

Student Worksheet**Time : 15 minutes**

Instructions: Given below is a worksheet in which certain steps related to the conduction of information through neurons are given in a tabular form. They have not been placed in the correct order. Allot a number to each step in order put them in correct sequence.

Step number	Description of the Step
	The electrical impulse travels along the dendrite
	An electrical impulse is created at the dendrite.
	Stimulus provides the information.
	Information is acquired at the end of the dendritic tip of the nerve cell.
	The electrical impulse travels from cell body to axon to the end of axon.
	The chemicals cross the synapse and reach the dendrite of the next neuron.
	The information sets off a chemical reaction
	The electrical impulse travels from dendrite to the cell body.
	The chemicals start a similar electrical impulse in the dendrite of the next neuron.
	At the end of the axon, the electrical impulse sets off the release of some chemicals

Criteria for Assessment: $\frac{1}{2}$ mark for each correctly numbered step

Total: $\frac{1}{2} \times 10 = 5$

Suggested Remediation :

- A few students may not be able to number the steps in the proper sequential order. The teacher may provide hints or ask the students to write the steps on different pieces of paper and then arrange them near the diagram of nerve cell.
- The Teacher may also prepare a worksheet where the events are written in the correct sequence but some key-works are missing (close activity or fill in the blank). A word bank may also be provided.

Control and Coordination**Chapter 7**

Assessment Technique : Activity Match-the-events' based Worksheet

Objectives : To enable the students to

- Understand how control and coordination takes place in plants and animals
- Recognize the chain of events that occur after a stimulus is received
- Associate the chain of events that occur after a stimulus, to the response
- Appreciate the role of hormones and nervous system in initiating a response



Task : Individual Work**Approximate Time : 15 Minutes****Procedure:**

- The students are given a worksheet that contains a table about stimuli and responses that occur in plants and animals.
- The stimuli are given in the bottom row and the responses in the top row of the table
- In the middle rows of the table are the chain of events that lead to a particular response.
- Using connecting lines, the students will connect each stimulus to the chain of events and finally to the response it produces.
- The students may use different colours for different events.
- One example has been done in the table.

Student Worksheet**Time : 15 minutes**

MM = 5

Instructions: Given below is a table of various stimuli and responses that occur in plants and animals. The stimuli are given in the bottom row the responses in the top row. In the middle rows of the table are the “chain of events” that lead to a particular response. Using connecting lines, connect each stimulus to the chain of events and finally to the response. You may use a different colour for each event. One example has been done for you.

It clings to the object	Body ready to deal with emergency situation	Leaves droop	Suggested Remediation mechanism	Plant appears to bend towards light	Hand is moved away
Insulin secretion reduced	More oxygen to muscles	Cells on the side exposed to light do not grow at the same rate	Signal moves to motor neuron	Movement occurs	Tendrils circle around the object
Cells on the 'shady' side grow longer	Signal from sensory neuron to spinal cord	Amount of water in the cells changes	Heart beats faster	Unequal growth	Blood sugar level falls
Blood carries hormone to different parts of the body	Cells change shape	Receptor sends message to a neuron	Part of the tendril close to the object does not grow as rapidly	Auxin diffuses to shady side	The cells release more insulin
Electrical-chemical signals move from cell to cell	Detected by pancreas	Receptor = skin	Synthesis of auxin at shoot tip	Part of tendril away from the support grows rapidly	Adrenalin secreted
Touching a hot object	Emergency situation	Touching a leaf (touch-me-not Plant)	Sugar level in blood rise	Tendrils of pea plant come in contact with support	Light on a growing plant from one direction



Criteria for Assessment: Marks for each correct 'chain of events' = 1

Total: $1 \times 5 = 5$

Suggested Remediation :

- Some students may not be able to connect the stimuli to chain of events and finally the response. Such students may be explained the concepts again and then given a similar worksheet.
- The teacher may show demonstrations of the 'stimulus' and the related 'response' before the worksheet is given to the students.
- Alternatively, a group activity may be given to the students who have not been able to get a good score in this worksheet. The group activity may involve a single stimulus-response (allotted by the teacher) where the students have to identify and exhibit the chain of events through a model, a wall magazine or a Power Point presentation.

