Sample (Soil / water)	Broad range pH paper	Result Acid / Base / Neutral
1	7	Neutral
2	12	Base

PH TEST

* PH means Negative logarithm of hydrogen ion concentration.

⇒ If PH value is more than Seven then it is base

* If PH value is equal to Seven then it is Neutral

⇒ If PH value is less than Seven then it is acid

* Mostly Base is nearly Blue colour i.e PH paper turns Blue

⇒ Mostly Neutral is No colour change i.e PH paper does not change colour.

* Mostly Acid is pink colour i.e PH paper turns pink

LIVING ORGANISMS IN WATER SAMPLES

⇒ To analyze living organisms in water samples.

⇒ The number and type of organisms present in a water body determines the productivity and nature of trophic level.

⇒ A water body with rich phytoplanktons per unit area is said to be productive

⇒ It is usually turbid with high amount of nutrients & dissolved oxygen

⇒ A water body which is poor in organism is said to be a non-productive.

⇒ It is usually more or less transparent with fewer amount of nutrients & dissolved oxygen

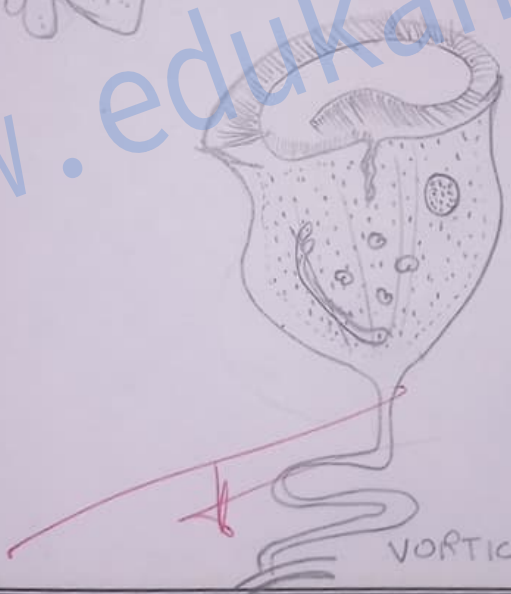
⇒ The analysis of water samples help us to know the number & type of organisms present in it at a given time

⇒ It also help to find out whether a water body is polluted.

⇒ As some of the organism are strong indicator of water pollution.

AMOEBA

PARAMECIUM



VORTICELLA

EUGLENA

NOSTOC

OSCILATORIA

⇒ Requirements :⇒ water samples from different water bodies, beakers, small test tube or vials, corks, slides cover slips, watch glasses, droppers, measuring jar (100ml) compound microscope, nail polish @ moter wax, and 5% FAA (Formalin Aceto Alcohol) or 5:5:90 Formulla : Acetic acid : Ethanol as preservative

⇒ collect about a litre of water sample from different water bodies in a beaker

⇒ Add about 5ml of FAA to fix and preserve the living organism immediately after samples are collected.

⇒ Transfer the water samples into a one litre measuring jar & label each water sample to indicate the site at which the water sample has been collected

⇒ Keep the samples undisturbed for about 2-3 days

⇒ Remove the upper clear the water & retain the concentrated sediment at the bottom.

⇒ Transfer the sediment into vial or test tube cork & label it for future use

⇒ Take few drops of diluted Sediment Sample on a Slide
⇒ Place a cover slip over it. Remove excess water using blotting paper.
⇒ Seal the margin with the nail polish or molten wax.
⇒ observe the organism under the microscope
⇒ Repeat the procedure with other Sample
⇒ observation → Indentify, record & sketch the different type of organisms seen

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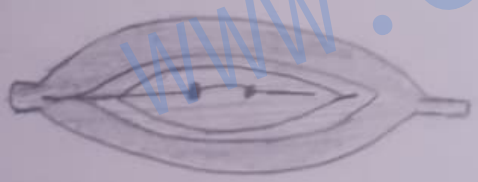
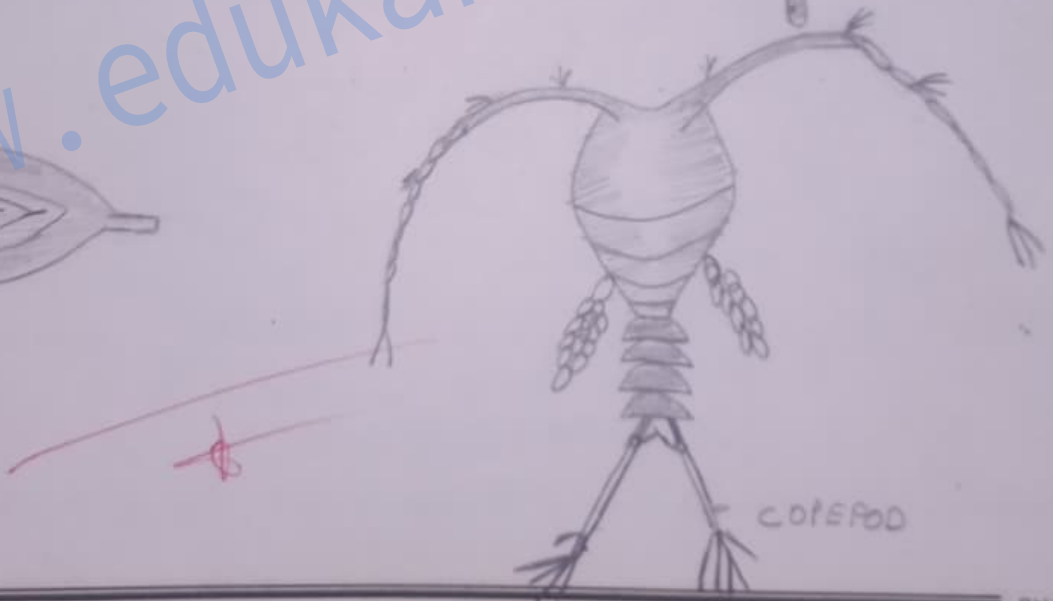
CHLAMY DOMONAS

CERATIUM



DIATOM



COPEPOD

CONTROLLED POLLINATION

A - EMASCULATION B - BAGGING C - POLLEN DUSTING ON THE STIGMA

CONTROLLED POLLINATION

⇒ To perform emasculation and to perform controlled pollination

→ controlled or artifical pollination technique involves one of the proces called emasculation.

⇒ It is done in plants bearing bisexual flower to prevent Self pollination

⇒ In this technique Stamens or anther are removed before antithesis without affecting female reproductive organs

⇒ Mature and viable pollen grain of desired male parent is transfered on the Stigma of emasculated flower to achieve cross pollination

⇒ Emasculation → carefully remove the Stamens from a Selected flower bud using forceps.

→ Bagging → cover the emasculated flower with Suitable polythene bag that has minute pores to prevent undesirable pollination

⇒ collection of pollen and dusting :- collect mature & viable pollen grains from the male parent open the bag & dust the pollen on the Stigma to achieve cross pollination & again bag the flower

GAMETOGENESIS T.S OF MAMMALIAN TESTIS

⇒ Each testis is made up of abt 250 compartments called testicular lobules

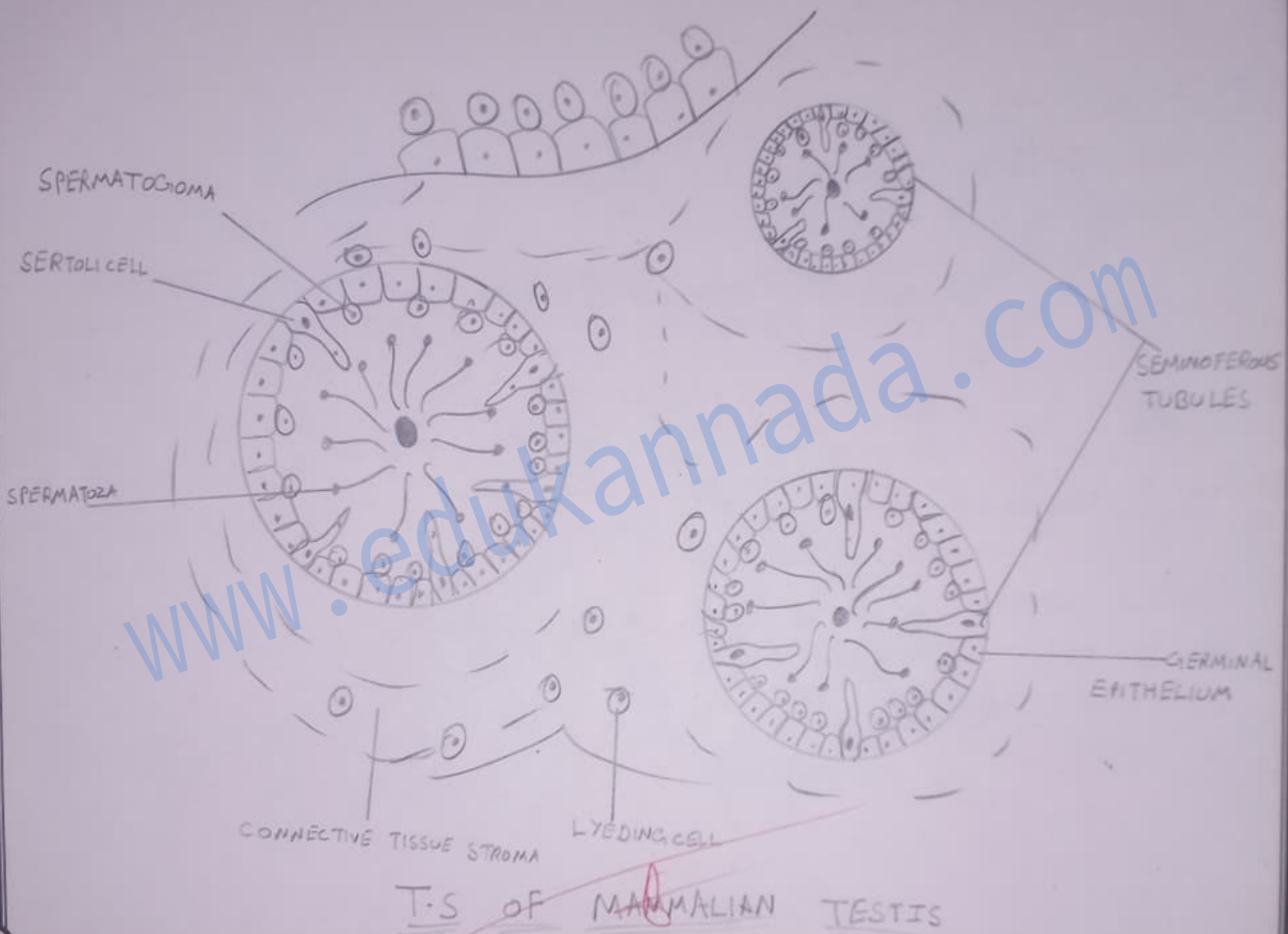
⇒ Each lobules contains 2-3 coiled seminiferous tubules which are lined with germinal epithelium

