# પુ•ના International School

Shree Swaminarayan Gurukul, Zundal

**Class – XII** **Subject: Biology** **Experiment (2020_21)**

| Exp. No | Aim |
|---|---|
| | **Section – A** |
| 1 | To prepare a temporary mount of the onion root tip to study mitosis. |
| 2 | 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. |
| 3 | Collect water from two different water bodies around you and study them for pH, clarity and presence of any living organism. |
| 4 | Study the effect of different temperatures & 3 different pH on the activity of salivary amylase on starch. |
| 5 | Isolate DNA from available plant material such as spinach, green pea seeds, papaya, etc. |
| | **B. Study/observation of the following (Spotting)** |
| 6 | Flowers adapted to pollination by different agencies (wind, insects, birds). |
| 7 | Identification of stages of gamete development, i.e., T.S. of testis and T.S. of ovary through permanent slides (from grasshopper mice). |
| 8 | Meiosis in onion bud cell or grasshopper testis through permanent slides. |
| 9 | T.S. of blastula through permanent slides (Mammalian). |
| 10 | Prepared pedigree charts of any one of the genetic traits such as rolling of tongue, blood groups, ear lobes, widow's peak and colour blindness. |
| 11 | Common disease-causing organisms Like Ascaris, Entamoeba, Plasmodium, Ringworm through permanent slides or specimens. Comment on symptoms of diseases that they cause. |
| 12 | Two plants and two animals (models/virtual images) found in xeric conditions. Comment upon their morphological adaptations. |
| 13 | 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
- Watch glass
- Glass slide
- Filter paper
- Aceto-alcohol
- Coverslip
- Water
- N/10 Hydrochloric acid
- Acetocarmine Stain
- Burner
- Forceps
- Dropper
- Blade
- Needle
- Compound microscope

## Procedure

- Place the onion on a tile
- Using the blade, remove the dry roots
- Regrow the root tips by placing the bulbs in a water-filled beaker
- After 3 to 6 days, new roots may emerge
- Slide 2 to 3 cm off freshly grown roots and place them on a watch glass
- 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 24 hours
- 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 root tip
- Then, put 2-3 drops of acetocarmine stain
- 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, if any
- Cut the significantly stained portion of the root using a blade and place it on a slide. Discard the rest of the root
- Put a drop of water on the root tip
- Place a coverslip using a needle
- Tap the coverslip such that the meristematic tissue of the root tip is compressed and spread out as a thin layer.
- The preparation is ready for studying mitosis.

- **OBSRVATION UNDER COMPOUND MICROSCOPE**

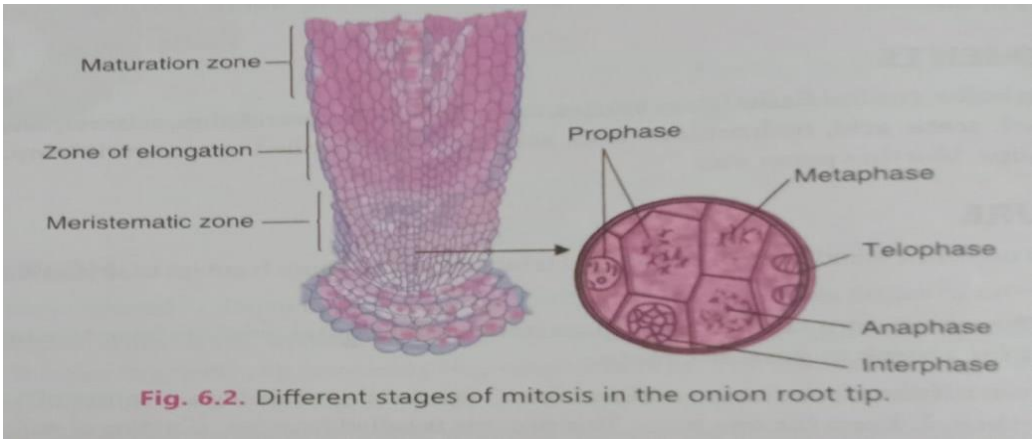


Fig. 6.2. Different stages of mitosis in the onion root tip.

## 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 and disappears.

3. The end of prophase is marked by the beginning of the organization of a group of fibres to form a spindle.

2. Metaphase

1. The chromosome become thick and two chromatids of each chromosome become clear.
2. Each chromosome attaches to spindle fibres at its centromere.
3. The chromosomes are arranged at the midline of the cell.

**3. Anaphase**

1. In anaphase each chromatid pair separates from the centromere and move towards the opposite ends of the cell by the spindle fibres.