Control and Coordination

Chapter 7

Assessment Technique : Diagram based work sheet

Objectives : To enable the students to

- Recall the names of various endocrine glands present in our body
- Recognise the importance of the role these glands play in body metabolism
- Identify the location of endocrine glands in our body
- Correlate the glands with their respective function/functions
- Appreciate the balancing act of hormones, secreted by these glands
- Differentiate between endocrine glands and exocrine glands

Task :

Individual Work

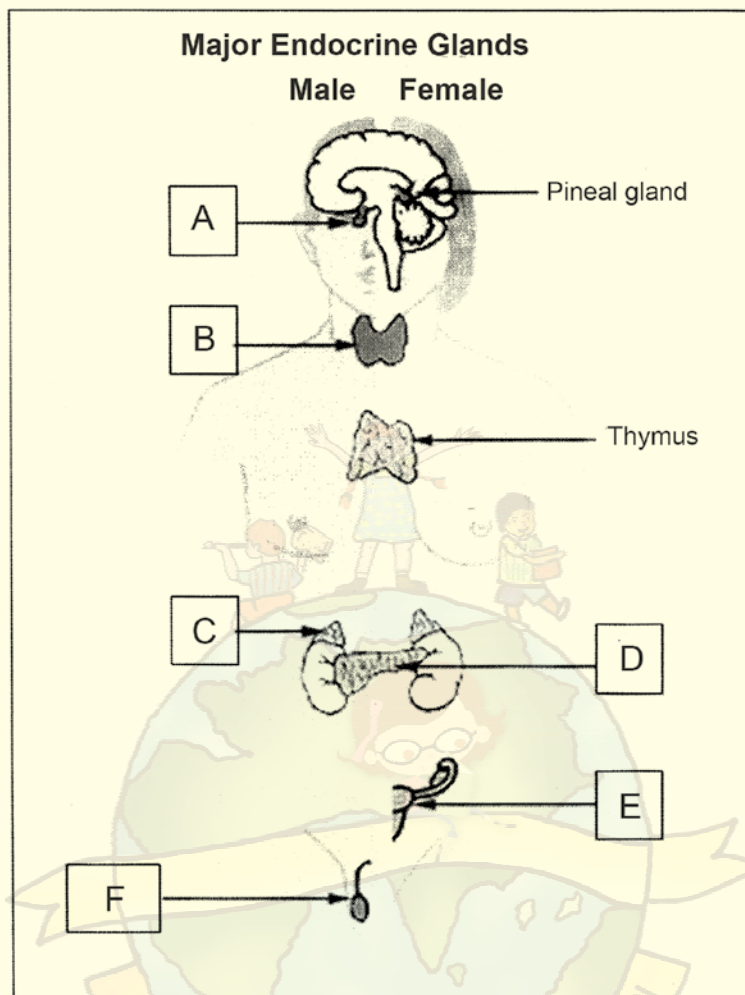
Procedure : This worksheet may be given to the students to assess their basic understanding of endocrine glands and their coordinating role in body's functions, after completing the unit.

Student Worksheet

Time : 15 minutes

Instructions : Observe the diagram given below carefully and write names of the endocrine glands A, B, C, D and E in the given boxes. Mention, name of one hormone produced each of these glands, in the table provided One example (F) has been done for you.





S.No.	Endocrine Gland	Hormone released
1	A =	
2	B =	
3	C =	
4	D =	
5	E =	
6	F = Testis	Testosterone

Criteria for assessment : Each correct labeling (name of the endocrine gland) = ½ mark

Name of the hormone = ½ mark

Total: ½ × 5 + ½ × 5 = 5 marks

Suggested Remediation :

- Students may find it confusing to differentiate between endocrine and exocrine glands. It may be difficult for an average student to remember the names of all glands and the hormones secreted by them.



- Teacher may guide students to read the names of glands given in the diagram after carefully observing the location of the glands.
- A 'Match the following' worksheet (endocrine glands and hormones) may be given to the students to know more about endocrine system.