⇒ The germinal epithelium consists of Spermatogonia & Sertoli cells

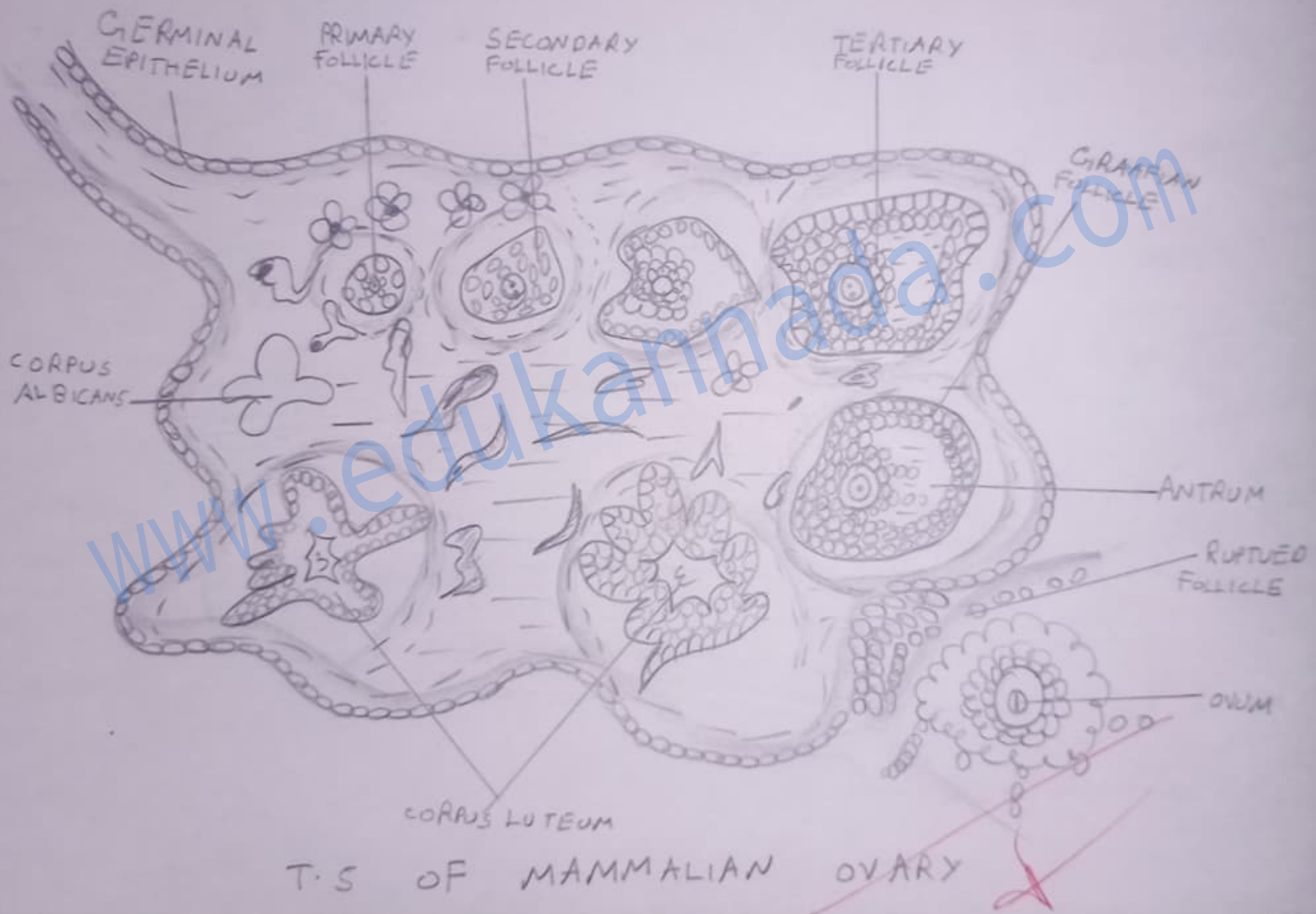
⇒ Spermatogonia undergo Spermatogenesis to produce Sperm Diffrent all stages of Spermatogenesis like primary Spermatocyte, Secondary Spermatocyte, Spermatids and Spermatozoa are observed from the periphery towards the lumen

⇒ Sertoli cells are large cells which provide nutrition to the developing Spermatids & Sperm

⇒ connective tissue stroma is present between the seminiferous tubules contains small group of interstitial cells called leydig cells secrete testosterone (male sex hormone)



T.S OF MAMMALIAN TESTIS



T.S OF MAMMALIAN OVARY

T.S OF MAMALIAN OVARY

⇒ The ovary is a solid structure externally covered by a single layer of germ cell called germinal epithelium

⇒ The cortex has many ovarian follicles of different stages follicle, secondary follicle, tertiary follicle & mature or Graafian follicle, corpus luteum & corpus albicans

⇒ Graffian follicle have a secondary oocyte & a fluid filled cavity called antrum.

⇒ Graafian follicle rupture to expel the oocyte with a few follicular cells. This is called ovulation.

⇒ Ruptured Graafian follicle develop into corpus luteum which is characterised by a large yellow mass of cells.

⇒ The degenerated corpus luteum is called albicans.

MEIOSIS - I

Meiosis - I

Sequential phases of meiosis - I seen during karyokinesis are prophase - I, metaphase - I, Anaphase - I & Telophase - I

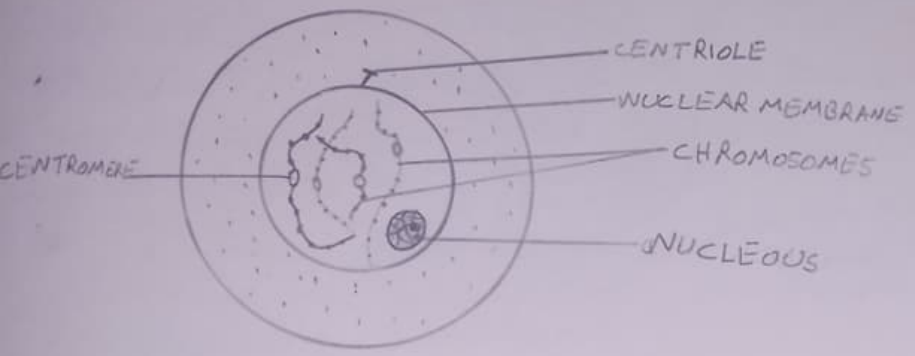
Prophase - I The longest phase of meiosis & is further divided into five stages namely

a. **Leptotene** (leptos - slender; tene - thread)
   ⇒ First stage of prophase - I

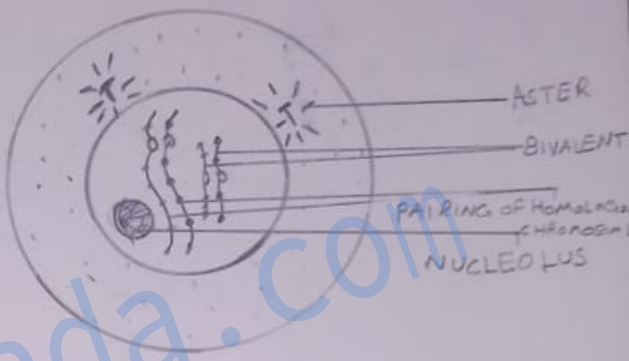
b. **Zygotene** (Zygon - paired)
   ⇒ Second stage of prophase - I
   ⇒ Homologous chromosome undergo pairing

c. **Pachytene** (Pachy - Thick)
   ⇒ Third stage of prophase - I
   ⇒ chromosome of homologous pair are twisted Spirally around each other

d. Diplotene (Dipols - double)
   ⇒ Fourth stage of prophase
   ⇒ nucleous disappear.

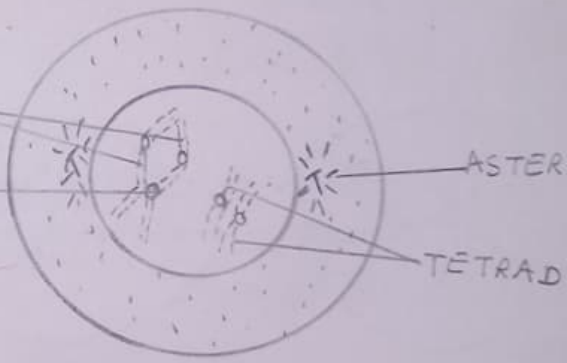


LEPTOTENE

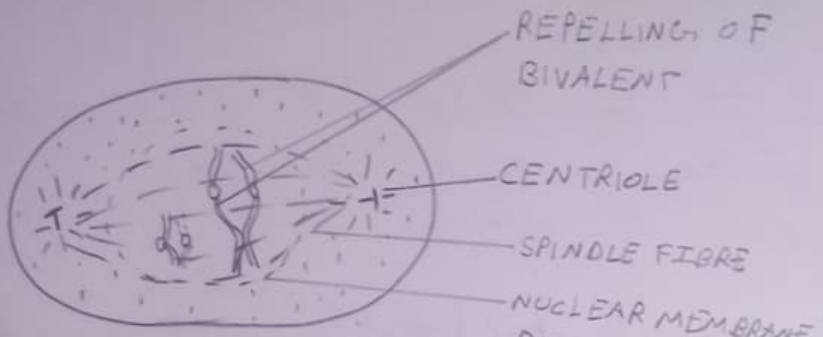


ZYGOTENE

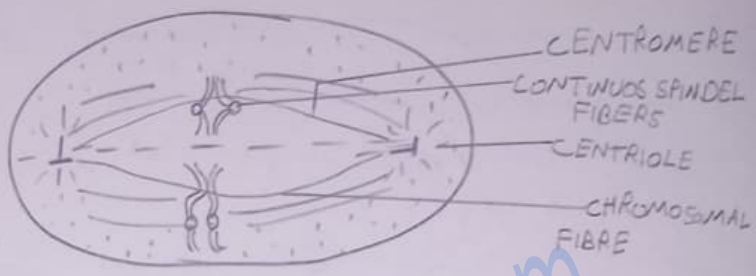
PACHYTENE



DIPLOTENE



DIAKINESIS



METAPHASE I

ANAPHASE - I

TELOPHASE - I

2. Metaphase I :

⇒ Bivalents are arranged at the equitorial plate of the Spindle
⇒ Bivalents are attached at its centromers to the Spindles.
⇒ centromeres are pointed towards the poles

3. Anaphase I

⇒ The two chromosomes in each bivalent segregates & move to opposite pole
⇒ There is no Spliting of chromosome.