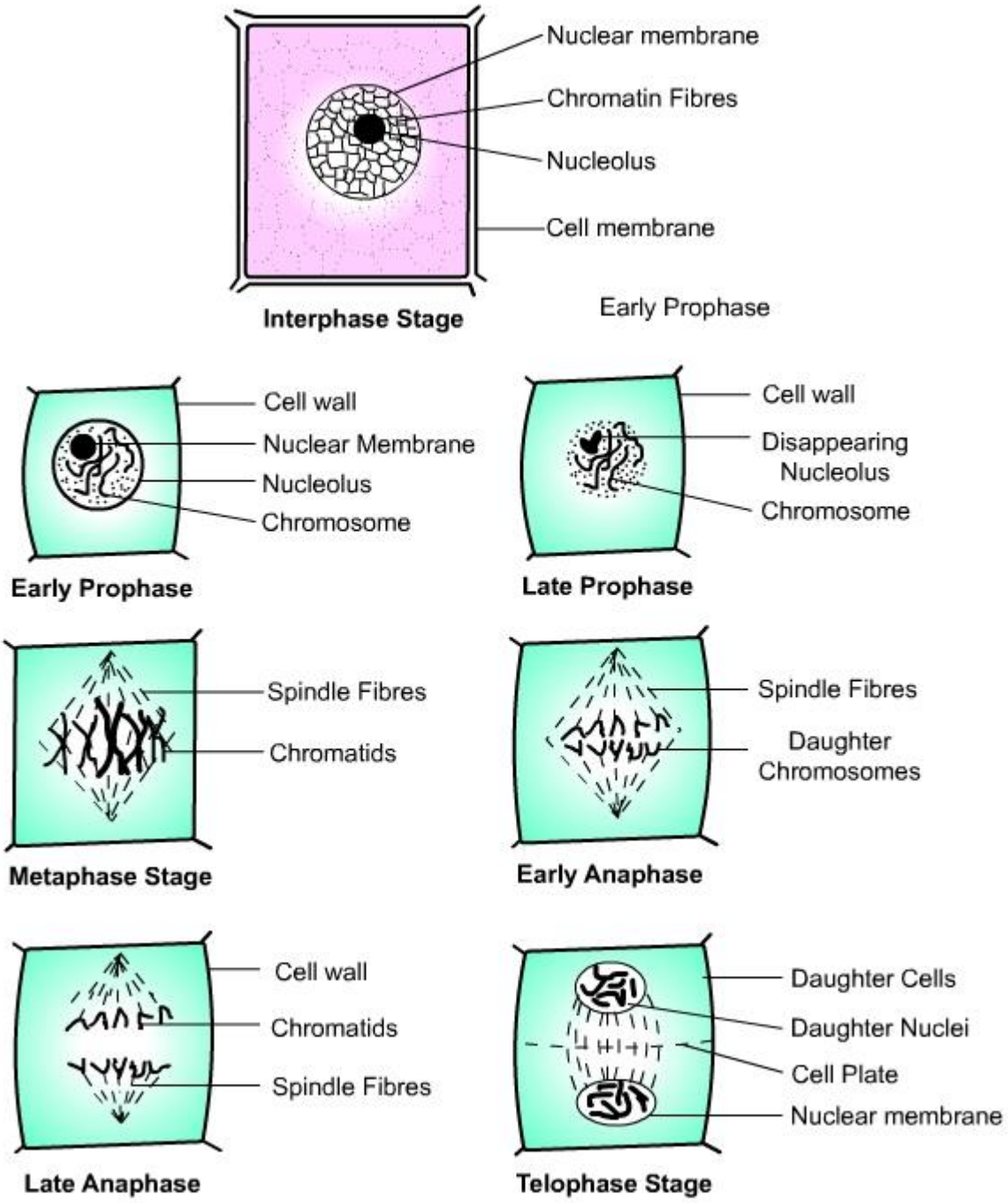
2.The cell membrane begins to pinch at the centre.

**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 the roots.**
2. **Root tip should be fixed in the morning between 8 to 10 am**
3. **The slide should be warmed gently much above the flame of the spirit lamp.**

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# 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
- Petri dish.
- Glass rods.
- Test tubes.
- Wire gauze.
- Filter Paper.
- Distilled water.
- Mortar and Pestle.
- pH paper booklet.
- Measuring cylinder.
- Universal pH indicator solution.
- Tin Box with a perforated bottom.
- Weighing scale or Electronic balance.

## Procedure

The following are the steps taken to prepare the soil samples for experiments to analyse various properties.

### To study the pH of the Soil Samples

- Take the collected roadside soil and garden soil into two different beakers containing water.
- Mix the test tubes with the soil solution slowly
- Now into a clean and dried two test-tube, arrange a funnel spread covered with a filter paper.
- Now gently pour the soil solutions into the test tubes separately.
- Let the water to completely filter off from the filter paper.
- 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 test tubes.
- Observe the changes.