Extra Worksheet (need not be evaluated)

- ◆ Hormone - A hormone is a chemical secreted by an endocrine _____ and carried by _____ to target organs where it performs a specific _____.
- ◆ Functions of Hormones Based on the time taken to produce an action the hormones may be fast-acting (e.g. Adrenaline a hormone that increases heart _____ and breathing rates when we get a fright), or may be slow-acting (e.g. Human Growth Hormone regulates the many body processes involved in _____).
- ◆ Complete the following table:

Endocrine Gland	Hormone Secreted	Target Organ	Function
Pituitary	human growth hormone	all cells	
	antidiuretic hormone	kidneys	
Thyroid	Thyroxine	all cells	
Parathyroid	parathyroid hormone	bones, kidneys	
Adrenal	adrenaline ('fight or flight' hormone)	most cells	
Pancreas	insulin	all cells	
	glucagon	all cells	
Gonads (Testes and Ovaries)	oestrogen	sex organs	
	progesterone	sex organs	
	testosterone	sex organs, muscle	



The Clues

Across:

- 1- Malarial parasite reproduces this way
- 4- Male reproductive part of a flower
- 5- Also called 'Future shoot'
- 6- Female reproductive part of a flower
- 7- A contraceptive that creates a mechanical barrier
- 9- An organism that reproduces by budding and regeneration
- 11- The leaves of this plant produce buds for reproduction

Down:

- 2- In animals, embryo gets nutrition through.....
- 3- A sexually transmitted disease
- 8- This part of the flower ripens to form a fruit
- 10- It passes from one generation to the other

Criteria for Assessment :

Marks for each correct word added in the puzzle = $\frac{1}{2}$ (Total Marks: $\frac{1}{2} \times 10 = 5$)

Suggested Remediation :

- A few students may not be able to guess the correct terms/names. The teacher may help them by giving additional hints which may be in the form of pictures.
- If the students have not learned the characteristics, or, if this activity is given before the chapter is discussed in class, then the students may be allowed to use the text book.

How do Organisms Reproduce?

Chapter 8

Assessment Technique : Flower and Seed Dissection

Objectives: To help the students to :

- Identify the different parts of a flower and a seed
- Differentiate between male and female reproductive structures in flowers.
- Develop the skill of dissection
- Recognise the various parts of a seed and a flower.



Task : Group Work / Individual Work

Time Required : 30 minutes

Procedure :

1. The class is divided into groups of 2-4 students.
2. Each group may be asked to bring a flower and a few seeds that have been soaked overnight in water.
3. The students may be asked to bring any of the following flowers and seeds-

Suggested flowers : China Rose, Tube rose, salvia, poppy, Lily

Seeds : Bengal Gram, green Moong, Kidney Beans (Rajma)

4. The students may also be asked to bring some material like: scissors, brush, hand- lens, needle, two white/coloured sheets of paper.
5. The teacher may guide the students and provide a list of parts that have to be displayed:

For example, Parts to be displayed during flower dissection- Stalk, Sepal, petal, stamen, pistil (or just stigma and style)

Parts to be displayed during seed dissection: Cotyledon, plumule, radicle (or just embryo and cotyledons).

Each group shall dissect one flower and one seed. They shall remove the parts one-at-a-time and place them on the sheet of paper giving appropriate names to identify the parts.

Criteria For Assessment :

This activity may be assessed on the basis of the following criterion:

- Dexterity in Dissection (Skill)
- Correct identification of parts
- Besides this, each student may be asked questions individually by the teacher to assess his/her understanding (Viva).

Marking may be done in the following manner:

S.N.	Name of the Student	Group	Dexterity in Dissection (Skill) (2)	Correct identification of parts (2)	Viva (1)	Total (5)



Suggested Remediation:

- A few students may not be able to dissect the flower or seed properly. The teacher may help them so that they are able to perform the activity skillfully.
- Some students may not be able to identify the parts of the flower/ seed. The teacher may check to ensure that the flower/ seed that is being dissected is not damaged. She may also provide a picture /diagram of the dissected flower / seed so that the students know what is expected from them.
- In case, there are more number of students who are unable to dissect the flower / seed, the teacher may draw the required diagrams on the Blackboard or demonstrate the activity before it is done by the students.