4. Telophase I

⇒ Segregated chromosomes reach opposite pole.
⇒ Spindle fibre disintegrate
⇒ chromosomes decondense to become a chromatin network

Cytokinesis

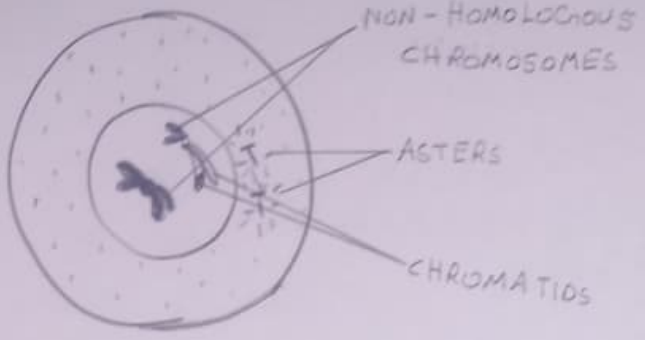
A cleavage furrow appears around the equatorial plate which gradually deepends and divides the cytoplasm into two daughter cell.

MEIOSIS II

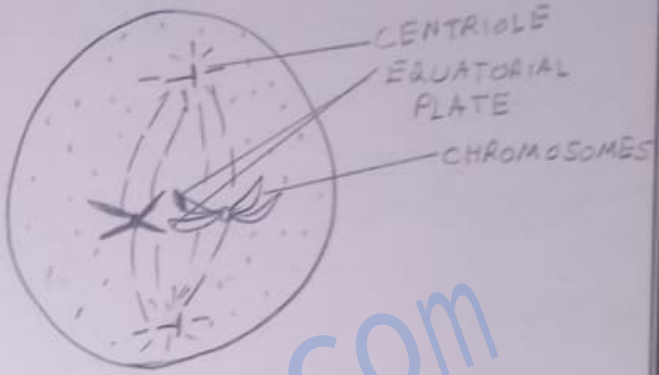
The Sequential phases seen during Karyokinesis of meiosis II are :-

1. Prophase II :-
⇒ chromosome are found in highly condensed state
⇒ Nuclear membrane break down and nucleoli disappear.
⇒ 2. Metaphase II :-
⇒ Chromosome are arranged on a equatorial or metaphase plate
⇒ chromosome are highly condensed.
⇒ centrioles occupied opposite pole
3. Anaphase II :-
⇒ centromere divide and chromatids move to opposite poles.
⇒ Separated chromatids are now called as chromosomes.
4. Telophase II :-
⇒ Daughter chromosomes reach opposite pole
⇒ Spindle fibers disappear

Cytokinesis :-
A cleavage furrow appears around equatorial plate which gradually deepens and divides the cytoplasm into daughter cells thus form two meiotic division.

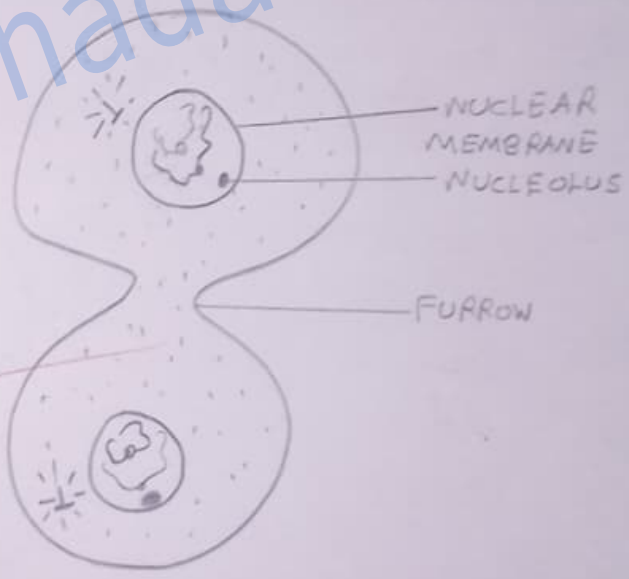


PROPHASE II

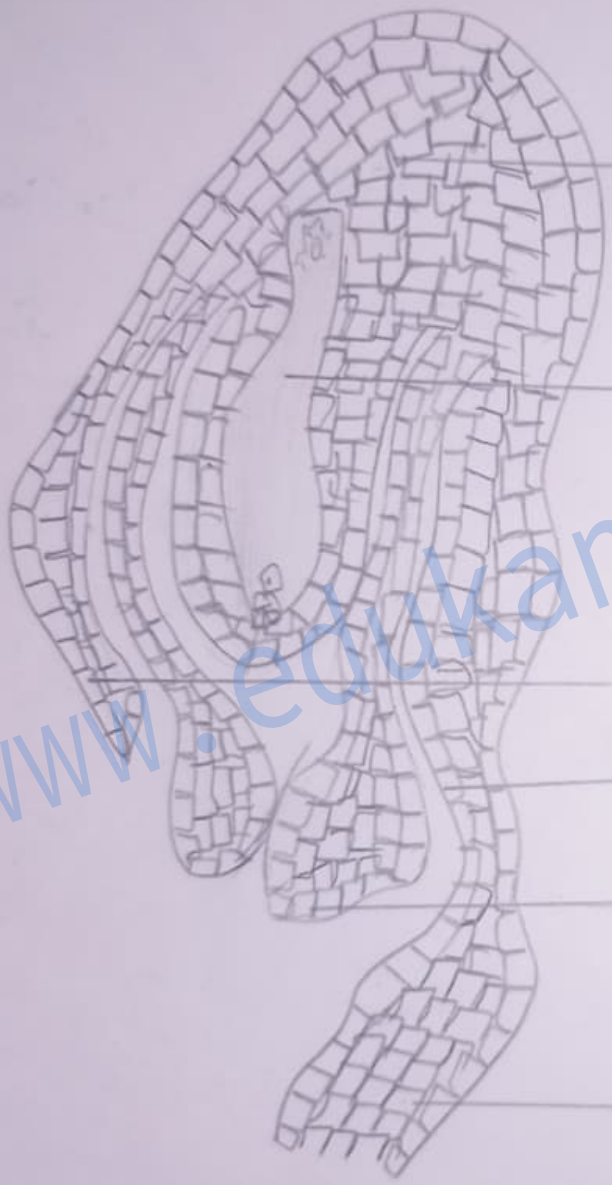


METHAPHASE II

ANAPHASE II



TELOPHASE II



V.S OF OVULE

FEMALE GAMETOPHYTE DEVELOPMENT

1. V.S of an ovule (megasporangium)

⇒ The ovule develop inside the ovary
⇒ It is attached to the placenta by a stalk called funicle
⇒ The ovule consists of two integuments & nucellus.
⇒ The cells of nucellus contain reserve food material
⇒ The female gametophyte (embryo sac) is located inside the nucellus.
⇒ The embryo sac forms at megaspore mother cell.

2. DEVELOPMENT OF FEMALE GAMETOPHYTE

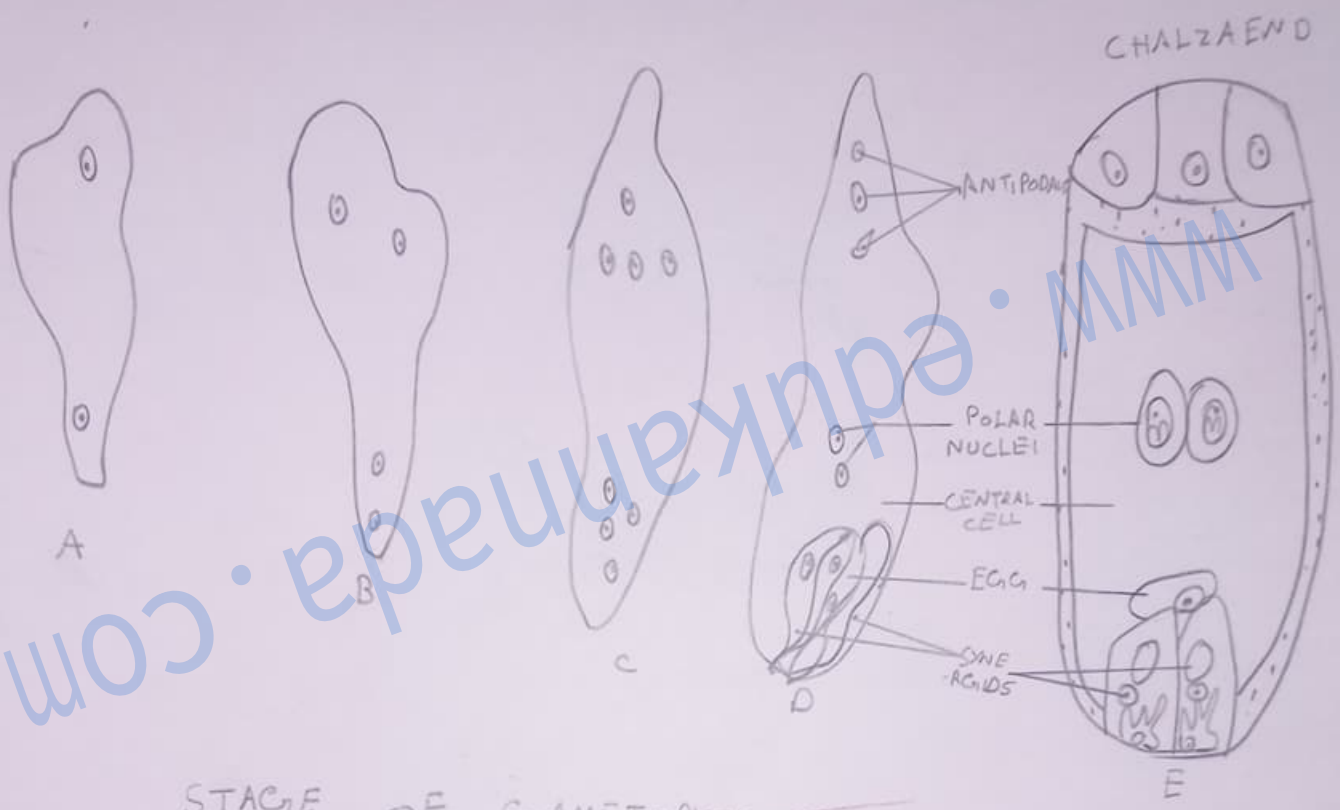
⇒ The megaspore mother cell undergo mios resulting in four haploid daughter cell.