**Observation**

When the universal pH indicator is added to the test tube containing the soil solution, the colour changes. These colour changes can be tracked using the pH colour chart. 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 a beaker.
- 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 shake well.
- Keep the apparatus undisturbed for a few minuted and wait for the particles to settle down.
- After a while, observe the changes in the measuring cylinder.
- The soil particles in the measuring cylinder will start to settle down in layers.
- Record the thickness of these layers

**Observation**

| Sr. No | Soil Samples | Colour | texture | Relative percentage | | | 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 a beaker.
- To a clean and dried mortar pestle add the collected soil sample.
- Now slowly grind the soil sample into a fine powder using a pestle.
- Place a filter paper at the bottom of the tin box.
- Weigh the entire contents of the tin box.
- Now, add the powered soil into the tin box.
- Use the glass rod to press and tap the box, so that the soil is uniformly layered.
- Now, the weight of the tin box is measured and to be recorded.
- Next, take two glass rods and place them parallel to each other. Ensure that the distance between the two is not long.
- Position the tin on the two glass rods in such a way that the bottom is in contact with the water.
- The complete setup should be left undisturbed until the water seeps through the upper surface of the soil.
- Now, remove the tin and allow all the water to flow out from the bottom.
- Wait until no more water percolates from the tin.
- Now wipe the bottom dry and use the weighing machine to note down the weight.
- Calculate the two different readings to know the water holding capacity of the given soil samples.

## 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 soil sample.

| 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 done accurately.

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

## 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.
- Test tube.
- pH paper.
- Glass slides.
- Cover slips.
- Filter paper.
- Secchi's Disk.
- Compound microscope.
- Universal Indicator solution.

# Procedure

**To study pH levels:**

- Take two clean and dried test tubes.
- Add the collected two different water samples into the two test tubes.
- For a safer side, label the test tubes as A and B.
- Dip the individual pH paper strips into the two different water samples.
- Keep the strips on the tile and wait for the strips to dry.
- Alternatively, pH levels of the water sample can also be found using the universal indicator solution.
- 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 colour chart.

# Observation

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

**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:

- Reach the centre of a pond in a boat.
- Immerse Secchi's disc into the water, lowering it eventually until the black and white segments are no longer visible.
- Mark the length on the rope, where the disk is not visible with a pin.
- Name this position as "A".
- Carefully, bring the disc back up and mark the length of rope where the disc becomes visible again.

- Name this position as “B”.
- Use a meter tape to measure the length of section A to B.
- Nnd the mean length of the rope by using X= (A+B)/2.

## Observation

The value of X tells us the depth of the photic zone. Below this level, enough light does not penetrate, hence, photosynthesis does not take place.

**To study the presence of living organisms**

- Take a clean dried test tube.
- Add the collected water sample, preferably from a pond, into the test tube.
- Leave the sample undisturbed, until the sediment settles at the bottom of the test tube.
- Transfer a drop from the test tube on to a glass slide.
- Gently place a coverslip on the slide using a needle.
- Observe the entire slide under a compound microscope.

## 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.

# EXPERIMENT 4

## Aim : To study the effect of different temperatures and pH on the activity of Salivary amylase on starch

## Material requirements :

- Water.
- Ice cubes.
- Test tubes.
- Droppers.
- Wire gauze.
- Thermometer.
- Bunsen burner.
- Saliva solution.
- Iodine solution.
- pH tablets of 5, 6.7, 8.
- Beaker with water and a thermometer.
- 15 ml 1% starch solution + 3 ml 1% NaCl.
- 3 series of test tubes, each containing iodine solution.

## Procedure

**Effect of Various Temperatures on the activity of salivary amylase on starch**

- Divide and pour the 15 ml 1% starch solution + 3 ml 1% NaCl solution into three test tubes and name them as A, B and C.
- Pour a few ice cubes in a beaker and ensure that they stay at 5 °C.
- Transfer tube- A to the beaker with ice.
- Take two more beakers and fill them with water.
- Heat the two beakers, one up to 37 °C and the other at 50 °C.
- Ensure that the temperatures for the two beakers are constant.
- Transfer test tube B into the beaker which is set at 37 °C.
- Similarly, transfer test tube C into the beaker set at 50 °C.
- Draw 1 ml of saliva solution and add it into test tube A. Do the same for test tube B and C.
- Quickly draw a few drops using a dropper from test tube A and transfer the same to the first series of test tubes having iodine solution.
- Repeat the same: transfer a few drops from test tube B and C into the second and third series of test tubes having iodine solutions.
- Note the time as “0-minute reading” and wait 2 minutes before proceeding to the next step.
- Draw a few drops from each tube and add it to the tubes with the iodine solution. Note the change in colour.
- Repeat the experiment in intervals of 2 minutes until the colour of iodine does not change.

