પુખ્તા International School

Shree Swaminarayan Gurukul, Zundal

Class–XII **Subject: Biology** **Experiment 202122**

Term: 2

Exp. No	Aim
	Major experiments
1	To prepare a temporary mount of the onion root tip to study mitosis.
2	Collect water from two different water bodies around you and study them for pH, clarity and presence of any living organism.
3	To collect and study soil from at least two different sites and study them for texture, moisture content, pH & water holding capacity. Correlate with the kinds of plants found in them
	Minor Experiments
	B. Study/observation of the following (Spotting)
1	Common disease-causing organisms Like Ascaris, Entamoeba, Plasmodium, Ringworm through permanent slides or specimens. Comment on symptoms of diseases that they cause.
2	Two plants and two animals (models/virtual images) found in xeric conditions. Comment upon their morphological adaptations.
3	Two plants and two animals (models/virtual images) found in aquatic conditions. Comment upon their morphological adaptations

Experiment – 1

Aim To prepare a temporary mount of the onion root tip to study mitosis.

Apparatus/ Material Required

Necessary Materials &Apparatus

- **Onion**
- **Watchglass**
- **Glassslide**
- **Filterpaper**
- **Aceto-alcohol**
- **Coverslip**
- **Water**
- **N/10 Hydrochloricacid**
- **AcetocarmineStain**
- **Burner**
- **Forceps**
- **Dropper**
- **Blade**
- **Needle**
- **Compoundmicroscope**

Procedure

- **Place the onion on atile**
- **Using the blade, remove the dryroots**
- **Regrow the root tips by placing the bulbs in a water-filled beaker**
- **After 3 to 6 days, new roots mayemerge**
- **Slide 2 to 3 cm off freshly grown roots and place them on a watchglass**
- **Use a forceps to transfer the freshly cut tips to a test tube containing Aceto-alcohol (1:3 = anhydrous acetic acid:ethanol)**
- **Submerge the root tips in the solution for 24hours**

- **Use the forceps to take out a single root and place it on a glass slide.**
- **Put a single drop of N/10 HCl on the roottip**
- **Then, put 2-3 drops of acetocarminestain**
- **Use a burner to warm it, and ensure that the stain does not dry up.**
- **Use a filter paper to blot out the excess stain, ifany**
- **Cut the significantly stained portion of the root using a blade and place it on a slide. Discard the rest of theroot**
- **Put a drop of water on the roottip**
- **Place a coverslip using aneedle**
- **Tap the coverslip such that the meristematic tissue of the root tip is compressed and spread out as a thinlayer.**
- **The preparation is ready for studyingmitosis**.
- **OBSRVATION UNDER COMPOUNDMICROSCOPE**

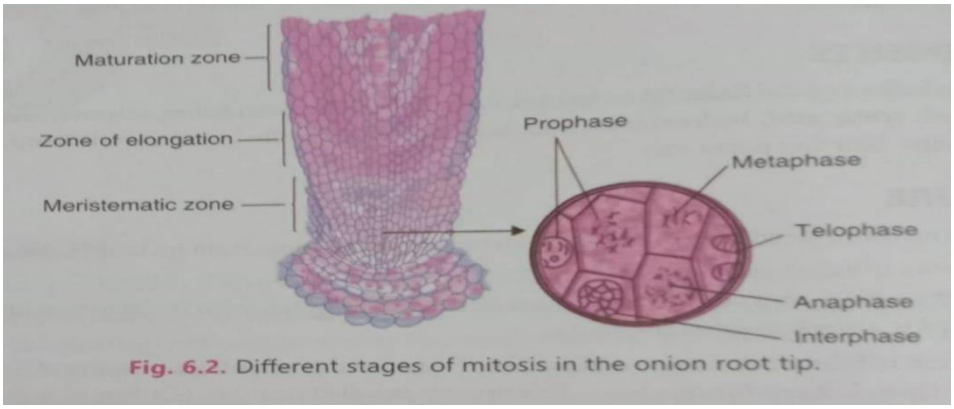


Fig. 6.2. Different stages of mitosis in the onion root tip.

Events during Mitosis

1. **Prophase**:

1 Mitosis begins at prophase with the thickening and coiling of the chromosomes.

2.The nuclear membrane and nucleolus shrinks anddisappears.