How do Organisms Reproduce ?**Chapter 8**

Assessment Technique : Individual Worksheet MCQ based)

Objectives : To enable the students to

- Identify the parts of an organism involved in reproduction
- Learn the names and functions of different parts of the reproductive system/ reproductive structures.
- Understand the difference in structure, location and function of the reproductive parts organs
- Appreciate the relationship between the reproductive part / organ, its structure and its function

Task :

Individual Work

Approximate Time :

20 Minutes

Procedure :

The worksheet that has the multiple choice questions (MCQs) is given to the students. The students have to select the correct answer from the four different choices given for each question.

Student Worksheet

Time : 15 minutes

Instructions: Select the correct option from the four different choices given for each question.

1.	The information source for making proteins is		
a.	Rough Endoplasmic reticulum	c.	DNA
b.	Hormones	d.	Enzymes



2.	Binary fission in some organisms occurs in definite orientation in relation to the cell structures. One such organisms is:		
a.	Leishmania	c.	Amoeba
b.	Plasmodium	d.	Bacteria

3.	Plants that have lost their capacity to produce seeds, reproduce by		
a.	Spores	c.	Fission
b.	Vegetative propagation	d.	Regeneration

4.	A stamen consists of two parts namely:		
a.	Anther and style	c.	Anther and filament
b.	Stigma and style	d.	Filament and style

5.	A bisexual flower contains		
a.	Stamens only	c.	Either stamens or carpels
b.	Carpels only	d.	Both stamens and carpels

6.	The part of the flower that ripens to form a fruit is:		
a.	Ovule	c.	Carpel
b.	Ovary	d.	Egg cell

7.	The testes perform the following function/functions:		
a.	Produce testosterone	c.	Produce male gametes and hormone
b.	Produce sperms	d.	Produce sperms and urine

8.	Fertilisation in human beings takes place in		
a.	Uterus	c.	Cervix
b.	Vagina	d.	Fallopian Tube



9.	Condom is a method of control that falls under the following category:		
a.	Surgical Method	c.	Mechanical method
b.	Hormonal Method	d.	Chemical Method

10.	The common passage for sperms and urine in the male reproductive system is:		
a.	Ureter	c.	Seminal Vesicle
b.	Urethra	d.	Vas deferens

Criteria for Assessment : Marks for each correct answer = $\frac{1}{2}$ (Total Marks: $\frac{1}{2} \times 10 = 5$)

Suggested Remediation:

- A few students may not be able to give the correct answers to a few questions. The concepts related to such questions may be explained again. The students may be asked to answer similar questions after a few days.

How do Organisms Reproduce ?

Chapter 8

Assessment Technique

Model Making

Objectives: To enable the students to

- Identify the different parts of a flower
- Learn the names and functions of different parts of a flower
- Understand the relationship between size, location and function of parts of a flower
- Appreciate the relationship between various parts of a flower and their role in reproduction

Task :

Group Work

Approximate Time :

Two hours (can be done as work home too)

Procedure :

1. The class is divided into groups of 3-4 students.
2. Each group may prepare a model of a flower highlighting the parts of a flower.
3. The time-frame for completion of work and display is conveyed to the students.

(The teacher may allot a space in the desired area (classroom, laboratory, corridors etc) for display.



The following guidelines may be given to the students :

- The size of the model : 18” by 18”
- Materials used (Suggested, the student may use other materials too): Board for the base, clay dough, beads, yellow soil, handmade paper, paper flags for labeling etc.
- **Student Activity:** The students shall prepare the model of a flower showing the parts required for various functions.

Criteria for Assessment :

The Model may be assessed according to the following criteria

- Presentation of the model*
- Placement of the structures/Accuracy**
- Besides this, each student may be asked questions individually by the teacher to assess his/her understanding and level of contribution (Viva).***

Marking may be done in the following manner:

S. N.	Name of the Student	Group	Presentation (1½)*	Placement of structures/Accuracy (1½)**	Viva (2)***	Total (5)

* = Availability of material used
Cost effectiveness -Durability

** = Relevance to the chosen topic -Aesthetically pleasing -Explicitly conveys content

*** = Two questions based on the model

Suggested Remediation :

- The models made by some students may not be very accurate or presentable. The teacher may allot a buddy to such groups from another then group that has done well.
- The students may also be asked to do peer assessment and give suggestions to the group they are assessing so that they may improve their work. The groups may be allowed to make the improvements and then their work can be reassessed.