**Effect of different pH levels on the activity of salivary amylase on starch**

- Divide and pour the 15 ml 1% starch solution + 3 ml 1% NaCl solution into three test tubes and name them as A, B and C.
- Add pH tablets 5, 6.8 and 8 into test tube A, B, and C respectively.
- Now add water into a beaker and boil it by placing it on a Bunsen burner.
- Transfer all the three test tubes into boiling water.

- Use a thermometer to ensure that the temperature of this water is to be maintained at 37 °C.
- Use a dropper to transfer 1ml of saliva solution to each of the three test tubes.
- Immediately transfer a few drops from test tube A to the first series test tubes containing iodine solution.
- Repeat the same for test tube B and C, transferring the same to series 2 and 3 test tubes respectively.
- Note the time as “0-minute reading” and wait 2 minutes before proceeding to the next step.
- Draw a few drops from each tube and add it to the tubes with the iodine solution.
- Note the change in colour.
- Repeat the experiment in intervals of 2 minutes until the colour of iodine does not change.

## Observation

**Effect of Various Temperatures on the activity of salivary amylase on starch:**
The test tube at 37 °C reaches the achromic point quickest compared to the other two. At high temperatures, the enzyme gets denatured and at low temperatures, the enzyme is deactivated. Hence, it takes more time for starch to be digested at temperatures outside 37° C.

**Effect of different pH levels on the activity of salivary amylase on starch**

The salivary amylase did not react in the tubes that had pH tablets of 5 and 8. It only reacted with the tube that had the pH tablet 6.8. The pH is considered acidic when it is level 5. A pH of 8 is considered to be alkaline. A pH of 6.8 s considered to be slightly acidic.

**Video link https://youtu.be/iaqxTaXit9M**

## EXPERIMENT 5

**Aim:** Isolate DNA from available plant material such as spinach, green pea seeds Papaya etc.

**Material required :**

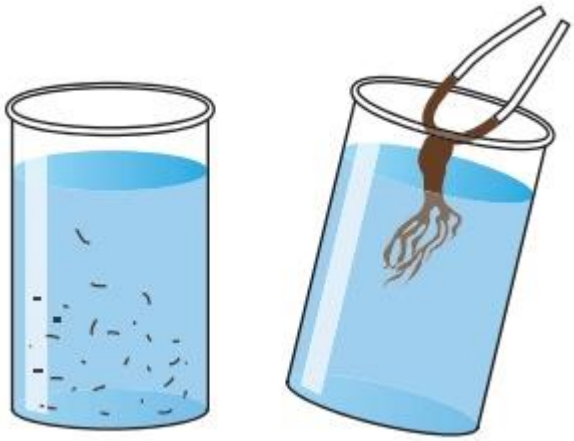
- Any available plant materials
- Mortar and pestle
- Test tubes
- Beakers
- Ethanol
- Spool
- Enzymes (Cellulase, ribonuclease, lipases, protease)

## Procedure

- Take the available plant material and grind it in the mortar.
- Treat the material with cellulase to break down the cell wall of the plant cells.
- Next, treat it with protease to hydrolyze the peptide bonds of proteins in the plant material. In other words, the enzyme removes the histone proteins which are intertwined with the DNA.
- Dissolve RNA with ribonuclease
- Use lipase to dissolve lipids.
- Add chilled ethanol to enable the precipitation of the DNA. It essentially increases DNA concentration.
- Use spooling to extract the precipitated DNA. Spooling involves winding the fine threads of DNA on to a reel.

## Observation

The DNA appears as white precipitates of fine thread on the spool.



## Isolation of DNA

## Precautions

**1.** The plant material should be washed thoroughly with distilled water to remove any dust and dried by blotting before weighing

**2.** All the glasswares are used must be thoroughly cleaned and dried.

3. The chemicals and enzymes used for the experiment must be of standard quality which should be manufactured by standard pharmaceutical

**Video link https://youtu.be/a7cTlZpj--0**

## B Study / observation of the following ( spotting )

## Experiment 6

## Aim : To study flowers adapted to pollination by different agencies ( wind ,insects, birds)

### Material Required

- Fresh flowers
- Magnifying glass

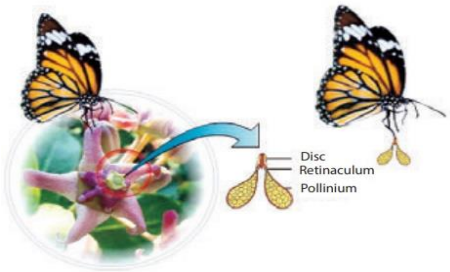



**Figure 5b:** *Calotropis*

### Theory

### What is Pollination?

Pollination is the process of transferring pollen from the male anther of a flower to the female stigma of the same or different flower. Pollination can be carried out by different agents such as wind, water, birds, insects, etc.

Following are a few observations of the flowers that are adapted to pollination by wind, insects and birds.

