ZIAUDDIN UNIVERSITY
EXAMINATION BOARD

RESOURCES FOR

"HSC-II BOTANY"

ZUEB EXAMINATIONS 2021

PREFACE:

The ZUEB examination board acknowledges the serious problems encountered by the schools and colleges in smooth execution of the teaching and learning processes due to sudden and prolonged school closures during the covid-19 spread. The board also recognizes the health, psychological and financial issues encountered by students due to the spread of covid-19.

Considering all these problems and issues the ZUEB Board has developed these resources based on the condensed syllabus 2021 to facilitate students in learning the content through quality resource materials.

The schools and students could download these materials from www.zueb.pk to prepare their students for the high quality and standardized ZUEB examinations 2021.

The materials consist of examination syllabus with specific students learning outcomes per topic, Multiple Choice Questions (MCQs) to assess different thinking levels, Constructed Response Questions (CRQs) with possible answers, Extended Response Questions (ERQs) with possible answers and learning materials.

ACADEMIC UNIT ZUEB:

1. Extended Response Questions (ERQs)

HOW TO ATTEMPT ERQs:

- Write the answer to each Constructed Response Question/ERQs in the space given below it.
- Use black pen/pencil to write the responses. Do not use glue or pin on the paper.

SECTION C (LONG ANSWER QUESTIONS)

1. WhatisOsmoregulation?ClassifyvarioustypeofplantsonthebasisofOsmoregulation**?**

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S. NO	ERQ	ANSWER	CL	DL
	WhatisOsmoregulation?Classifyvarioustypeofplantsonthebasisof Osmoregulation.	**OSMOREGULATION INPLANTS:** Efficient functioning of plant cell and the whole plant depend on maintaining the water content at the steady state. According to the availability of the water the plants are divided into fourgroups. 1. Hydrophates 2. Mesophates 3. Xerophates 4. Halophates **HYDROPHATES:** Hydrophates are those plants which are found in the fresh water. The plants may be partly or totally submerged in water They do not have any difficulty in obtaining water. To remove excessive water, they have following adaptations. **ADAPTIONS:** • Their leaves are large so surface area is large for removal of excessive water bytranspiration. • They have large numbers of stomata at upper surface ofleaves,. • The stomata always remainopen. • Root is absent if present root hairs areabsent. **MESOPHATES:** The type of plants that are found in the moderate supply of water majority of angiosperms are mesophates. These are the land plants and can easily maintain their water balance. When there is sufficient supply of water, the stomata are kept open but when there is restricted supply the stomata are closed. To prevent excessive loss, the stems and leaves are covered with cuticle. Shape of leaves is variable which also helps in regulating the water. Leaf fall also help in regulating the water.	R	E

		XEROPHATES: These are the plants which are found in the dry placesuch as deserts, steep hills. Under such conditions, the water potential is very low. They have the following adaptions to prevent the water loss. Root is deep vertical to absorb more water from soil and it also spread horizontally. Leaves in most cases are absent or shed during dry season. In such cases the stem become green and performs the function of photosynthesis. Leaves become small or modified into spines to reduced the rate of transpiration. The leaves are covered with cuticle or by hairs. Number of stomata are reduced and are sunken type. In rainy season stem root and leaves store water in their parenchymatous cells such parts are called succulent. **HALOPHATES:** The plants growing in salt marshes close to sea are called halophates. They have to absorb water, which has high salt concentration Such plants actively absorb salt by their root and as the salt concentration in their root cell become high, they absorb water by osmosis. Excess of salt absorbed by root, stored in the cells is executed out from salts glands in leaves. The salt thus secreted by some species help them to trap water vapours from air, which is being absorbed in liquid form by leave surface.		
	Define movement in Plants? Describe various types of Paratonic movements in plants.	**1. PARATONICMOVEMENT:** Themovementoccursduetoexternalstimuliarecalledparatonicor Induce Movement. **TYPEOFPARATONICMOVEMENT:** Therearetwotypeofparatonicmovement. i. NasticMovement ii. TropicMovement	**U**	**M**

I. NASTICMOVEMENT:

Thenondirectionalmovementofpartsofplantinresponsetoexternalstimuliare called NasticMovement.

Usually this movement occur in leaves or petals of flower.

TYPE OF NASTIC MOVEMENT:

There are two of nastic

i. Photonastic

ii. Haptonastic

I. PHOTONASTIC:

The nastic movement occurs due to light are called photonastic.

EXAMPLE:

The flower open and close due to light intensity.

