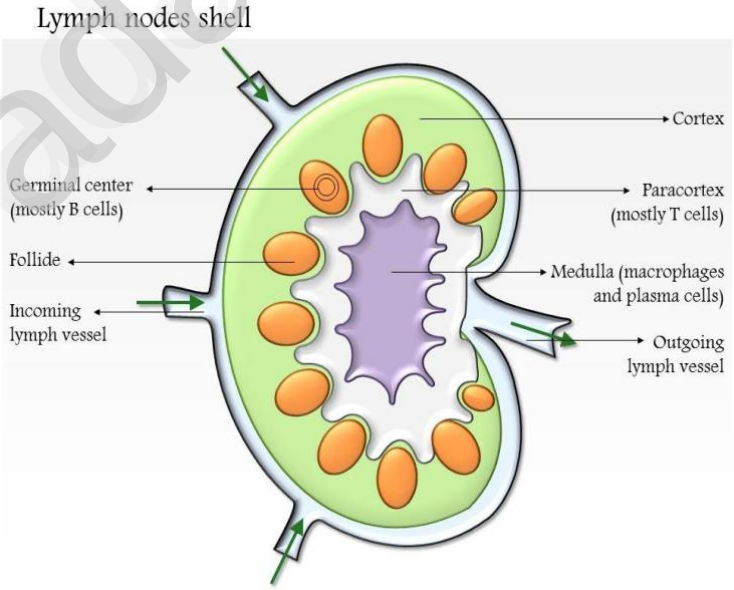
III.A6 – LYMPH NODE – T.S

IDENTIFICATION :

The given slide"A6" is identified as lymph node – T.S.

COMMENTS : (ANY TWO)

- **Lymph node is a small bean shaped structure found along the course of lymphatic duct.**
- **Lymph node has three zones:**
  - **cortex,**
  - **para cortex and**
  - **medulla.**
- **The cortex contains B lymphocytes, macrophages and follicular dendritic cells.**
- **The medulla consists of sparsely populated B-lymphocytes, which secrete antibody molecules.**
- **The paracortex zone lies between the cortex and medulla and consists of richly populated T cells and dendritic cell.**



IV.B – PICTURES

IV.B1 – tRNA

IDENTIFICATION :

The given picture "B_1" is identified as tRNA (transfer RNA).

COMMENTS : (any two)

- t RNA was formerly referred to as sRNA (soluble RNA).
- It is a type of RNA and has a clover leaf structure.
- It is a small RNA molecule, typically between 70 to 90 nucleotides in length.
- It is an adapter molecule composed of RNA that serves as the physical link between the mRNA and the amino acid sequence of proteins.
- It transports activated amino acids from the cellular amino acid pool to the site of protein synthesis.

IV. B2 – HOMOLOGOUS ORGANS

IDENTIFICATION :

The given picture"B_2" is identified as homologous organs.

COMMENTS : (any two)

- Structures which are similar in origin but perform different functions are called homologousstructure.
- E.g. Fore limbs of terrestrial vertebrates
  - bird,
  - bat,
  - whale,
  - horse, and
  - human.
- The forelimbs of these organisms perform different functions, and have similar anatomical structures such as humerus, radius, ulna, carpals, metacarpals and phalanges.
- In these animals same structures develop along different directions due to adaptations to different needs. This is referred to as divergent evolution.

IV.B_3- ANALOGOUS ORGAN

IDENTIFICATION :

The given picture "B_3" is identified as Analogous organs.

COMMENTS : (any two)

- Organism having different structural patterns but similar function is termed as analogous structure.

- E.g. Wings of bird and insects (Butterfly, dragon fly).
- The structures of these animals are not anatomically similar though they perform similar functions.
- The analogous structures are developed due to convergent evolution – different structures evolving for the same function.

IV. B_4 - ANIMAL CLONING – DOLLY (SHEEP)

IDENTIFICATION :

The given picture "B_4"is identified as cloning of animal – Dolly (Sheep)

COMMENTS : (ANY TWO COMMENTS)

- Cloning is the process to produce genetically identical individuals of an organism either naturally or artificially.
- Dolly was the first mammal (sheep) clone developed by Ian Wilmut and Campbell in 1997.
- Dolly was cloned from a differentiated somatic cell taken from an adult animal without the process of fertilization.
- In this process, the udder cells (somatic cells) of mammary gland from a donor sheep were isolated. An ovum (egg cell, germ cell) was taken from the ovary of another sheep and enucleated.
- The udder cell and enucleated ovum were fused and implanted into a surrogate mother. Five months later, dolly was born.