⇒ out of which three disintegrates & the remain one divides thrice to produce 8 haploid cell

⇒ of those 8 nuclei, 6 surrounded by cell wall to form cell wall.

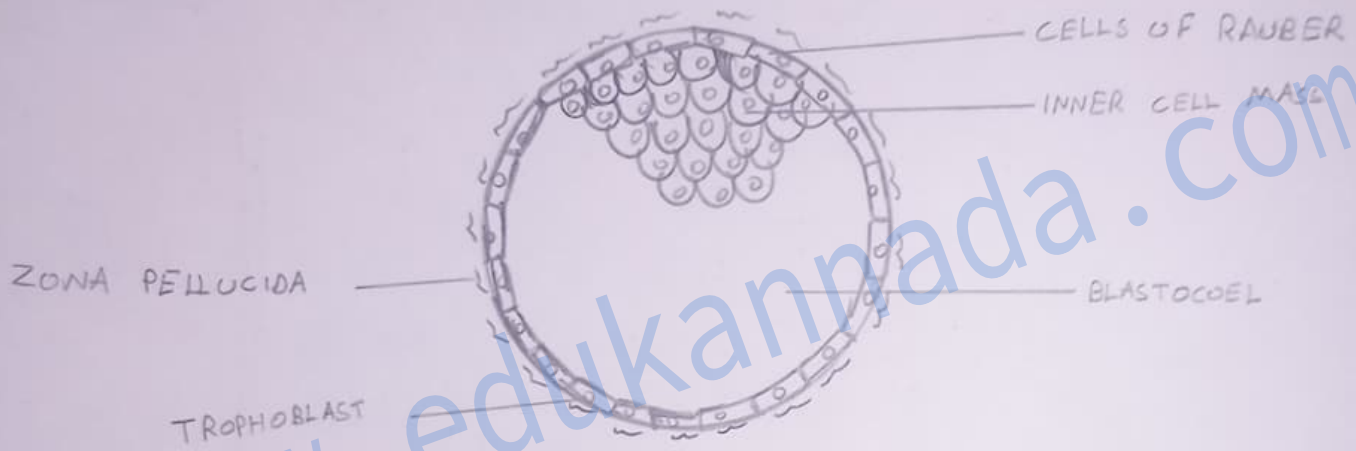
⇒ They are 3 antipodals at chalazal end and two Synergids with an egg cell at the micropylar end.

⇒ The remaining 2 nuclei region in the center as polar nuclei. Thus before fertilization the embryo sac has 8 nuclei and 7 cells.



STAGE OF GAMETOPYTE DEVELOPMENT

A - MEGASPORE WITH 2 NUCLEI B - 4 NUCLEATE STAGE C 8 NUCLEATE STAGE D 8 NUCLEATE STAGE SHOWING 3+2+3 DISTRIBUTION OF NUCLEI E - MATURED EMBRYO SAC.



V.S OF MAMMALIAN BLASTULA

BLASTULA OF MAMMALS

* Blastula of a Mammal is called the blastocyst
* It consists of a covering trophoblast, an inner cell mass and a central fluid filled cavity called blastocoel.
* Trophoblast gives rise to extra embryonic membrane and helps in implantation. It is externally covered with zona pellucida.
* Inner cell mass is oriented towards one sides and is suspended from the trophoblast like a honey comb. It develops into embryo proper.
* The trophoblast cells which cover the inner cell mass are called cells of Rauber.

COMMON DISEASE CAUSING ORGANISMS

ENTAMOEBA

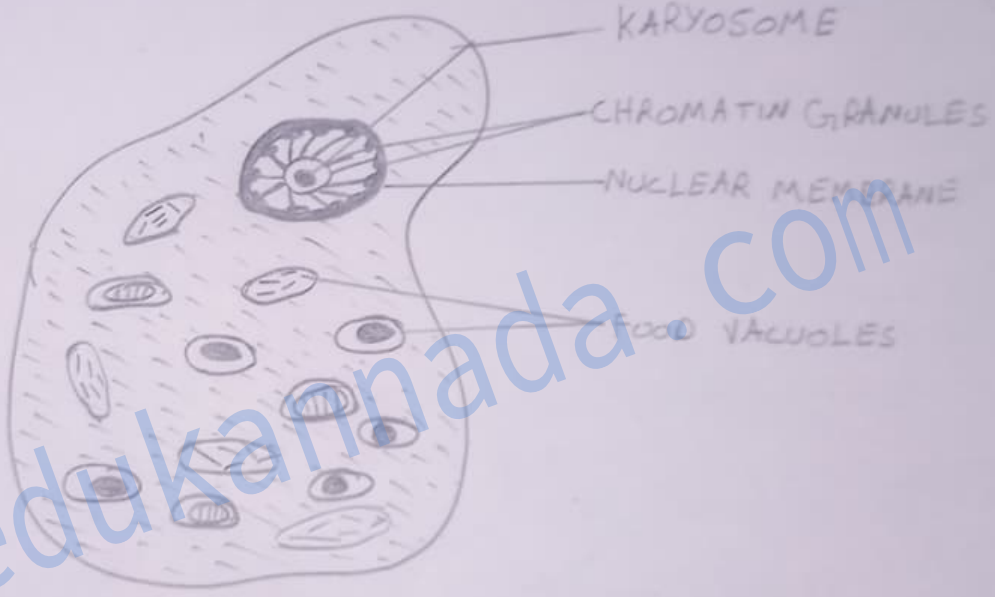
⇒ Entamoeba histolytica is a endoparasite in the intestine of human

☆ Features

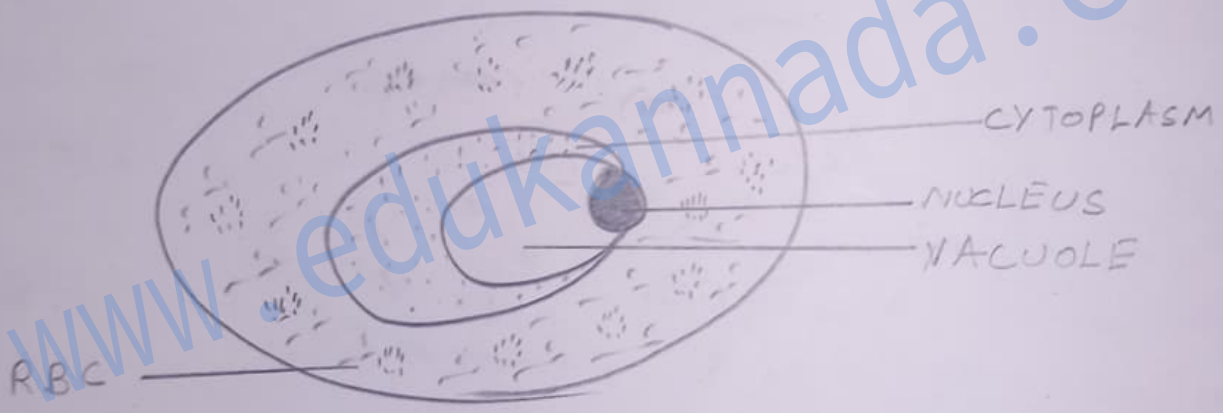
* Microscopic and acellular form.
* Body is irregular in shape due to pseudopodia
* Nucleus is large, single and eccentrically placed
* Nucleus has a central dot like karyosome and a peripheral ring of nucleo protein
* cytoplasm contains variable number of food vacuoles
* contractile vacuole are absent
* In its life cycle the parasite passes through stage like minuta and tetranucleate cyst.
* causes amoebic dysentery or amoebiasis.

☆ Symptom

* Frequent loose mucous filled water stool
* Severe abdominal pin & spasm
* Blood in motion (Dysentery)



ENTAMOEBA



RING STAGE RBC

PLASMODIUM (malarial parasite) Signet ring Stage

⇒ Plasmodium is an intracellular digenic parasite, which requires two hosts namely human and mosquito to complete life cycle

★ Features

⇒ Microscopic and acellular form

⇒ Diagnostic Stage of the parasite is Signet ring Stage in the RBCs of human host

⇒ In this Stage it appear like a ring & rounded body with large central vacuole the cytoplasm is concentrated with nucleus towards place.

⇒ Female anopheles mosquito is the vector for the parasite

⇒ The parasite enters the human host in the infective stage called Sporozoite

★ Symptoms

⇒ Intermittent high fever with chills

⇒ Profuse Sweating

⇒ Headache and muscular pains

⇒ Loss of appetite & Sleeplessness.

ASCARIS (Round worm)

⇒ Ascaris is an endoparasite in the intestine of man.

★ External characters :-

⇒ Long, unsegmented and cylindrical body with tapering ends

⇒ External surface of the body is covered with cuticle.

⇒ Anterior tip has mouth bounded by three lips.