II. HAPTONASTIC:

Thenasticmovementoccursduetothetouchofanylivingorganismarecalled Haptonastic.

III .THERMONASTIC :

Nastic movement caused due to high atmospheric temperature. Eg Indian telegraph Plant.

IV SEISMONASTIC :

Seismonastic movements are brought about by chemical stimuli such as contact with foreign body, fast wind **and** rain drops etc. **seismonastic movements** are also seen in stigma, stamen **and** leaves of many plants. **Example**:- Touch me not plant

V. NYCTINASTIC MOVEMENT :

Nyctinasty is the circadian rhythmic nastic **movement** of higher plants in response to the onset of darkness, or a plant "sleeping". ... **Nyctinastic movements** are associated with diurnal light and temperature changes and controlled by the circadian clock

II. TROPICMOVEMENT:

Tropic ------- >Tropos mean "toturn"

Themovementinresponseofgrowthofwholeorgantowardandawayfromstimuli

arecalledtropicmovement.Itisalsokno wnasdirectionalmovement.

TYPE OF TROPIC MOVEMENT:

The main type of tropic movement are as follow

* Phototropism

* Geotropism

* Chemotropism

* Hydrotropism

* Thigmotropism

PHOTOTROPISM:

Photo ------>LightTropos---------- >turn

Themovementofpartofplantinrespons etostimulusoflightarecalled phototropism.

EXAMPLE:

* Positivephototropisminstem

* Negativephototropisminroot

GEOTROPISM:

Geo ------>earthTropos ---------- turn

The movement of part of plant in response to force of gravity are called Geotropism.

EXAMPLE:

Root display positive Geotropism and shoots negative geotropism.

CHEMOTROPISM:

Chemo ------>ChemicalTropos ---------->turn

The movement in response to some chemicals is called Chemotropism.

EXAMPLE:

The hyphase of fungi show chemotropism.

HYDROTROPISM:

		Hydro ------>WaterTropism ----------->turn The movement of plant parts in response to stimulus of water is called hydrotropism. **EXAMPLE:** Thegrowthofroottowardwaterisduetopositive hydrotropismandshootsnegative hydrotropism. **THIGMOTROPISM:** Thigmos ------>touchTropos----------- >turn Themovementofplantpartsinresponseto stimulusoftoucharecalled Thigmotropism. **EXAMPLE:** The movement in climber		
	Describe phases of Growth. OR Describe Watson and Crick model of DNA. How does themodelexplain semi-conservativereplication ofDNA?	**PHASES OF GROWTH:** **FORMATIV PHASE.** It is the first phase of growth. And it is usually present at the tips of root and stem. The number of cells increases in it. **CELL ELONGATION:** It is the second phase of the growth. It lies just behind the first phase that is cell division. Here the cells simply elongate to attain their maximum size. During elongation the cell volume increases up to 150 times due to uptake of water. The cells synthesize new cytoplasm, cell wall material and a large central vacuole is formed. Thus cells show increase in weight and attain different shapes. **MATURATION PHASE:** This is the last phase of the growth and it is present behind the phase of cell elongation. Here the cell walls become thicker and cells attain their final size and shape. The cells modified into different tissues according to their location and function. Some cells form parenchyma, collenchymas, xylem and phloem.	**U**	**D**

4	Describe Prophase I of Meiosis with diagram.	Prophase I is divided into five phases: leptotene, zygotene, pachytene, diplotene, and diakinesis. In addition to the events that occur in mitotic prophase, several crucial events occur within these phases such as pairing of homologous chromosomes and the reciprocal exchange of genetic material between these homologous chromosomes. Prophase I occurs at different speeds dependent on species and sex. Many species arrest meiosis in diplotene of prophase I until ovulation. In humans, decades can pass as oocytes remain arrested in prophase I only to quickly complete meiosis I prior to ovulation. **Leptotene** Main article: Leptotene stage In the first stage of prophase I, leptotene (from the Greek for "delicate"), chromosomes begin to condense. Each chromosome is in a haploid state and consists of two sister chromatids; however, the chromatin of the sister chromatids is not yet condensed enough to be resolvable in microscopy.Homologous regions within homologous chromosome pairs begin to associate with each other **Zygotene** In the second phase of prophase I, zygotene (from the Greek for "conjugation"), all maternally and paternally derived chromosomes have found their homologous partner. The homologous pairs then undergo synapsis, a process by which the synaptonemal complex (a proteinaceous structure) aligns corresponding regions of genetic information on maternally and paternally derived non-sister chromatids of homologous chromosome pairs. The paired homologous chromosome bound by the synaptonemal complex are referred to as bivalents or tetrads. Sex (X and Y) chromosomes do not fully synapse because only a small region of the chromosomes are homologous. The nucleolus moves from a central to a	**U**	**D**

peripheral position in the nucleus

Pachytene

The third phase of prophase I, pachytene begins at the completion of synapsis. Chromatin has condensed enough that chromosomes can now be resolved in microscopy. Four chromatids called Tetrads are formed.