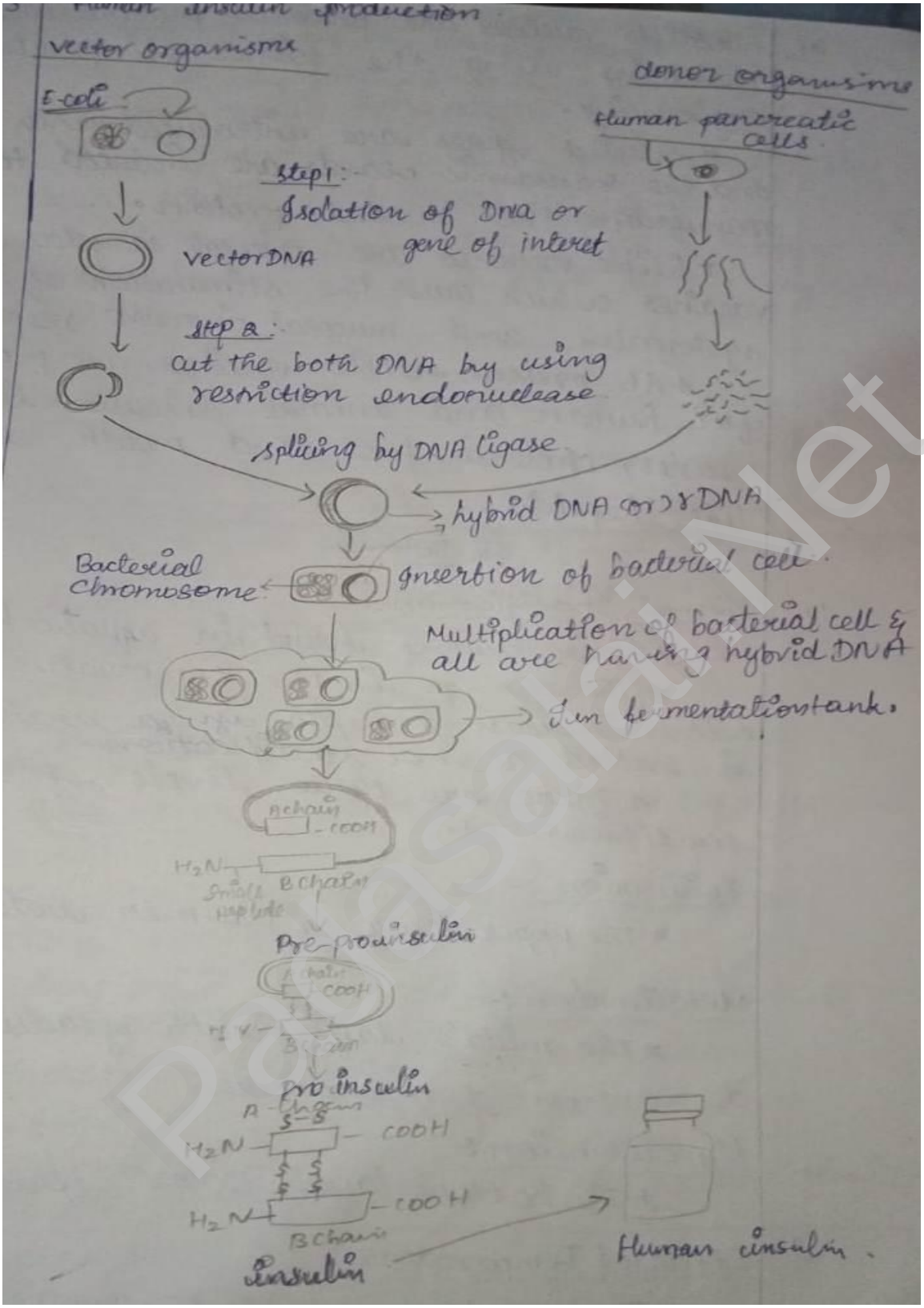
IV. B5 - IV.B_5 - HUMAN INSULIN PRODUCTION- FLOWCHART

IDENTIFICATION :

The given picture"B_5" is identified as the flow chart of Human Insulin Production.

COMMENTS :

- Production of insulin by recombinant DNA technology started in the late 1970s.
- This technique involved the insertion of human insulin gene on the plasmids of E.coli.
- The inserted gene synthesizes the polypeptide chains A and B segments linked by a third chain(C) as a precursor called Pre-Pro insulin.
- The linking C chain is excised, leaving, A and B polypeptide chains.
- Insulin was the first ever pharmaceutical product of rDNA technology, administered to humans.


vector organisms
E-coli
donor organisms
Human pancreatic cells
Step 1:
Isolation of DNA or gene of interest
Vector DNA
Step 2:
cut the both DNA by using restriction endonuclease
splicing by DNA ligase
hybrid DNA or r DNA
Bacterial Chromosome
insertion of bacterial cell
Multiplication of bacterial cell & all are having hybrid DNA
in fermentation tank.
A chain
COOH
B Chain
Pre-proinsulin
Pro insulin
A-Chain
S-S
COOH
B Chain
Insulin
Human insulin

V – C. GENETICS

V.C1- NORMAL HUMAN KARYOTYPE

IDENTIFICATION

The given photograph "C1" is identified as normal karyotype of human beings.