### Flowers Pollinated By Wind

Most of the conifers and angiosperms exhibit wind pollination. Such flowers do not produce nectar and fragrance. In the flowers pollinated by the wind, the microsporangia hang out of the flower. As the wind blows, the light-weight pollen blows with it. The pollen gets accumulated on the feathery stigma of the flower. These flowers appear even before the leaves when the spring commences. Few examples of such flowers include:

- Rice
- Corn
- Oats
- Maize
- Barley
- Papaya

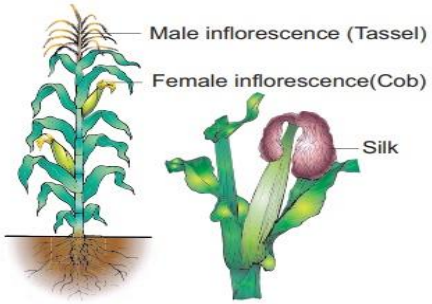



Figure 5a: Maize

### Flowers Pollinated By Insects

The flowers pollinated by insects are bright-coloured and produce nectar. The fragrance of the flowers attracts the insects. The pollen is sticky, large, heavy and rough so that stick to the body of the insects. The stigmas are also sticky so that the pollens depositing are not dispersed. Nectar guides are present on the petals. Few examples of the flowers pollinated by insects are:

- Aster
- Lithops
- Magnolia

### Flowers Pollinated By Birds

The flowers pollinated by birds are strong and are adapted to allow the birds to stay near the flowers without their wings getting entangled in them. The flowers are tubular and curved that facilitates nectar-sucking by birds. The flowers are odourless and bright-coloured that attracts the birds. While sucking the nectar, the pollen gets deposited on their beaks and neck and is transferred to the plant they visit next. Few examples of flowers pollinated by birds include:

- Hibiscus
- Fuchsias
- Verbenas
- Beebalms
- Bromeliads

## Video link https://youtu.be/ge3EM8AERV0

**EXPERIMENT 7**

**Aim : Identification of stages of gamete development, i.e., T.S. of testis and T.S. of ovary through permanent slides (from grasshopper mice).**

**Materials required**

## aterials Required

- Permanent slides of T.S. of testes.
- Permanent slides of T.S. of the ovary.

## Procedure

### T.S. of Testes of Mice

- The testes comprise several seminiferous tubules embedded in the interstitial tissues.
- Thick fibrous tissues called tunica albuginea cover the testes.
- It comprises different types of cells from the outside to the lunar in the manner given below:

Spermatogonia → Spermatocytes → Spermatids → Spermatozoa (sperms)

- Sertoli cells are located between the germinal cells.
- The Leydig cells that produce testosterone are present in the interstitial tissues.

### T.S. of Ovary of Mice

- An ovary is a germinal epithelium bounded by a solid structure covered by a thick layer of fibrous tissue known as tunica albuginea.
- It consists of an inner medulla and an outer cortex.
- The medulla comprises several round or oval bodies known as ovarian follicles.
- Follicle development takes place in the following stages:

1°follicle → 2°follicle → 3°follicle → Graffian follicle → Corpus luteum

- Cortex comprises corpus luteum along with mature follicles.

## Precautions

- The microscope should be handled with care.
- Adjust the lens such that the focus is better.

**Video link https://youtu.be/LLyG3sh6N7A**

# EXPRIMENT 8

## Aim : Meiosis in onion bud cell or grasshopper testis through permanent slides

## Material required

**Permanent slides of meiosis**

- Compound Microscope

## Procedure

1. Place the slide on the stage of the microscope.
2. Look for dividing cells with lower magnification.

### Observations

**The different stages of meiosis are observed along on the basis of the following features.**

### Stages of Meiosis I

### Prophase I

In this stage, the chromosomes condense and move towards the centre of the cell. It consists of five different sub-phases:

- Leptotene: The homologous chromosomes replicate.
- Zygotene: Synapsis between homologous chromosomes start.
- Pachytene: The sister chromatids separate but the homologous chromosomes remain attached.
- Diplotene: The two homologous chromosomes migrate apart and disintegrate between the chromosomal arms.
- Diakinesis: The condensation of chromosomes stops at this stage and the chiasmata is clearly visible under an electron microscope. The nucleolus and the nuclear envelop disappear at this stage and the centrosome moves to the equator.

### Metaphase I

The homologous chromosomes that contain two different alleles for each gene, line up on the metaphase plate to be separated.

### Anaphase I

The separated chromosomes are pulled towards the centrioles on either side of the cell.

### Telophase I

The chromosomes are completely pulled apart and new nuclear envelope forms.

### Stages of Meiosis II

### Prophase II

In this stage, the nuclear envelope disintegrates and centrioles develop.

### Metaphase II

The chromosomes line up on the metaphase plate and the chromatids are on either side of the metaphase plate.

## Anaphase II

The sister chromatids separate and are known as sister chromosomes.