Diplotene

In the fourth phase of prophase I, diplotenecrossing-over is completed.Homologous chromosomes retain a full set of genetic information; however, the homologous chromosomes are now of mixed maternal and paternal descent. Visible junctions called chiasmata hold the homologous chromosomes together at locations where recombination occurred as the synaptonemal complex dissolves. It is at this stage where meiotic arrest occurs in many species

Diakinesis

In the fifth and final phase of prophase I, (full chromatin condensation has occurred and all four sister chromatids can be seen in bivalents with microscopy. The rest of the phase resemble the early stages of mitotic prometaphase, as the meiotic prophase ends with the spindle apparatus beginning to form, and the nuclear membrane beginning to break down.

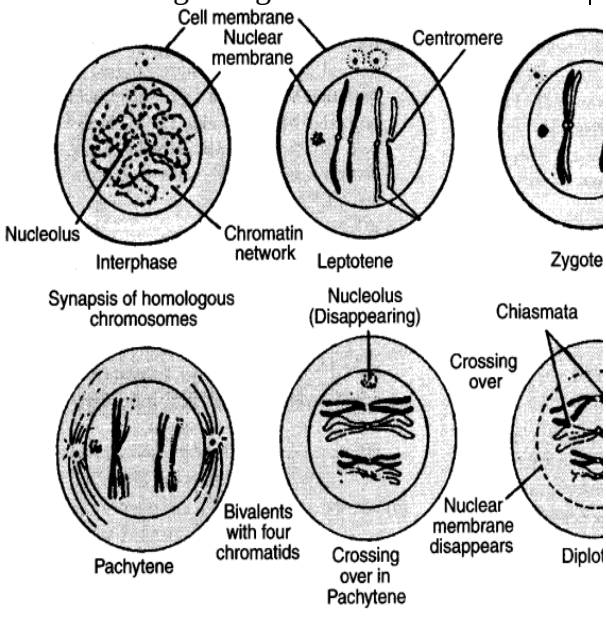


Fig. : Prophase I of meiosis I

5.	Describe Watson and Crick model of DNA. How does themodelexplain semi-conservativereplication ofDNA?	**WATSON AND CRICK'S MODEL OF DNA:** In the early 1950's James Watson a post-doctoral student from Indiana university teamed up with Francis crick a Cambridge researcher and suggested a model of DNA in 1953. It was based on X-ray diffraction data provided by Murice H.F Wilkins for their pioneer work the three scientists received noble prize in 1962. **STRUCTURE:** Watson and Crick suggested ladder type organization of DNA. Each molecule of DNA is made up of two polynucleotide chains which are twisted around each other and form a double helix. The uprights of ladder are made up of sugar and phosphate parts of nucleotide and the rungs are made up of paired nitrogenous bases. The pairs are always as follows. Adenine always pairs with thymine and cytosine always pairs with guanine. There is no alternative possible. Two nucleotide chains are held together by weak hydrogen bond. There are two hydrogen bonds between A=T and three hydrogen bonds between C=G. both polynucleotide strands remain separated by 20A° distance. The coiling of double helix is right handed and complete turn occurs after 34A°. since each nucleotide occupies 34A° distance, along the length of polynucleotide strand there are 10 mono-nucleotide which occurs in each complete turn. **REPLICATION OF DNA:** The discovery of DNA structure was a turning point in studies of inheritance i.e how the hereditary material is replicated. The weak hydrogen bond that hold together the double helix of DNA is broken up by an enzyme DNA helecase starting from the ends like a zip, one bye one, each purine is separate from its pyrimidin partner. Each separation leaves an unmatched purine and pyrimidin bases. Then free nucleotides which are present in cellular pool could pair with exposed bases on both unwound strands. Each parent strand remains in fact and a new companion strand is assembled on	**U, K**	**M**