COMMENTS: (ANY TWO)

- Karyotyping is a technique through which a complete set of chromosomes are separated from a cell and are arranged in pairs.
- A diagrammatic representation of chromosomes is called an idiogram.
- There are 22 pairs of autosomes and a pair of allosomes (XX- female, XY – male) arranged based on their size, shape, banding pattern and position of centromere.
- It helps in gender identification and to detect genetic diseases.

V. C2- AUTOSOMAL ANOMALY – PATAU'S SYNDROME

IDENTIFICATION

The given photograph "C2"is identified as Patau's Syndrome.

COMMENTS :(ANY TWO)

- It is one of the autosomal aneuploids formed due to trisomic condition of chromosome 13.
- It is caused by meiotic nondisjunction of chromosomes.
- The symptoms are multiple and severe body malformation with profound mental deficiency.
- The individuals have small head with small eyes, cleft palate and malformation of brain.

V. C3- SEX CHHROMOSOMAL ANOMMALY – TURNER'S SYNDROME

IDENTIFICATION :

The given photograph"C_3" is identified as Turner's syndrome.

COMMENTS :(ANY TWO)

- This genetic disorder is due to the loss of an X chromosome resulting in a karyotype of 44A+XO = 45.
- It is caused due to meiotic nondisjunction of allosomes.
- These individuals are sterile female with short stature and webbed neck.
- They also have under developed breasts and gonads with lack of menstrual cycle during puberty.

OR

V. C_4 - X linked Disease -Haemophilia

IDENTIFICATION :

The given pedigree chart" C_4" is identified as the genetic disease Haemophilia.

COMMENTS : (ANY TWO COMMENTS)

- Haemophilia or bleeder's disease (Royal disease) is the most notorious of all sex-linked diseases. The person suffering from this disease bleeds for a long period (30 minutes to 24 hours) during injury due to the failure of blood coagulation.
- It is caused by a recessive X – linked gene more common in men than women.
- The females are carriers of the disease and would transmit the disease to 50% of their sons even if the male parent is normal.
- It follows criss – cross or zig – zag pattern of inheritance (i.e., grandfather transmits his X linked character to his grandson through carrier daughter).

DISCUSSION QUESTIONS ((ANY TWO QUESTION AND ANSWERS)

1. Observe given pedigree chart and identify the affect individuals and carriers in the II Generation?

   In the II generation affected male : 1 ,Carrier female : 1.

2. Why are men affected often in Xlinked inheritance ?

   Men are affected often in X linked inheritance.

   Because ,

   Men had only one X chromosome and they were not having corresponding gene in Y chromosome.

3. What is the pattern of inheritance in the given pedigree chart ?

   X – linked inheritance or Criss – Cross pattern of inheritance.

4. Why are woman said to be carriers in X linked inheritance?

   Woman are told to be carrier in X – linked inheritance ,

   Because ,

   They did not expressed themselves the recessive gene characters received from father and carried to son.

5. How is haemophilia caused ?
   - Haemophilia is caused by a recessive X – Linked gene more common in men than women.
   - The person suffering from this disease bleeds for a long period (30 minutes to 24 minutes Hours) During injury due to the failure of blood coagulation.

V. C_5 - AUTOSOMAL DISEASE – SICKLE CELL ANEMIA

IDENTIFICATION :

The given pedigree chart "C_5" is identified as the genetic disease sickle cell anaemia,.

COMMENTS : (ANY TWO COMMENTS)

- **It is an autosome linked recessive trait that can be transmitted from parents to the offspring, if both the parents are carriers for the gene (heterozygous).**
- **The genotype HbS HbS causes sickle cell anemia, while the genotype HbA and HbS individuals appear apparently unaffected but they are carrier of the disease.**
- **Sickle cell anemia is a classical example of point mutation.**
- **The defect is caused by the substitution of Glutamic acid by valine at the sixth position of the beta chain of the haemoglobin molecules.**

DISCUSSION QUESTIONS : (ANY TWO QUESTION AND ANSWERS)

1. **Observe the given pedigree chart and give reasons for the occurrence of the disease in the first generation.**

   Sickle cell anemia disease is not expressed in first generation.

   Because ,

   They are carriers of this disease.

2. **Will males and females be equally affected in this type of inheritance ?**

   Give reasons.

   Yes ,

   It is an autosomal recessive traits .Both sexes are carriers of this gene.

3. **How does the disease appear in the II generation when the parents are normal ?**

   When the parents are normal ,

   But ,

   They are heterozygous (HbA ,HbB) in condition the disease appeared in the II generation.

4. **How is Sickle cell anemia disease caused?**

   Sickle cell anemia disease caused by substitution of glutamic acid by valine at the sixth position of the beta chain of Haemoglobin due to change of gene combination Hbs,Hbs by Mutation.