Heredity and Evolution

Chapter 9

Assessment Technique

Activity based Worksheet

Introduction: Industrial Melanism is a term used to describe the adaptation of a population in response to pollution. One example of rapid industrial melanism occurred in populations of peppered moths in the area of Manchester, England from 1845 to 1890. Before the industrial revolution, the trunks of the trees in the forest around Manchester were light grayish-green due to the presence of lichens. Most of the peppered moths in the area were light colored with dark spots. As the industrial revolution progressed, the tree trunks became covered with soot and turned dark. Over a period of 45 years, the dark variety of the peppered moth became more common.

Objectives: To enable the students to

- Describe the importance of coloration in avoiding predation
- Relate environmental change to adaptive changes in organisms
- Explain how natural selection causes populations to change over a period of time
- Analyze how colour affects the organism's ability to survive in certain environments

Task : Group activity (2 students) followed by Individual worksheet

Approximate Time: 30 minutes (15 minutes for activity and 15 minutes for worksheet)

Procedure : In lab, teacher may simulate how predators locate prey in different environments. Teacher may tell students about Industrial Melanism in England.

Then the students may be asked to perform the following activity:

1. Cut 30 circles from newspaper and 30 circles from white sheet (can be made with punching machine). These are symbolic of two types of Moths.
2. Place a sheet of white paper on the table and have one student spread 30 white circles and 30 newspaper circles over the surface. Ensure that the other student) isn't looking.
3. The other student is a "predator", who will now use forceps to pick up as many of the circles as he can in 15 seconds.
4. Record your data in the row for 'trial 1' in the table.
5. Repeat this activity and record your data in the row for 'trial-2' in the table.
6. Repeat this trial with 30 white circles and 30 newspaper circles on a newspaper background.
7. Record your data in the row for 'trial 3' in the table.
8. Repeat this activity and record your data in the row for 'trial-4' in the table.



Trial	Background	Starting Population		Number Picked up	
		Newspaper circles	White circles	Newspaper circles	White circles
1	White	30	30		
2	White	30	30		
3	Newspaper	30	30		
4	Newspaper	30	30		

Student Worksheet

Time: 15 minutes
MM= 5

Instructions : Observe the data filled in the table and answer the following questions on the basis of pattern you have observed.

1. Which moth(circle) coloration is the best adaptation for a dark (newspaper) background?
2. Give one evidence for your answer given in question 1.
3. Which coloured moth would be found in larger numbers in the next generation after trial 1?
4. Which coloured moth would be dominating the population after three generations?
5. What is this phenomenon called as?

Criteria For Assessment : Each correct answer = 1 mark

Total = $1 \times 5 = 5$

Suggested Remediation : The students must be made aware of the sources of error that may be responsible for incorrect data. Some such sources of error are:

- The circles that have been prepared using the 'punching machine' may not have been counted properly.
- At times, these circles tend to stick to one another, so care should be taken that they are separated properly.
- The newspaper that is used for cutting circles and as a background may have coloured pictures or light/white areas.

Some students may not be able to answer the questions given in the worksheet. The teacher may explain the concepts again and give an alternate activity (crossword puzzle or a concept map with pictures/figures).



Heredity and Evolution

Chapter 9

Assessment Technique

Flow Chart based assessment

Objectives : To help the students to

- Understand the concept of evolution
- Recognise the evidences that support evolution
- Correlate accumulation of variations with formation of new species
- Appreciate the process of Natural Selection operating in nature
- Understand how evolution takes place

Task :

(Individual Worksheet)