⇒ Dorsal, ventral and two lateral lines run all along the length of the body.

⇒ Excretory pore lies slightly behind the mouth on the ventral surface.

⇒ Sexes are separate and exhibit sexual dimorphism

⇒ Males are small with curved posterior end females are long with straight posterior end.

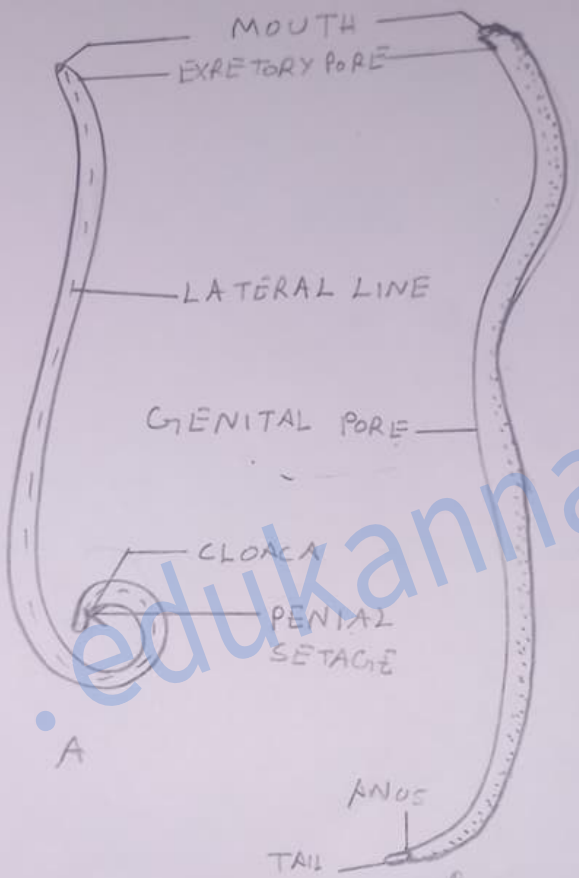
★ Symptoms

⇒ Irregular bowl with abdominal pain.

⇒ Indigestion & loss of appetite

⇒ Anaemia & fatigue

⇒ occasional vomiting



A. MALE B. FEMALE

TRICHOPHYTON

TRICHOPHYTON (Ringworm fungus)

⇒ Trichophyton rubrum is a ectoparasite on man that feeds on skin and nails via Keratin degradation.

★ Features :-

⇒ Texture is waxy, smooth and even to cotton

⇒ Hyphae have white to cream color pigmentation on its surface and Yellow-brown to cinnamon on the opposite side

⇒ It is the most common cause of ringworm

Symptom

⇒ Ring shaped [illegible] lesions in the skin, between toes and on scalp

⇒ [illegible] in the region of Infection

⇒ Nails become discolored, thickened and brittle

ECOLOGICAL ADAPTATIONS OF XERIC PLANTS

Xeric adaption in opuntia

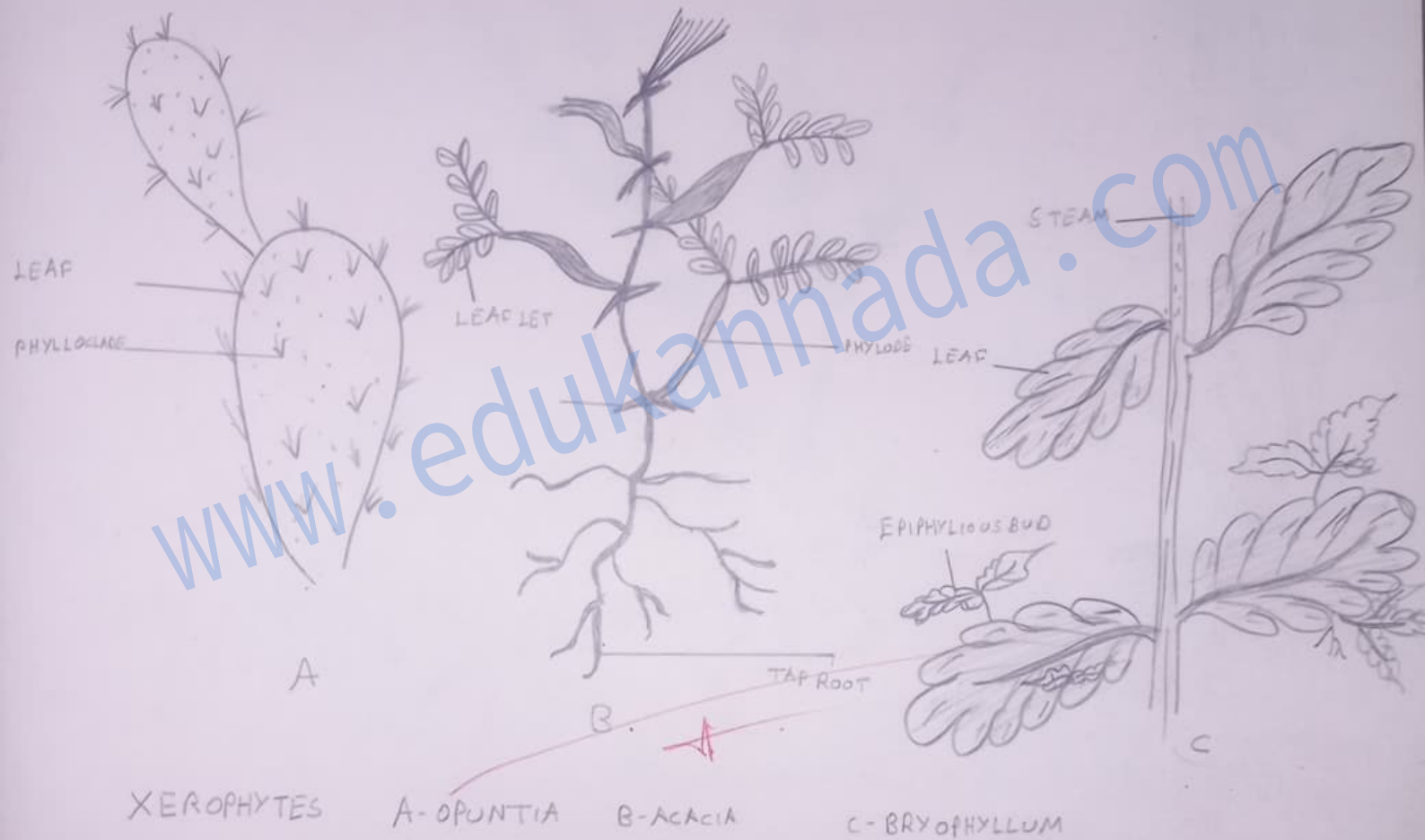
* Leaves are represented by Spines
* Stem is flattened, Succulent, adapted for storage
* Stem Surface is green & photosynthetic in nature

Xeric adaption in Acacia

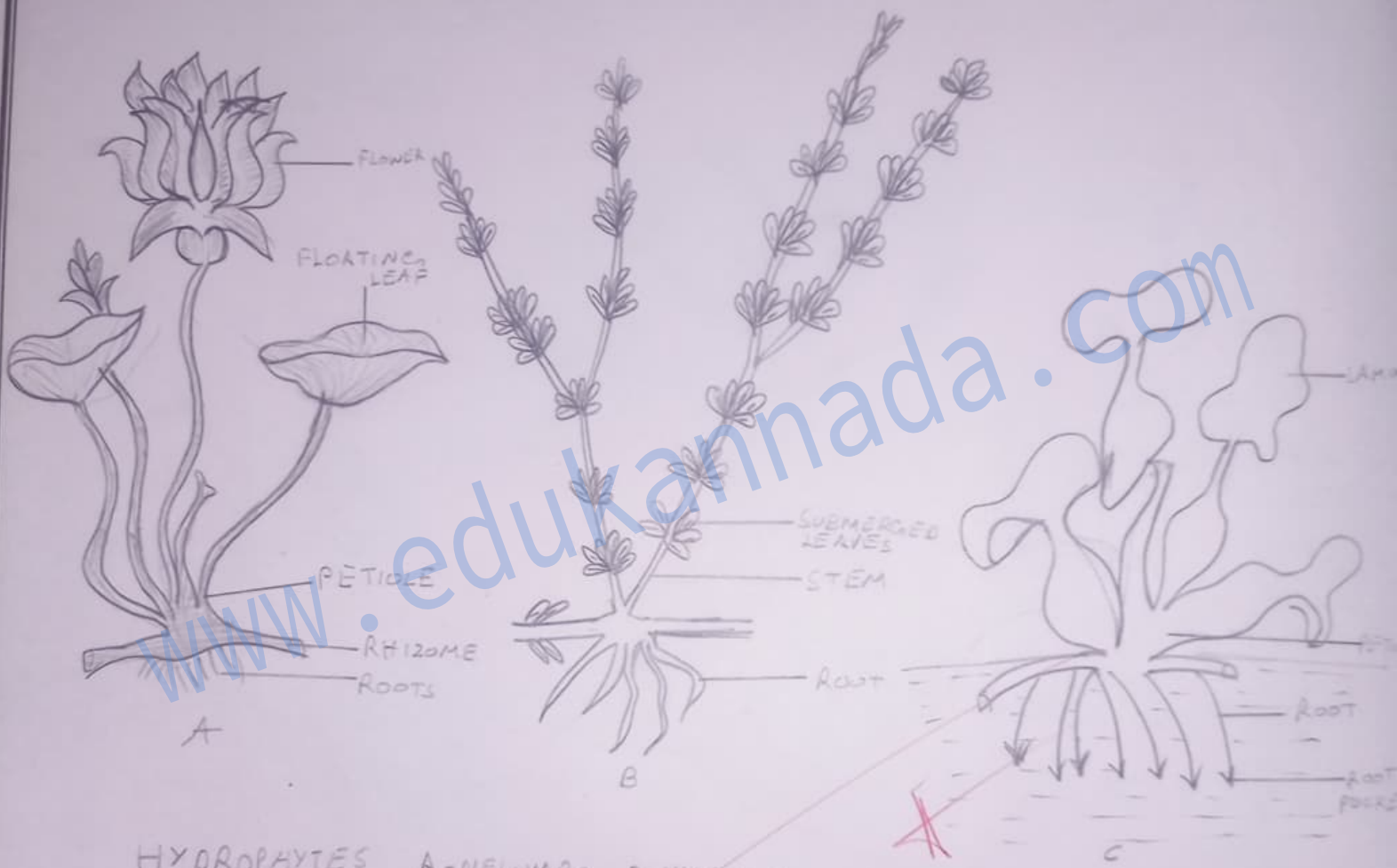
* Bipinnately compound leaves are modified & short with
* Petiole is modified into photosynthetic leaf like structure
* Long & profusely branched root.