		each one. During the replication, each parent strand is twisted into a double helix with its new partner strand. Through these steps, a new upright, (of sugar and phosphate) would be supplied for each ladder. Thus each strand will have replaced the nucleotide partners it has lost with ones of exactly the same kind. **DNA REPLICATION IS SEMI CONSERVATIVE:** Insemiconservativereplication,thetwostrandsoftheduplexseparateouteach actingasamodelormold,alongwhichnew nucleotidesarearrangedthusgiving rise to two newduplexes. Theconservativemodelstatedthatthepare ntaldoublehelixwouldremainintact and generate DNA copies consisting of entirely newmolecules.		
(	Explain in detail the response of plants to environmental stress	**RESPONSES TO ENVIRONMENTAL STRESS:** Changes in environmental conditions are the big threats for living organisms especiallyforplants.Thesefactorswhichc hangethenormalconditionoflight,CO2, nutrients, temperature etc. causes severe stresses on plants. The common environmental stresses for plantsare 1. Water Shortage (Droughtcondition) 2. Less OxygenSupply 3. High Concentration of Salt in theSoil 4. HighTemperature 5. Low / ColdTemperature 6. Herbivory / OverGrazzing **1. WATERSHORTAGE:** Indrycondition,theguardcells ofleafbecomeflaccidtocloset hestomata. In this way the transpiration isstopped. Thedryconditionalsostimulatesincrea sedsynthesisandreleaseofabscisicacid . This hormone help in keeping stomataclose. These plants produce deeper root system. **2. OXYGENDEFICIENCY:** Thoseplantswhichgrowinwethabitato rmarshes,theydevelopaerialrootsto absorboxygen. Some plants developed air tubes that provide oxygen to submerged roots.	**U, R**	**E**

		3. SALTSTRESS: Theplantsespeciallyhalophytes,havesalt glandsintheirleaveswheredesalination occurs. **4. HEATSTRESS:** In plants there are two methods to tolerate the heat stress. Transpirationhasacoolingeffectonthe plantbody.Bythismethodtheeffectsof heat arereduced. Above40oCplantscellstartsynthesizingr elativelylargequantitiesofspecialprotein called heat shockproteins. **5. COLDSTRESS:** Plantsrespondtocoldstressbyalteringthel ipidcomposition,changesinsolute compositionisalteredalsobyproducingdi fferentpolymersofpentose(Fructose) whichallowthecrystalstosupercoolwitho utcompoundformation. **6. HERBIVORY / OVERGRAZZING:** Plantsovercomeexcessiveherbivoryb ydevelopinghornsandproductionof distasteful or toxiccompounds.		
	Describe various component of pond ecosystem.	**POND ECOSYSTEM:** Pond ecosystem is an example of fresh water ecosystem. The pond water is stationary. It may develop behind a dam or near a river. The life span in a pond ranges from few weeks to several hundred years. Following are the basic components of pond ecosystem. **ABIOTIC COMPONENTS:** The primary productivity of pond ecosystem is various nutrients. **MACRO NUTRIENTS:** The common macronutrients present in pond are C, H, O, K, Mg, and S.	**R**	**M**

MICRO NUTRIENTS:

The micronutrients present are Fe, Mn, Cu, and Zn.

- These nutrients play major role in building upprotoplasm.
- These nutrients enter in pond fromsurroundings.
- These nutrients also regulates the rate of functioning of entireecosystem.

BIOTIC COMPONENTS:

The biotic components consist of:

PRODUCERS:

The pond water favours particular type of plants which are autotrophic and may be of two types:

i. MACROPHYTES:

They may be of three types:

LARGE ROOTED PLANTS:

Large rooted plants like TyphaSagitaria occupying the outer most zone of pond.

ROOTED PLANTS (PARTIAL, SUBMERGED):

Rooted plants with floating leaves, like Nymphae (water lilies). Lotus, Echornia and water hyacinth.

SUBMERGED PLANTS:

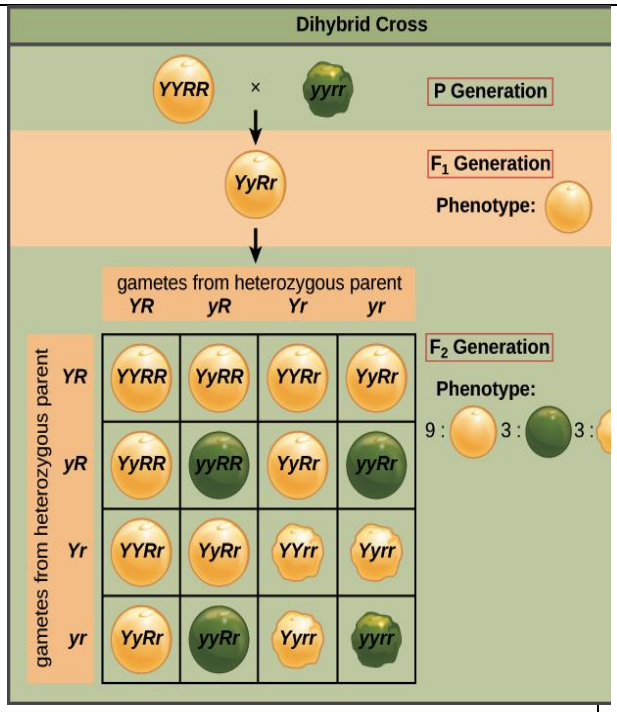
Submerged plants like Hydrilla, potamgetonvallisnaria and Trapa.

ii. MICROPHYTES(PHYTOPLANKTONS):

These are the minute floating plants like, chamydomonos, nostoc and

		Diatoms. They are distributed throughout the pond where light can penetrate. The presence of microphytes give greenish appearance to pond water. **CONSUMERS:** Many types of animals are also present in a pond ecosystem. **i. PRIMARYCONSUMERS:** The primary consumers are herbivores which includes zooplanktons like crustaceans and rotifers which feed on phyrtoplankton. **ii. SECONDARYCONSUMERS:** The secondary consumers include living beetles, carnivore fishes etc. **iii. TERTIARYCONSUMERS:** Among the tertiary consumer turtle is an example. **DECOMPOSERS:** The decomposers are aquatic bacteria, and fungi distributed throughout the pond. They are abundant at the mud water, where the dead plants and animals remains are accumulated. The bacteria and fungi decompose them and the nutrients present in them are released for reuse by the plants.		
8	State the law of independent assortment with the help of checkerboard method.	**3RD LAW OF INHERITANCE OR LAW OF INDEPENDENT ASSORTMENT:** It states that when two pairs of independent alleles are brought together in the hybrid (F1), they, at the time of gamete formation, segregate or assort independent at random and freely. This shows that genes are independent influence each other. **Example: Pea color and pea shape genes** Let's look at a concrete example of the law of	**U**	**D**

		independent assortment. Imagine that we cross two pure-breeding pea plants: one with yellow, round seeds (*YYRR*) and one with green, wrinkled seeds (*yyrr*). Because each parent is homozygous, the law of segregation tells us that the gametes made by the wrinkled, green plant all are *ry*, and the gametes made by the round, yellow plant are all *RY*. That gives us \text F_1F1start text, F, end text, start subscript, 1, end subscript offspring that are all *RrYy*. The allele specifying yellow seed color is dominant to the allele specifying green seed color, and the allele specifying round shape is dominant to the allele specifying wrinkled shape, as shown by the capital and lower-case letters. This means that the \text F_1F1start text, F, end text, start subscript, 1, end subscript plants are all yellow and round. Because they are heterozygous for two genes, the \text F_1F1 start text, F, end text, start subscript, 1, end subscript plants are called **dihybrids** (*di-* = two, *-hybrid* = heterozygous). A cross between two dihybrids (or, equivalently, self-fertilization of a dihybrid) is known as a **dihybrid cross**. When Mendel did this cross and looked at the offspring, he found that there were four different categories of pea seeds: yellow and round, yellow and wrinkled, green and round, and green and wrinkled. These **phenotypic** categories (categories defined by observable traits) appeared in a ratio of approximately 9:3:3:1		



This ratio was the key clue that led Mendel to the law of independent assortment. That's because a 9:3:3:19:3:3:19, colon, 3, colon, 3, colon, 1 ratio is exactly what we'd expect to see if the \text F1F1start text, F, end text, 1 plant made four types of gametes (sperm and eggs) with equal frequency: *YR*, *Yr*, *yR*, and *yr*. In other words, this is the result we'd predict if each gamete randomly got a *Y* or *y* allele, and, in a separate process, also randomly got an *R* or *r* allele (making four equally probable combinations).