## Telophase II

The cell divides into two and a new nuclear envelope surrounds the chromosomes.

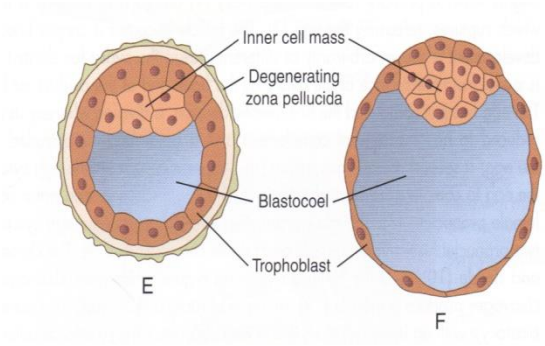
# EXPERIMENT 9

**Aim:** T.S. of blastula through permanent slides (Mammalian).

## Material required

**Permanent slides of meiosis**

- Compound Microscope




Procedure

1. Place the slide on the stage of the microscope.
2. Look for dividing cells with lower magnification.

**Observations**

The different stages of meiosis are observed along on the basis of the following features.

### Stages of Meiosis I

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### Anaphase I

The separated chromosomes are pulled towards the centrioles on either side of the cell.

### *T*elophase I

The chromosomes are completely pulled apart and new nuclear envelope forms.

### Stages of Meiosis II

### Prophase II

In this stage, the nuclear envelope disintegrates and centrioles develop.

### Metaphase II

The chromosomes line up on the metaphase plate and the chromatids are on either side of the metaphase plate.

Anaphase II

The sister chromatids separate and are known as sister chromosomes.

**Telophase II**

The cell divides into two and a new nuclear envelope surrounds the chromosomes.

## Precautions

## 1. First focus the slide under low power and then under high power of the microscope

## 2 use fine adjustments while focusing the slide under high power of the microscope

# EXPERIMENT 10

## Aim To prepare pedigree charts of any one of the genetic traits such as rolling of tongue, blood groups are lobes, widow's peak and colour blindness

To prepare and analyse the pedigree charts.

### Requirements

Information about traits in a family for more than one generation.

### Procedure

1. Select a family with anyone of the monogenic traits like rolling of tongue, blood groups, ear lobes, widow's peak, and colour blindness.
2. Ask the person exhibiting the trait as to who in his/ her family has the trait in question.
3. Prepare a pedigree chart on the basis of the information collected, using appropriate symbols.
4. Examine the pedigree chart carefully to find out whether the disease is autosomal recessive, autosomal dominant, X-linked dominant or recessive, and Y-linked dominant or recessive.

### Explanation

Autosomal Dominant Trait- Blood Groups, Free hanging earlobes, Widow's Peak, Rolling of tongue

The encoding gene for these genes is present on any of the autosomes. In these traits, the mutant allele is dominant.

Such type of traits exhibit the following features:

1. The traits get transmitted from the parents to either gender.
2. It affects males and females equally.
3. The trait is present in each of the generations, i.e., the pedigree is vertical.
4. Some common traits of this type include blood groups, polydactyly, brachydactyly, the dimple in cheeks, etc.

### Autosomal Recessive Trait

The mutant allele of such traits is recessive. Salient features of such type of traits include:

1. It is found equally in multiple male and female siblings whose parents are carriers.
2. Homozygous siblings for defective alleles, but parents are heterozygous.
3. If men and women who are genetically related are married to each other, they might exhibit this trait.

### X-Linked Dominant Traits

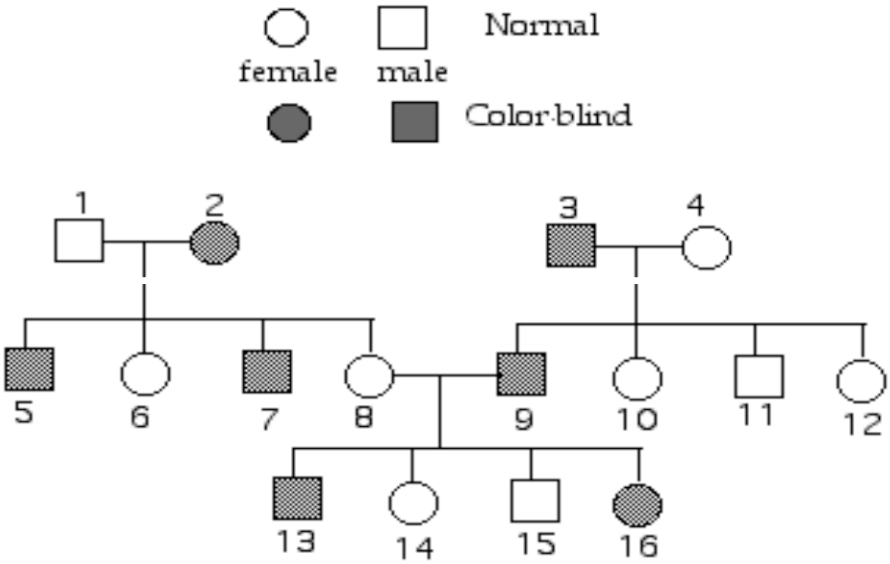
The encoding gene for such traits is located on the X chromosome. The mutant allele is dominant in this trait.