3. The end of prophase is marked by the beginning of the organization of a group of fibres toform

a spindle.

2. Metaphase

1. The chromosome become thick and two chromatids of each chromosome becomeclear.

2. Eachchromosomeattachestospindlefibresatitscentromere.

3. Thechromosomesarearrangedatthemidlineofthecell.

3. Anaphase

1. In anaphase each chromatid pair separates from the centromere and move towards theopposite ends of the cell by the spindlefibres.

2. The cell membrane begins to pinchat the centre.

4. Telophase

1. Chromatids arrive at opposite poles of cell.

2The spindle disappears and the daughter chromosome uncoils to form chromatin fibres..The nuclear membranes and nucleolus re-form and two daughter nuclei appear at opposite poles.Cytokinesis or the partitioning of the cell may also begin during this stage.

Precautions

1. **The base of the onion bulb should be in contact of water while growing theroots.**

2. **Root tip should be fixed in the morning between 8 to 10am**

3. **The slide should be warmed gently much above the flame of the spirit lamp.**

Videolink https://youtu.be/N-nIHhncEao

Experiment – 2

Aim: To collect and study soil from at least two different sites and study them for texture, moisture

content, pH & water holding capacity. Correlate with the kinds of plants found in them.

Material required:

this experiment, soil collected from the **roadside** and **garden** are to be used. Apart from the soil samples, other required materials are:

- Tile.
- Beaker.
- Funnel.
- Burner.
- Dropper.
- Crucibles
- Petridish.
- Glassrods.
- Test tubes.
- Wiregauze.
- **FilterPaper.**
- **Distilledwater.**
- **Mortar andPestle.**
- **pH paperbooklet.**
- **Measuringcylinder.**
- **Universal pH indicatorsolution.**
- **TinBoxwithaperforatedbottom.**
- **WeighingscaleorElectronicbalance.**

Procedure

Thefollowingarethestepstakentopreparethesoilsamplesforexperimentstoanalysevarious properties.

To study the pH of the Soil Samples

- **Take the collected roadside soil and garden soil into two different beakers containing water.**
- **Mixthetesttubeswiththesoilsolutionslowly**
- **Now into a clean and dried two test-tube, arrange a funnel spread covered with a filterpaper.**
- **N Letthewatertocompletelyfilterofffromthefilterpaper.**
- **Take the collected filtrates (soil) into the two different test tubes for testing the pH values.**
- **With the help of a dropper, add a few drops of universal indicator solution to both the testtubes.**
- **Observe thechanges.**
- **ow gently pour the soil solutions into the test tubesseparately.**

Observation

When the universal pH indicator is added to the test tube containing the soil solution, thecolourchanges.Thesecolourchangescanbetrackedusingthe pHcolourchart.
Roadside soil has a pH level of 7 while garden soil has a pH level of 6. Most crops grow between pH levels of 6.0 and 7.0.

S.No	Soil Samples	pH
1		
2		
3		

To study the texture of Soil Samples

- **Collect 50 gm of any soil sample in abeaker.**
- **Take a clean and moisture-free measuring cylinder and the collected soil sample into it.**
- **Now pour little water into the same measuring cylinder and shakewell.**
- **Keep the apparatus undisturbed for a few minuted and wait for the particles to settle down.**
- **After a while, observe the changes in the measuringcylinder.**
- **Thesoilparticlesinthemeasuringcylinderwillstarttosettledowninlayers.**
- **Record the thickness of these**

layers Observation

Sr. No	Soil Samples	Colour	texture	Relativepercentage			Soil class
1	From crop field			Sand	silt	clay	
2	Garden soil						
3	Road side soil						
4	From dried pond						
5	River bank soil						

To study the moisture Content

Take a small amount of soil from a sample in a dry crucible and weigh it. Record the weight. Heat the crucible on a burner to dry the soil and then cool it. Weigh the crucible again to record th weight of dry soil. Repeat the process for ach soil sample.