We can confirm the link between the four types of gametes and the 9:3:3:19:3:3:19, colon, 3, colon, 3, colon, 1 ratio using the Punnett square above. To make the square, we first put the four equally probable gamete types along each axis. Then, we join gametes on the axes in the boxes of the chart, representing fertilization events. The 161616 equal-probability fertilization events that can occur among the gametes are shown in the 161616 boxes. The offspring genotypes in the boxes correspond to a 9:3:3:1, ratio of phenotypes, just as Mendel

		observed.		
9	Describe desert ecosystem in detail.	**DESERTS:** Deserts occur in that regions where there is less than 25cm of rainfall. And even thisamountisunreliableandunevenlydistributed.Theremaybefrequentlyrains during one particular year but many years go completelydry. Due to low rainfall the humidity is less and temperature in summer months may reach to 55°C. Winter is some what better but short. Desert occupy about 17% of land. Surface of earth. **XEROPHYTIC ADAPTATIONS:** ➢ Someplantshaveshallowrootsystemsthemspreadbelowthesurfaceof soil, to absorb water very quickly before it isevaporated. ➢ Othershavedeeprootsystemtoabsorbwaterfromdeeperlayersofsoil. ➢ The plant organs show succulentcharacters. ➢ Theleavesfallofftoreducetheratetranspirationorbecomesmallor leathery. ➢ Stomata are sunken type or covered byhairs. ➢ The vegetation of sandy hills consists of Acacia, Euphorhia, Capparis, Calotropiswhileplantsofplainsare Prosopis,Capparisandlycium. There is also dry forming of sorghum and Bajra. **PRODUCERS:** The common producers of these deserts	**R**	**E**

		are xerophytes. For example, Accacia, Prosopis, Salvadora and Caparis. The ground vegetation is Calotropis, Penimeum, Tribulus. **ANIMALS (CONSUMER):** The desert animal shows various adaptations for conserving water. ➢ Manyanimalsliveinburrowswhe rehumidityishigherandtempera tureis low. ➢ Animals are nocturnal which is a mean to avoid intenseheat. ➢ Manyanimalsdon'tdrinkwatera ndrelyonthewaterpresentinsuc culent foods. ➢ Animalshaveabilitytop ullonwithlesswater.Th ecommondesert animalsare: Tenebrionidbeetles, Mantis, Grasshopper, Centipedes and Spider like arthropods. Among reptile. Lizards, Uromastics, Calottes and among Snakes, Vipers, Cobra, Kraits and Boas are found. Among birds Quail, Bustard and Partridge are present, Among mammals anteater, headgehog, porcupines, burrowing, rodents, wild cats, wild boars and foxes are present. **DECOMPOSERS:** Decomposers are few due to poor vegetation some thermo bacteria and fungi are present.		
10	Write a detailed note on simple Plant tissues.	**SUPPORT THROUGH SUPPORTING TISSUE:** InplantstherearecertaintissuecalledMec hanicaltissues.Thesetissueprovide strength to the plantbody. 1. Parenchyma 2. Collenchyma 3. Sclerenchyma **PARENCHYMA**	**K**	**M**

STRUCTURE:

* Parenchymaisasimpletissue.Iti scomposedofthinwalledspherical ,ovalor elongatedcells.

* They are with or without Intercellularspaces.

* They are livingcell.

LOCATION:

They are found in cortex, pith and epidemics, mesophyll region of leaves.

FUNCTIONS:

Theirfunctionissynthesisoffoodandst orageoffood.Theymayserveasa supportingtissueinsoftplantduetointer nalturgorpressure.

1. COLLENCHYMA:

STRUCTURE:

* Collencymisasimpleperma nenttissue.Itiscomposedofrou nded,ovalor polygonalcells.

* They are living cells withprotoplasm.

* Intracellularspacesareabsenta ndthesecellsthickenedatthecorn ersdueto deposition of cellulose andprotopectin.

LOCATION:

These tissues are found in the dicot stem below the epidermis.

FUNCTIONS:

Collenchymacellprovidesupporttoyoun gherbaceouspartoftheplant.Itelongate with the grow stem andleaves.

2. SCLERENCHYMA:

STRUCTURE:

* Sclerenchymaisasimplepermane nttissue.Itiscomposedoflong,narro wthick walledcell.

* They have no intracellularspaces.

* They are dead cell withoutprotoplasm.

		* Athickmaterialsisdepositalongthewallofcell calledpectinandlignin. **LOCATION:** Sclerenchyma tissues are found in xylem which are vascular tissue. **FUNCTIONS:** They provide strength and Mechanical support to the plant parts. **TYPES OF SCLERENCHYMA:** There are two type of sclerenchyma 1. Fibers 2. Sclerides **1. FIBERS:** Thesclerenchymaelongatedcellwithtapered ends.Theyaretoughandstrongbut flexibleFibers. **2. SCLERIDES:** Thevariableoftenirregularinshapesclerenchymaarecalledsclereids.Simple unbranched sclerids are generally called stonecell.		