The features of such type of traits are:

1. Inheritance is vertical and is found in all the generations.
2. If the female is affected, half of her sons are also affected.
3. If the male is affected, all the daughters will be affected but no sons will be affected, i.e., there is no male-to-male transmission.

## X-Linked Recessive Traits- Colour Blindness

In humans, color blindness is caused by a **recessive sex-linked** allele. Examine the pedigree of color-blindness below. On the diagram, label the genotypes of every individual. Note: If the gene is on the Y chromosome (Y-linked), we would write it as $Y^b$, and a male with this trait would be written as $XY^b$ .If the allele is on the X chromosome (X-linked), we would write it as $X^b$, and a heterozygous female would be $X^BX^b$ (1 pt)



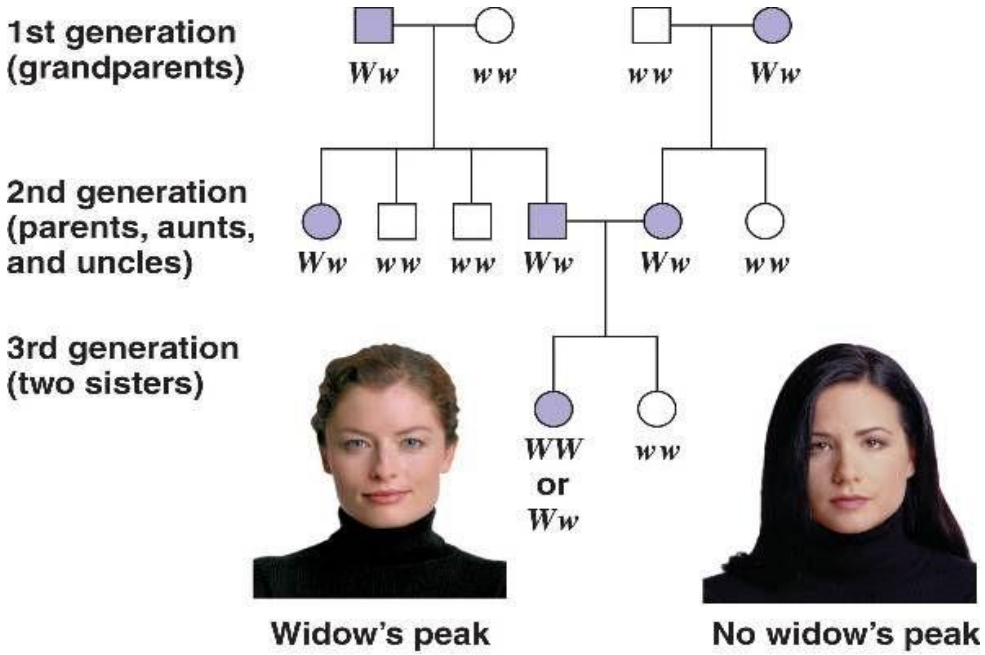

In such type of traits, the mutant allele is recessive to the wild type allele. The features of X-linked recessive traits include:

1. This is expressed only by homozygous females but homozygous and hemizygous males.
2. If the female is the carrier, about half the sons are affected. If the female is homozygous, 50% of the daughters and 100% of the sons can be affected. That is why the male population is the most affected.

**Read More:** Colour Blindness

## Y-chromosome Linked Traits

The gene for such traits is present on the Y-chromosome. Any trait linked to Y-chromosome is found only in males and not in females because the Y-chromosome is present only in males. All the sons of the affected male exhibit the trait, whereas, none of the daughters exhibits the trait.




**Video link https://youtu.be/Gd09V2AkZv4**

## EXPERIMENT 11

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

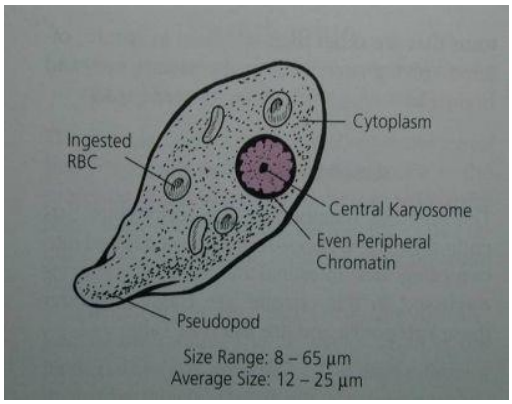
## Material required

Preserved slides or specimens of disease-causing organisms like Ascaris, Entamoeba, Plasmodium and 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. It has a long, cylindrical and unsegmented body.
2. The male and female organisms are separate.
3. It bears a mouth at the anterior end surrounded by three lips.
4. There is an excretory pore on the ventral surface slightly behind the anterior end.
5. A pair of penial spicules are present in the male worms close to the cloacal opening.
6. The female genitals are present at about one-third distance from the anterior end.