Observation

Sr. No	Soil samples	Initial weight (x) g	Final weight (y) g	Moisture content
1				
2				
3				
4				
5				

To study the Water Holding Capacity of Soil Samples

- **Collect a garden soil sample in abeaker.**
- **Toacleananddriedmortarpestleaddthecollectedsoilsample.**
- **Now slowly grind the soil sample into a fine powder using apestle.**
- **Place a filter paper at the bottom of thetin box.**
- **Weightheentirecontentsofthetinbox.**
- **Now, add the powered soil into the tin box.**
- **Usetheglassrodtopressandtapthebox,sothatthesoilisuniformlylayered.**
- **Now, the weight of the tin box is measured and to berecorded.**
- **Next, take two glass rods and place them parallel to each other. Ensure that the distance between the two is notlong.**
- **Position the tin on the two glass rods in such a way that the bottom is in contact with thewater.**
- **The complete setup should be left undisturbed until the water seeps through the upper surface of thesoil.**
- **Now,removethetinandallowallthewatertoflowoutfromthebottom.**
- **Wait until no more water percolates from thetin.**
- **Now wipe the bottom dry and use the weighing machine to note down theweight.**
- **Calculate the two different readings to know the water holding**

capacity of the given soilsamples.

Observation and result

The water holding capacity of the soil is determined by the quantity of water held by the soil sample versus the dry weight of the soilsample.

Sr.no	Soil sample	Wt. of empty box(x)	Wt. of box filled with soil (y)	Wt of box aftr taking out from the petri dish(z)	Wt.of soil (y-x)	Wt. of water Retained by The soil (z-y)	Water holding capacity of the soil (z-y)/ Y-X*100
1	Garden soil						
2	Roadside soil						

Conclusion :Garden soil retain more water and thus has higher water holding capacity than the road side soil.

Precautions:

1. **Weighing should be doneaccurately.**

2. **Weighing of tins after taking out of the petridish should be done only when dripping of water has stopped.**

https://youtu.be/POivZf4vc-c

YoutubeVideo https://youtu.be/eftNwlrQ7Fo

EXPERIMENT 3

Aim

To collect water from two different water bodies around you and study them for pH, clarity and presence of any living organism.

Material required

- **Tile.**
- **Tape.**
- **Pins.**
- **Beaker.**
- **Needles.**
- **Dropper.**
- **Testtube.**
- **pHpaper.**
- **Glassslides.**
- **Coverslips.**
- **Filterpaper.**
- **Secchi'sDisk.**
- **Compoundmicroscope.**
- **Universal Indicatorsolution**.

Procedure

To study pH levels:

- **Take two clean and dried testtubes.**
- **Add the collected two different water samples into the two testtubes.**
- **For a safer side, label the test tubes as A andB.**
- **Dip the individual pH paper strips into the two different watersamples.**
- **Keepthestripsonthetileandwaitforthestripstodry.**
- **Alternatively, pH levels of the water sample can also be found using the universal indicatorsolution.**
- **Now, with the help of a dropper, add five drops of universal Indicator solution into both the test**tubes.
- **Observe the change in colour in both the test tubes and compare the same with the colourchart.**

Observation

Note the change in colour and associate the same with a broad range indicator paper to get a rough idea of the pHlevel

To study the clarity of the water sample:

From a scientific perspective, the number of particles present in a liquid may make it cloudy or hazy. This property is called turbidity. The procedure for finding turbidity of a water body is as follows:

- **Reachthecentreofapondinaboat.**
- **Immerse Secchi's disc into the water, lowering it eventually until the black and white segments are no longervisible.**
- **Mark the length on the rope, where the disk is not visible with apin.**
- **Name this position as"A".**
- **Carefully, bring the disc back up and mark the length of rope where the disc becomes visibleagain.**
- **Name this position as"B".**
- **UseametertapetomeasurethelengthofsectionAtoB.**
- **And the mean length of the rope by usingX= (A+B)/2.**

Observation photosynthesis does not take place

ThevalueofXtellsusthedepthofthephoticzone.Belowthislevel,enoughlig htdoesnot penetrate,hence,.

To study the presence of living organisms

- **Takeacleandriedtesttube.**
- **Addthecollectedwatersample,preferablyfromapond,intothetesttube.**
- **Leavethesampleundisturbed,untilthesedimentsettlesatthebottomofthe testtube.**
- **Transferadropfromthetesttubeontoaglassslide.**
- **Gentlyplaceacoverslipontheslideusinganeedle.**
- **Observetheentireslideunderacompoundmicroscope.**

Observation

To study the presence of living organisms:

Pond samples have large numbers of microscopic organisms.