Xeric adaption in Bryophyllum

* The root system is very well developed in proportion to the shoot
* It occurs in a great degree of variation in the form structure of leaves
* Watery Sap or latex may also be present



XEROPHYTES A-OPUNTIA B-ACACIA C-BRYOPHYLLUM



HYDROPHYTES A-NELUMBO B-HYDRILLA C-EICCHORNIA

ECOLOGICAL ADAPTATIONS OF HYDRIC PLANTS

Hydric adaption in nelumbia:

* It is floating leaved hydrophyte that grows in ponds & lake
* The Stem is Rhizomatus & grows horizontally under ttom
* The petiole is long islender & spongy
* cuticle & stomata on the upper surface

Hydric adaption in Hydrilla

* leaf blade are grass like finely dissected
* Roots are poorly developed
* Aerenchyma is present in root, stem & leaf

Hydric adaption in Eichornia

* It is a free hydrophyte that grows in pond & water bodies
* when the level of the water is low
* The Stem is offset that grows below the surface of water

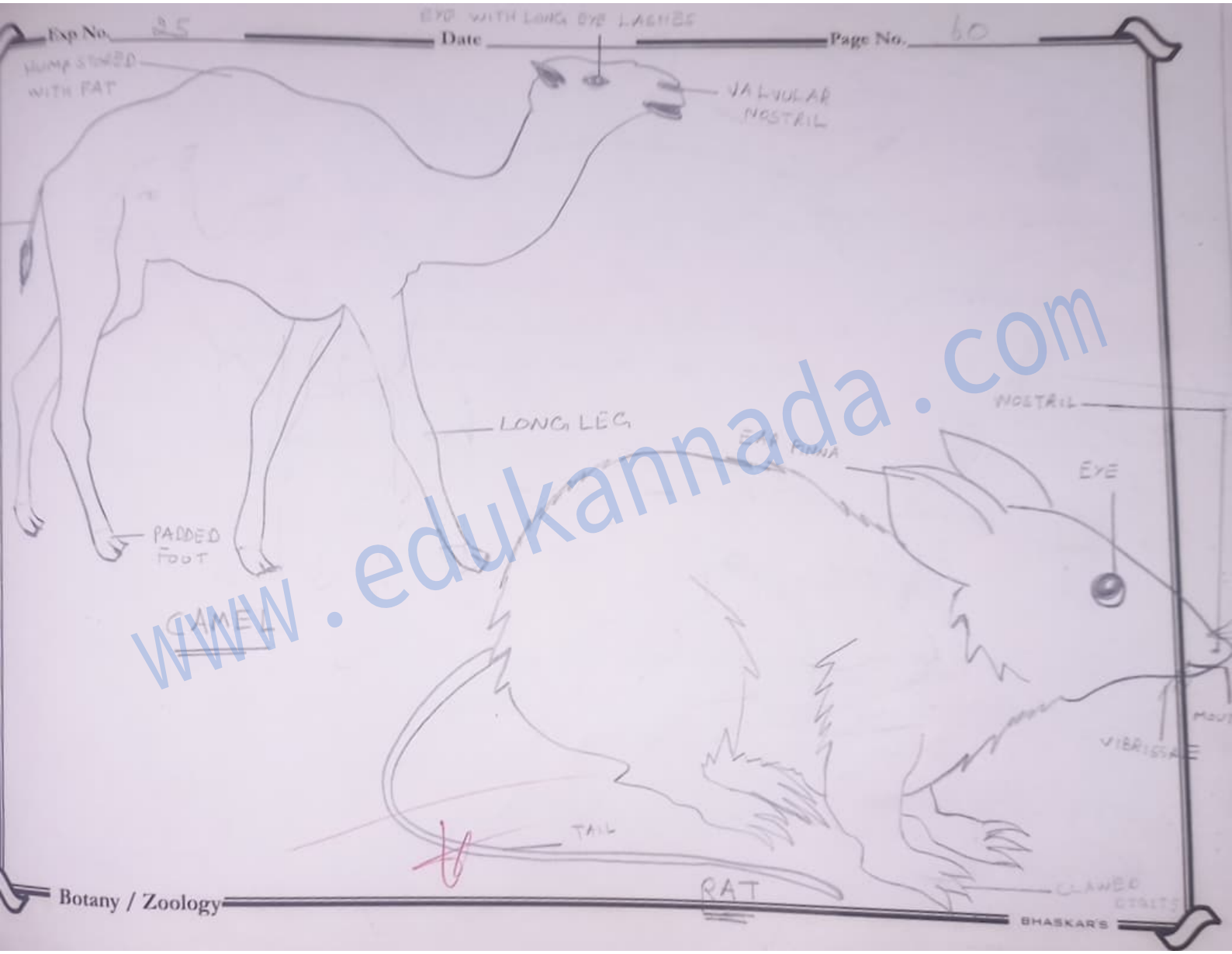
ECOLOGICAL ADAPTATIONS OF XERIC ANIMALS

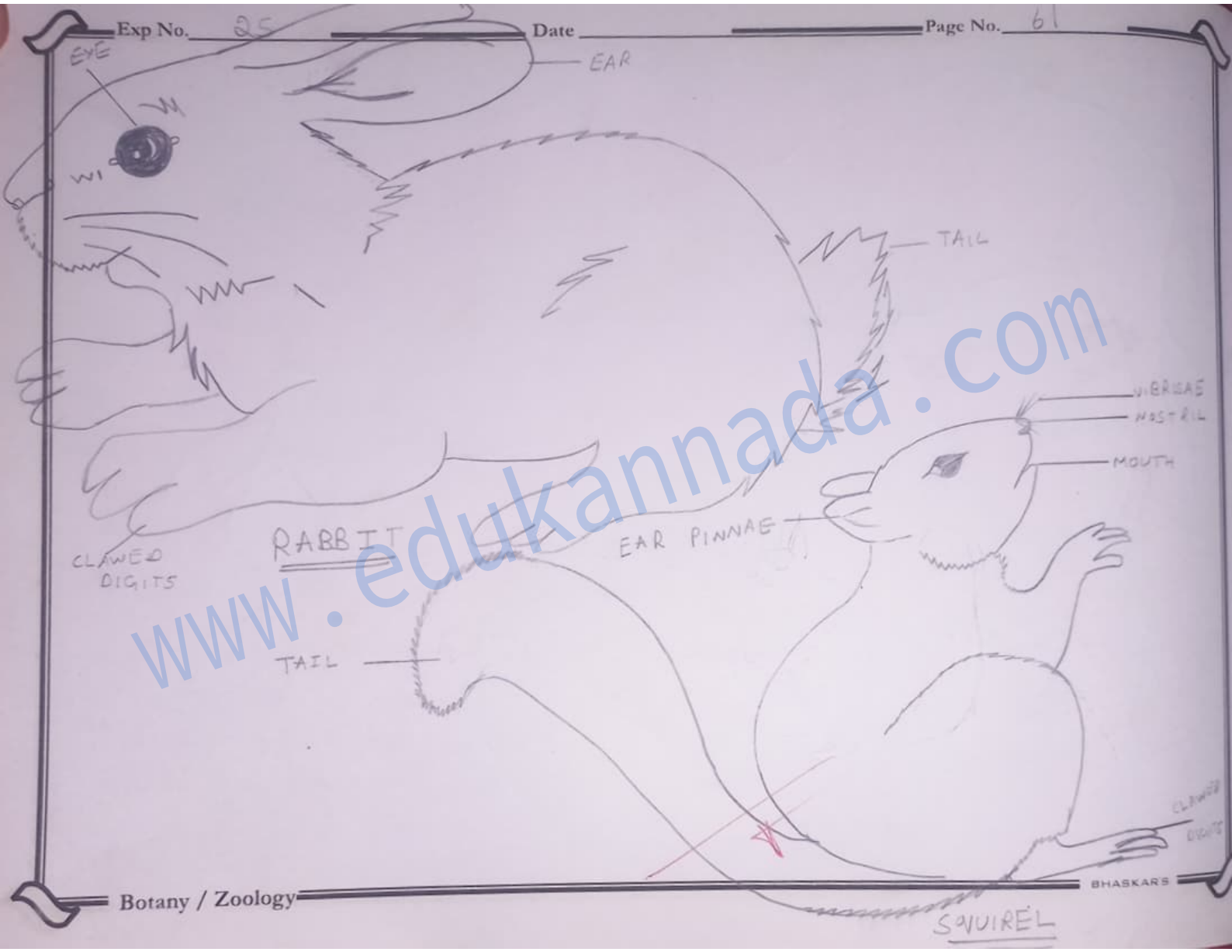
Xeric adaptations in camel

- Lips thick, help in eating tender thorny bushy plants
- Eye lashes thick, prevent Sand entry
- Limbs have pads, assist in walking on Sand
- Hump assists in storing fat
- Physiological adaptations include efficient water use & fat utilization to get water

Xeric adaptations in Rat

* In Rat the position of nostrils directly upward
* Eye lashes are present to prevent Sand entry
* Ear pinnae are efficient in dispating heat





Xeric adaption in Rabbit

* Eyes are set high on the head
* Is complimented with a weak but very flexible neck
* It have a greater field of vision
* Helps in spotting food as well as predators
* They have strong legs that are made for running

Xeric adaption in Squirrel

* It consist of hygroscopic skin
* Nostrils reduced to small pin holes
* Skin is spiny
* It consist of strong muscles in its forearms, abdominal & paws
* This helps in Squirrels climbing & jumping between trees

ECOLOGICAL ADAPTATIONS OF HYDRIC ANIMALS

Hydric adaption in Prawn

* Prawn living in water
* Body is protected by a chitinous exoskeleton
* Neck is absent
* Abdomen bears 5 pairs of swimming legs (pleopods) which helps to swim

Hydric adaption in fish

* Body streamlined, exoskeleton of scales present
* Paired & unpaired fins present - helps in swimming
* Gills are major respiratory organ
* Air bladder present in some helps in buoyancy & aids in respiration.