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

**Symptoms:**

- Abdominal cramping
- Abdominal swelling
- Nausea
- Vomiting
- Fever

### Entamoeba

**Phylum:** Protozoa

**Class:** Rhizopoda

**Type:** *Entamoeba hystolytica*

Following are the characteristic features of Entamoeba:

1. It is a unicellular organism with an irregular shape.
2. It consists of a few food vacuoles. The contractile vacuole is absent.

3. Cysts with four nuclei are present.
4. It consists of a nucleus located eccentrically in the cell.

*Entamoeba histolytica* is an organism found in the intestines of humans that is responsible for causing amoebic dysentery.

**Symptoms:**

- Abdominal pain
- Watery diarrhoea with mucus, blood and pus
- Fatigue
- Fever
- Nausea
- Vomiting

### Plasmodium

**Phylum:** Protozoa

**Class:** Sporozoa

**Type:** *Plasmodium vivax*

Plasmodium can be identified by the following characteristic features:

1. It is a unicellular endoparasite found within the red blood cells of the diseased person.
2. The parasite is mostly diagnosed at the “signet ring” stage where the parasite appears as a round body.
3. There is a big vacuole present inside the cell. The cytoplasm is accumulated at one place and contains the nucleus.

*Plasmodium vivax* is a protozoan parasite that causes malaria in humans. The infected female anopheles bites a healthy person and transmits the sporozoite into the peripheral blood vessels of humans, thereby, causing malaria.

**Symptoms:**

- High fever
- Shaking chills from moderate to severe.
- Headache
- Vomiting
- Nausea

## Ringworm Draw diagrams of your own

**Kingdom:** Fungi

**Class:** Deuteromycetes

**Type:** *Trichophyton rubrum*

Trichophyton or ringworm fungus has the following characteristic features:

1. This fungus feeds on the keratin of the skin of human beings.
2. The hyphae are waxy and can be smooth or cotton-like.
3. Hyphae that are not stained are yellowish-brown, reddish-brown or white in colour.

Ringworm is a communicable fungal infection of the skin.

**Symptoms:**

- Scaly, itchy skin
- Red and raised patches

- They are redder at the periphery than at the centre and forms a ring-like appearance.

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

# Experiment 12

## 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

Cacti

Pineapple

**Morphological Features:**

- **Succulence: These plants have special cells with water holding capacity in low moisture conditions.**
- **Reduced Leaves**: The leaves are reduced to spines that help in reducing excess loss of water through transpiration.
- **Stomata**: In these plants, the stomata are either few on in sunken pits below the surface of the leaves.
- **Waxy, hairy and spiny outer surfaces**: The hair and spines scatter light to reduce sun's effect. The waxy covering holds in water.
- **Roots near the surface**: These have the capacity of holding water quickly and can regenerate easily after rain.

### Two Xeric Animals

Camel

Sandfish

**Morphological Features:**

- **The desert animals are poikilotherms, i.e., they can match their internal temperature to the external.**
- They excrete nitrogenous waste in the form of uric acid.
- They undergo hibernation.
- The animals stay in burrows to avoid water loss from the body and excrete highly concentrated urine.
- The body temperature of camels increases by 7℃ during the late afternoon that decreases the heat flow from the environment. The fur reduces the heat gain from the environment.

Thus these adaptations help them to conserve water as much as possible and prepare them to live without water if required.

## Experiment 13

## 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
- Water Hyacinth

**Morphological Adaptations:**

1. Aquatic plants have very thin cuticle or no cuticle at all because the cuticle prevents water loss.
2. There are a number of stomata on either side of the leaves. The stomata are always open.
3. They are less rigid in structure.
4. They have specialized roots to take in oxygen.
5. The leaves on the surface are flat to facilitate floating. Also, the presence of air sacs helps them to float.
6. The roots are very small.

**Two Aquatic Animals**

- Fish
- Turtle

**Morphological Adaptations:**

1. They inhale oxygen through their gills or skin. Marine mammals have lungs and have to come to the surface to breathe.
2. They are cold-blooded, i.e., their body temperature is the same as the surrounding environment.
3. The collapsible lungs and rib cages help them to withstand very high water pressures.
4. The aquatic animals at great depths are bioluminescent, i.e., they emit light to attract preys and mates.
5. They have the property of osmoregulation, i.e., the fish can maintain an internal environment of salt and water.

https://youtu.be/4GwZ3Aw2oF0