Precaution

Ensure safety measures are in place when travelling to the centre of the pond.

To collect water from two different water bodies around you and study them for pH, clarity and presence of any living organism.

https://youtu.be/RVpSPidRhM8

Youtube video https://youtu.be/RVpSPidRhM8

B 1

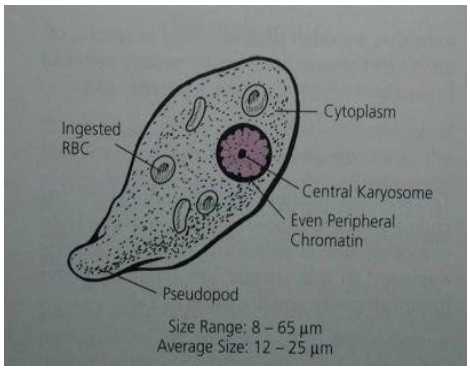
Aim: Common disease-causing organisms like Ascaris , Entamoeba, Plasmodium Ring worm through permanent slides or specimens. Comment on symptoms Of diseases that they cause

Material required

Preservedslidesorspecimensofdisease-causingorganismslikeAscaris,Entamoeba,Plasmodiumand Ringworm.

Procedure

Observe the specimens or slides and identify the organism on the basis of its features.



Observations

Ascaris

Phylum: Aschelminthes

Class: Nematoda

Type: *Ascaris lumbricoides*

Ascaris exhibits the following characteristic features:

1. Ithasalong,cylindricalandunsegmentedbody.
2. Themaleandfemaleorganismsareseparate.
3. Itbearsamouthattheanteriorendsurroundedbythreelips.
4. Thereisanexcretoryporeontheventralsurfaceslightlybehindtheanteriorend.
5. Apairofpenialspiculesarepresentinthemalewormsclosetothecloacalopening.
6. Thefemalegenitalsarepresentataboutone-thirddistancefromtheanteriorend.

Ascariasis is the disease caused by *Ascaris lumbricoides* or roundworm.

Symptoms:

- Abdominalcramping
- Abdominalswelling
- Nausea
- Vomiting
- Fever

Entamoeba

Phylum:

Protozoa

Class:

Rhizopoda

Type: *Entamoeba hystolytica*

Following are the characteristic features of Entamoeba:

1. Itisaunicellularorganismwithanirregularshape.
2. Itconsistsofafewfoodvacuoles.Thecontractilevacuoleisabsent.
3. Cystswithfournucleiarepresent.
4. Itconsistsofanucleuslocatedeccentricallyinthecell.

*Entamoebahistolytica*isanorganismfoundintheintestinesofhumansthatisresponsiblef orcausingamoebic dysentery.

Symptoms:

- Abdominalpain
- Waterydiarrhoeawithmucus,bloodandpus
- Fatigue
- Fever
- Nausea
- Vomiting

Plasmodium

Phylum:

Protozoa

Class:

Sporozoa

Type: *Plasmodium vivax*

Plasmodium can be identified by the following characteristic features:

1. It isaunicellularendoparasitefoundwithintheredbloodcellsofthediseasedperson.
2. Theparasiteismostlydiagnosedatthe"signetring"stagewheretheparasiteappears asaroundbody.
3. Thereisabigvacuolepresentinsidethecell.Thecytoplasmisaccumulatedatone placeandcontains thenucleus.

*Plasmodiumvivax*isaprotozoanparasitethatcausesmalariainhumans.Theinfectedfema leanophelesbitesa healthy person and transmits the sporozoite into the peripheral blood vessels of humans, thereby, causing malaria.

Symptoms:

- Highfever
- Shakingchillsfrommoderatetosevere.
- Headache
- Vomiting
- Nausea

Ringworm **Draw diagrams of yourown**

Kingdom: Fungi

Class: Deuteromycetes

Type: *Trichophyton rubrum*

Trichophyton or ringworm fungus has the following characteristic features:

1. Thisfungusfeedsonthekeratinoftheskinofhumanbeings.
2. Thehyphaearewaxyandcanbesmoothorcotton-like.
3. Hyphaethatarenotstainedareyellowish-brown,reddish-brownorwhiteincolour.