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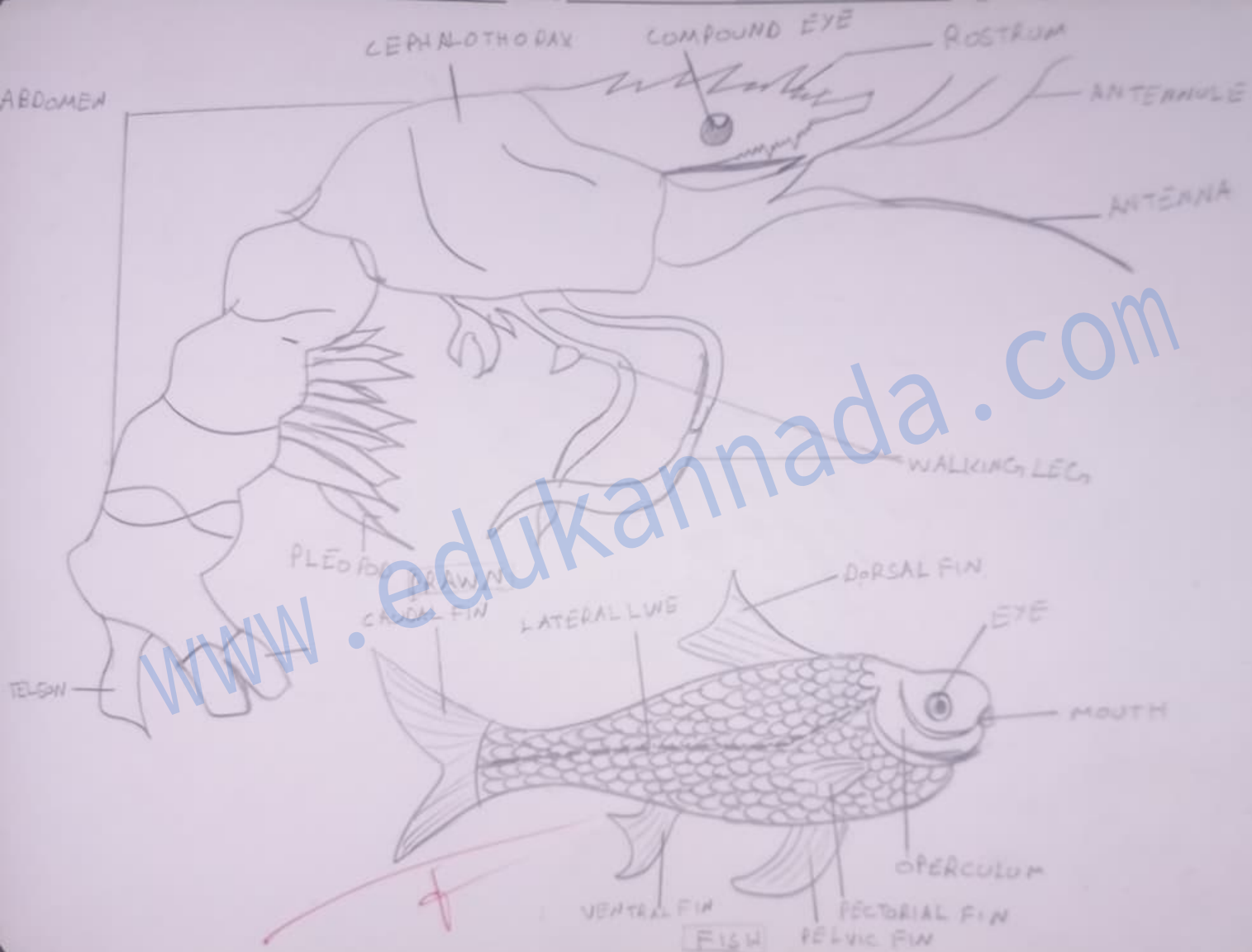


FROG

Hydric adaption in frog

* It is Secondarily adapted to aquatic life
* Body is divided into head, trunk & limbs without a neck
* Skin is thin, cutaneous vascularization makes it permeable skin which helps in cutaneous respiration
* Skin contains mucous gland makes it moist & slippy
* The webbed foot helps in swimming
* Eye is protected by nictitating membrane.

HOMOLOGOUS AND ANALOGOUS ORGANS

HOMOLOGOUS ORGANS IN PLANTS

Tendrils of passion flower plant and thorns of pomegranate

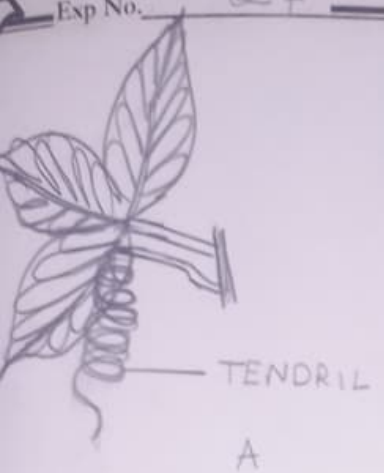
⇒ The tendrils of passiflora and thorns of pomegranate are homologous to one another as both arise from the axillary buds

⇒ The tendrils of passion flower help the plant in climbing while the thorns of pomegranate are defensive in function.

2. Tendrils of vitis and thorns of carissa

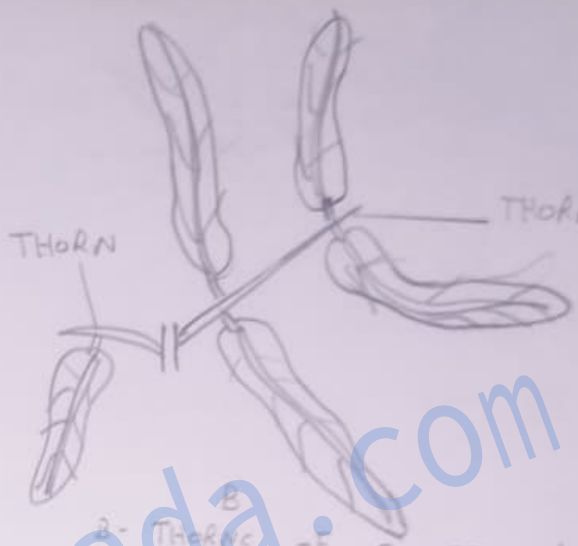
⇒ The tendrils of vitis and thorns of carissa are homologous to one another as both are modified terminal buds

⇒ The tendrils help the plant in climbing while the thorns help in defence.



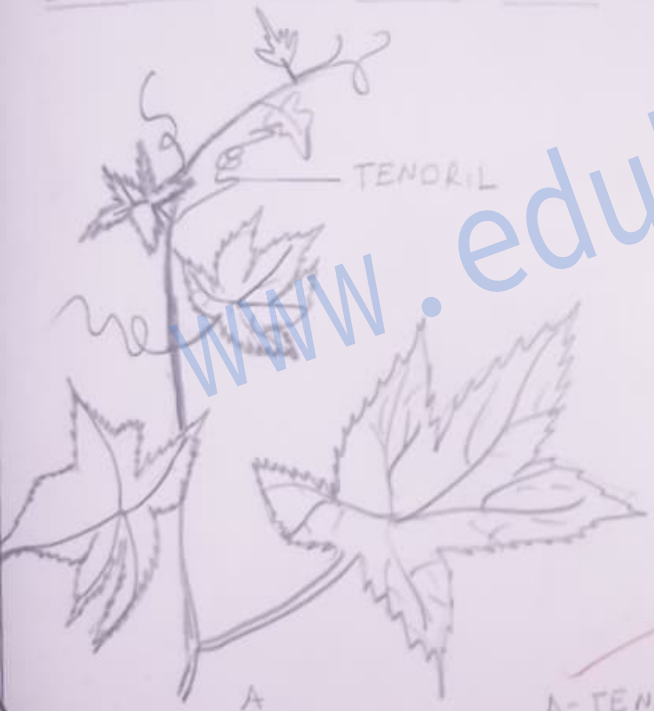
A

A- TENDRILS OF PASSION FLOWER



B

B- THORNS OF POMEGRANATE

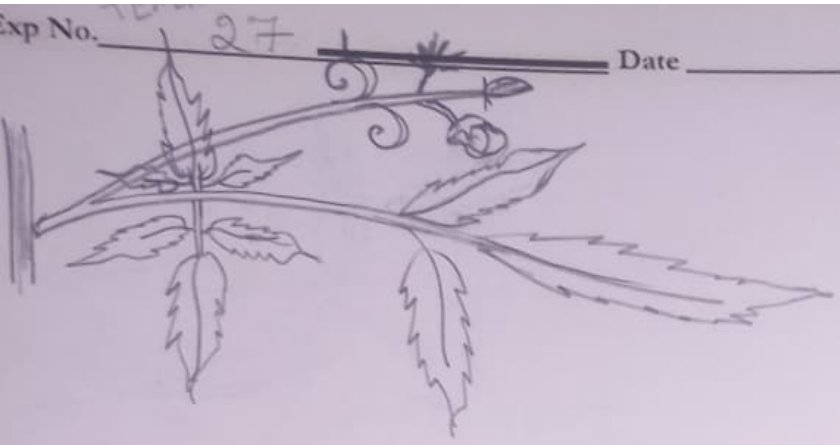


A

A- TENDRIL OF VITIS

B

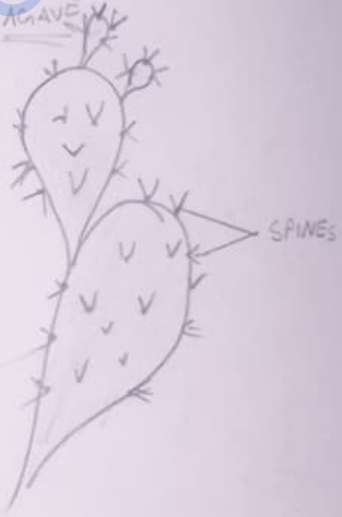
B- THORNS OF CARISSA



TENDRIL OF CARDIOSPERMIUM

BULBIL

BULBIL OF AGAVE



SPINES

SCALE LEAVES

SCALE LEAVES OF ONION

SPINES OF OPUNTIA

3. Tendrils of cardiospermum and Bulbil of Agave

⇒ The tendrils of cardiospermum and bulbils of Agave are homologous to one another as both are the modified flowers bud.