Ringworm is a communicable fungal infection of the skin.

Symptoms:

- Scaly, itchyskin
- Red and raisedpatches

- Theyareredderattheperipherythanatthecentreandformsaring-likeappearance.

Youtube video https://youtu.be/6ew4Pi8XWZk

B 2

Aim: To study two plants and two animals (models /virtual images) found in Xeric conditions. Comment upon their morphological adaptions

Material requirements

Virtual images or models of two plants and two animals found in xeric conditions.

Observations

Two Xeric Plants
Cactipinapple

Morphological Features:

- **Succulence:Theseplantshavespecialcellswithwaterholdingcapacityinlowmoisture conditions.**
- **ReducedLeaves**:Theleavesarereducedtospinesthathelpinreducingexcesslossofwaterthrough transpiration.
- **Stomata**:Intheseplants,thestomataareeitherfewoninsunkenpitsbelowthesurfaceoftheleaves.
- **Waxy,hairyandspinyoutersurfaces**:Thehairandspinesscatterlighttoreducesun'seffect.The waxy covering holds inwater.
- **Rootsnearthesurface**:Thesehavethecapacityofholdingwaterquicklyandcanregenerateeasily afterrain.

Two Xeric Animals

Camel sandfish

Morphological Features:

- **Thedesertanimalsarepoikilotherms,i.e.,theycanmatchtheirinternaltemperaturetothe external.**
- Theyexcretenitrogenouswasteintheformofuricacid.
- They undergohibernation.

- Theanimalsstayinburrowstoavoidwaterlossfromthebodyandexcretehighlyconcentratedurine.

- Thebodytemperatureofcamelsincreasesby7°Cduringthelateafternoonthatdecreasestheheatflow fromtheenvironment.Thefurreducestheheatgainfromtheenvironment.

Thustheseadaptationshelpthemtoconservewaterasmuchaspossibleandpreparethemtolivewithoutwater ifrequired.

B 3

Aim : To study two plants and two animals (models / virtual images) found in Aquatic conditions. Comment upon their morphological adaptions

Materials required

Models or virtual images of two plants and two animals found in aquatic conditions.

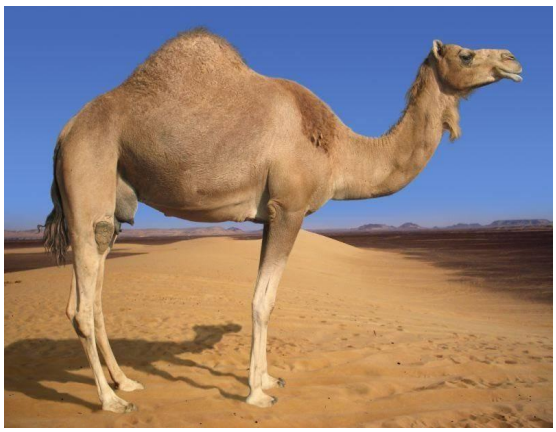
Observations

Two Aquatic Plants

- Lotus
- WaterHyacinth

Morphological Adaptations:

1. Aquaticplantshaveverythincuticleornocuticleatallbecausethecuticlepreventswaterloss.
2. Thereareanumberofstomataoneithersideoftheleaves.Thestomataarealwaysopen.
3. Theyarelessrigidinstructure.
4. Theyhavespecializedrootstotakeinoxygen.
5. Theleavesonthesurfaceareflattofacilitatefloating.Also,thepresenceofairsacshelpsthemtofloat.
6. Therootsareverysmall.



Two Aquatic Animals

- Fish
- Turtle

Morphological Adaptations:

1. Theyinhaleoxygenthroughtheirgillsorskin.Marinemammalshavelungsandhavetocometothe surface tobreathe.
2. Theyarecold-blooded,i.e.,theirbodytemperatureisthesameasthesurroundingenvironment.
3. Thecollapsiblelungsandribcageshelpthemtowithstandveryhighwaterpressures.
4. Theaquaticanimalsatgreatdepthsarebioluminescent,i.e.,theyemitlighttoattractpreysandmates.
5. Theyhavethepropertyofosmoregulation,i.e.,thefishcanmaintainaninternalenvironmentofsaltandwater.

https://youtu.be/4GwZ3Aw2oF0