⇒ The tendrils help the plant in climbing while the bulbils helps in reproduction.

4. Scale leaves of onion and Spines of opuntia (Prickly Pear)

⇒ The Scale leaves in onion and Spines in opuntia are homologous to one another as both are modification of leaves.

⇒ The Scale leaves of onion are thick, fleshy and store water and food while the Spines in opuntia are sharp and defensive in function.

ANALOGOUS ORGANS IN PLANTS

1. Tendrils of Pea and tendrils of vitis :-

⇒ The tendrils of Pea and the tendrils of vitis are analogous one another as they are similar in their structure and function but dissimilar in their origin

⇒ The tendrils of Pea are the modified leaves and the tendrils of vitis are the modified terminal buds

⇒ The tendrils help the plant in anchorage

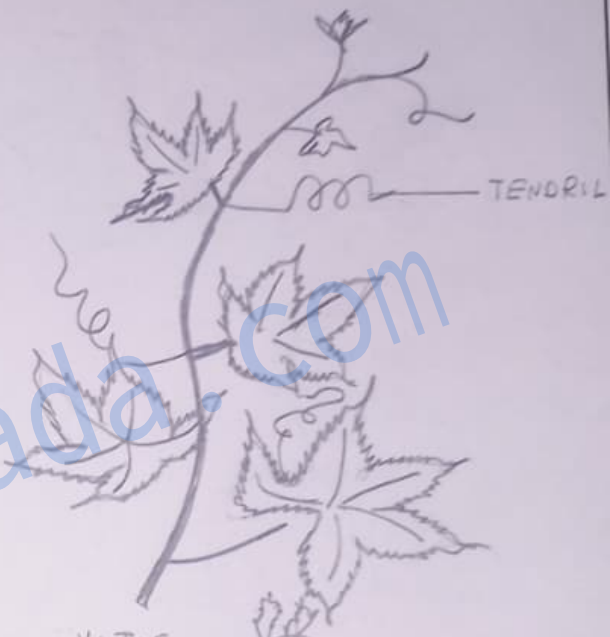
2. Thorns of Paragramate and Spines of Prickly Pear

⇒ The thorns of paragramate and Spines of prickly Pear are analogous to one another as they are Similar in their structure and function but different in their origin

⇒ The thorns are defensive in function.

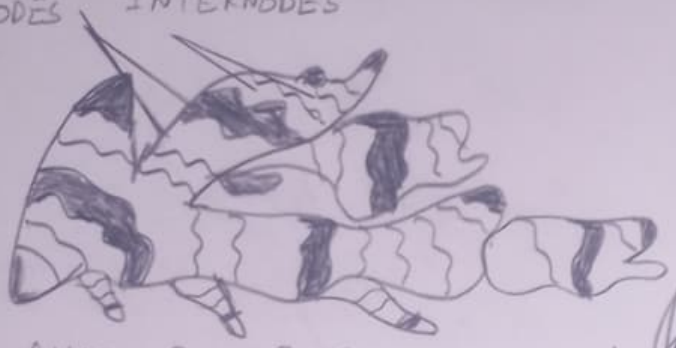
PEA

THORNS OF POMEGRANATE

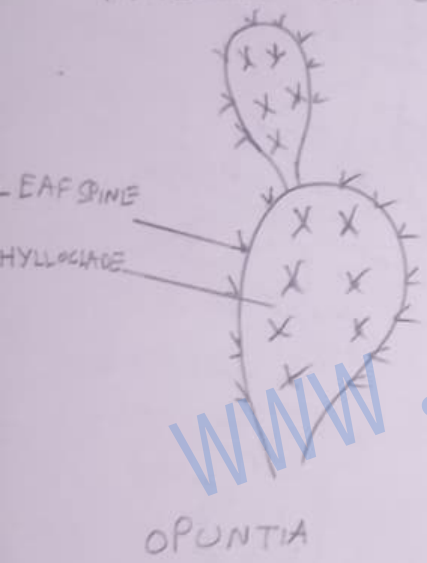


VITIS

SPINES OF OPUNTIA



RHIZOME OF GINGER



OPUNTIA

ASPARAGUS

MODIFIED ROOT OF CARROT

TYPICAL PLANT LEAVES

3. Modified underground Stem and modified root

⇒ Modified underground Stem are analogous to modified roots as they are similar in their structure and function but dissimilar in their origin.

⇒ Both are storage in function. They store water & food

H. Phyllocalade, cladode & leaves

⇒ A phyllocide is a green coloured, photosynthetic, flattened Stem of several nodes and internodes (Eg: opuntia)

⇒ A cladode is a green coloured, photosynthetic, flattened branch of the stem with one or two internodes (Eg: asparagus)

⇒ Both phyllocalade and cladode are leaf like Stem modification. They are analogous to leaf as they are green in colour and perform photosynthesis.

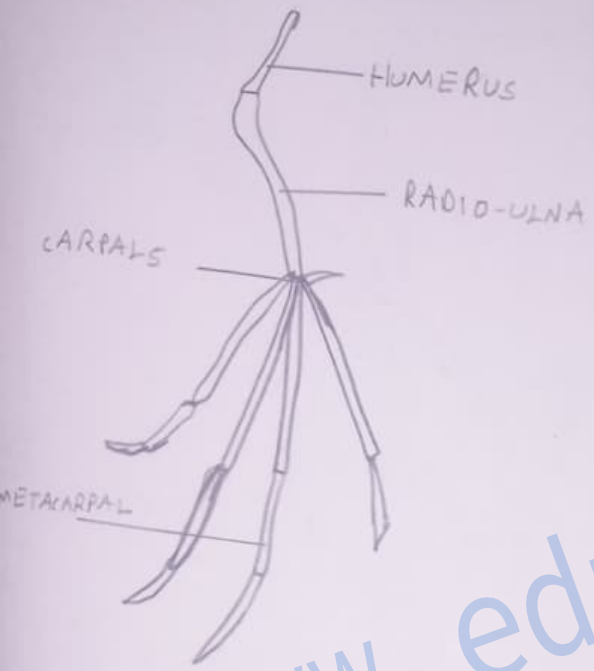
HOMOLOGOUS ORGAN IN ANIMALS

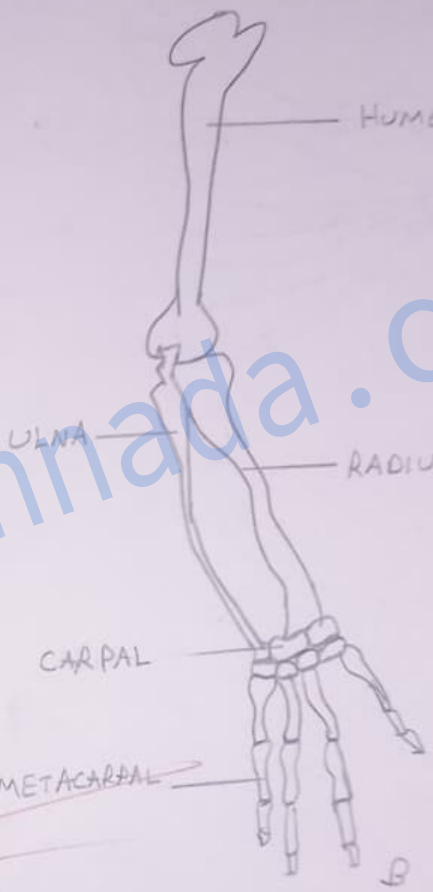
E.g. Fore limbs of Bat and human

⇒ The forelimbs of a Bat and a Human are homologus to one another as they have similar anatomical structures but perform different function.

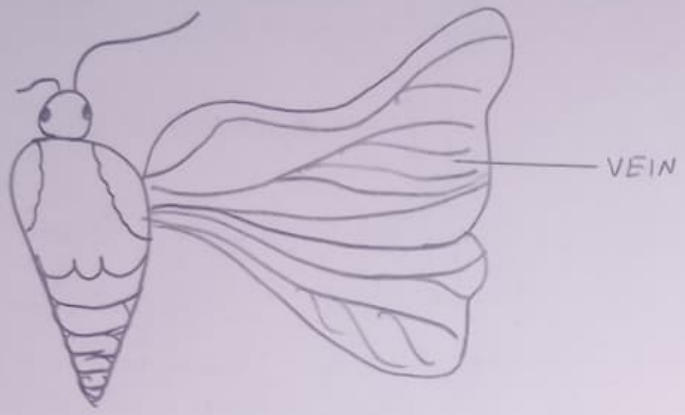
⇒ The bones namely humerus, radius, ulna, carpals, metacarpels and phalanges are found in both Bat and Human.

⇒ The forelimb of Bat helps in flight while the forelimb of human is used for various non-locomotory activites





FORE LIMB SECTION (A) BAT (B) HUMAN



A

B

(A) WINGS OF AN INSECT (B) WING OF ~~A~~ BIRD

ANALOGOUS ORGANS IN ANIMALS

1. The wing of an insect and of a bird

⇒ The wings of insects and birds are analogous to one another as they perform similar function but anatomically are different structures.

⇒ The wing of insect is [illegible] structure it is supported by hollow veins and covered with chitinous exoskeleton the wing of bird is supported by fore limbs skeleton & covered with feathers

⇒ wings help in flight.

2. Mandible of cockroach & lower jaw of Rabbit

⇒ The Mandible of a cockroach and the lower jaw of Rabbit are analogous to one another as they perform a similar function but are structurally different.

⇒ The Mandible of cockroach is chitinized structure while the lower jaw of Rabbit is bony.

⇒ Both help in cutting & grinding the food.

A) WING OF AN INSECT

DENTARY of COCKROACH

(B) WING OF A BIRD