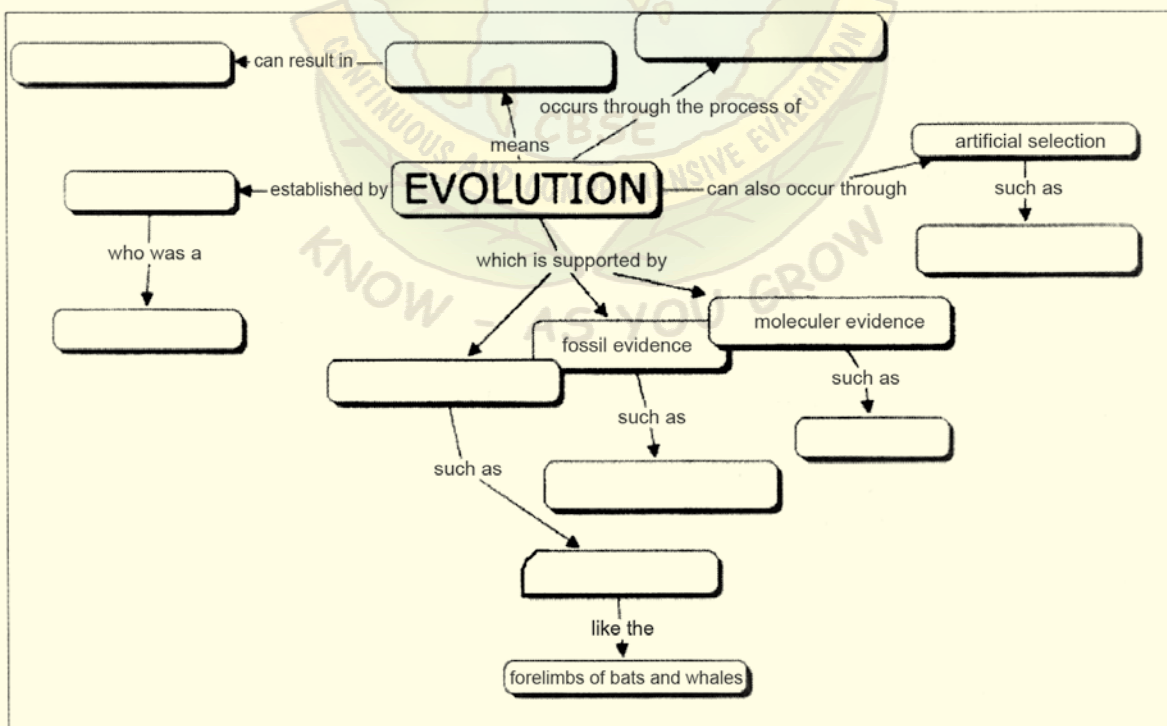
Approximate Time: 15 minutes

Procedure : After completing the chapter, teacher may give this worksheet to students to assess their understanding of the topic.

Student Worksheet

Time: 15 minutes

Instructions : Given below is a concept map about evolution. Use the words given in the word-bank to fill up the gaps in the concept map.



Word Bank : Anatomical evidence, Broccoli etc. from wild cabbage, change over time, DNA, Darwin, Dinosaur bones, Homologous structures, Natural selection, New Species, Naturalist,

Criteria for Assessment : Marks for each correct answer = $\frac{1}{2}$ mark

Total = $\frac{1}{2} \times 10 = 5$

Suggested Remediation :

- Any wrong answer would be an indicator of student's not understanding the concept it is associated with. Teacher may review the response of other students and identify the areas of strengths and weaknesses and provide inputs to help students to improve.
- Teacher may provide hints in the form of pictures.
- A film on evolution may be shown before the worksheet is given to the students.

Heredity and Evolution

Chapter 9

Assessment Technique :

Individual Worksheet

This worksheet has been developed not only to assess the student's understanding of the concept of 'Sex Determination in Human Beings' but also to make the students aware of the misconceptions related to this topic. Even today, in many parts of India, the women are largely held responsible for/the sex of the child they give birth to. Through his activity, the students will realize that it is the fathers sperms that determine the sex of the child. Since it is a matter of chance whether an 'x' carrying sperm or a 'Y' carrying sperm fertilizes the 'x' carrying egg.. neither the mother nor the father should be blamed for the sex of the child. The, teacher must discuss this issue after the worksheet has been completed by the students

Objectives : To enable the students to

- Understand that in human beings the sex of the individual is genetically determined
- Identify the sex chromosomes in human males and human females
- Realize that sex of a child is largely determined by the sex chromosome that he / she inherits from his / her father.

Task :

Individual Work

Approximate Time: 15 Minutes

Procedure :

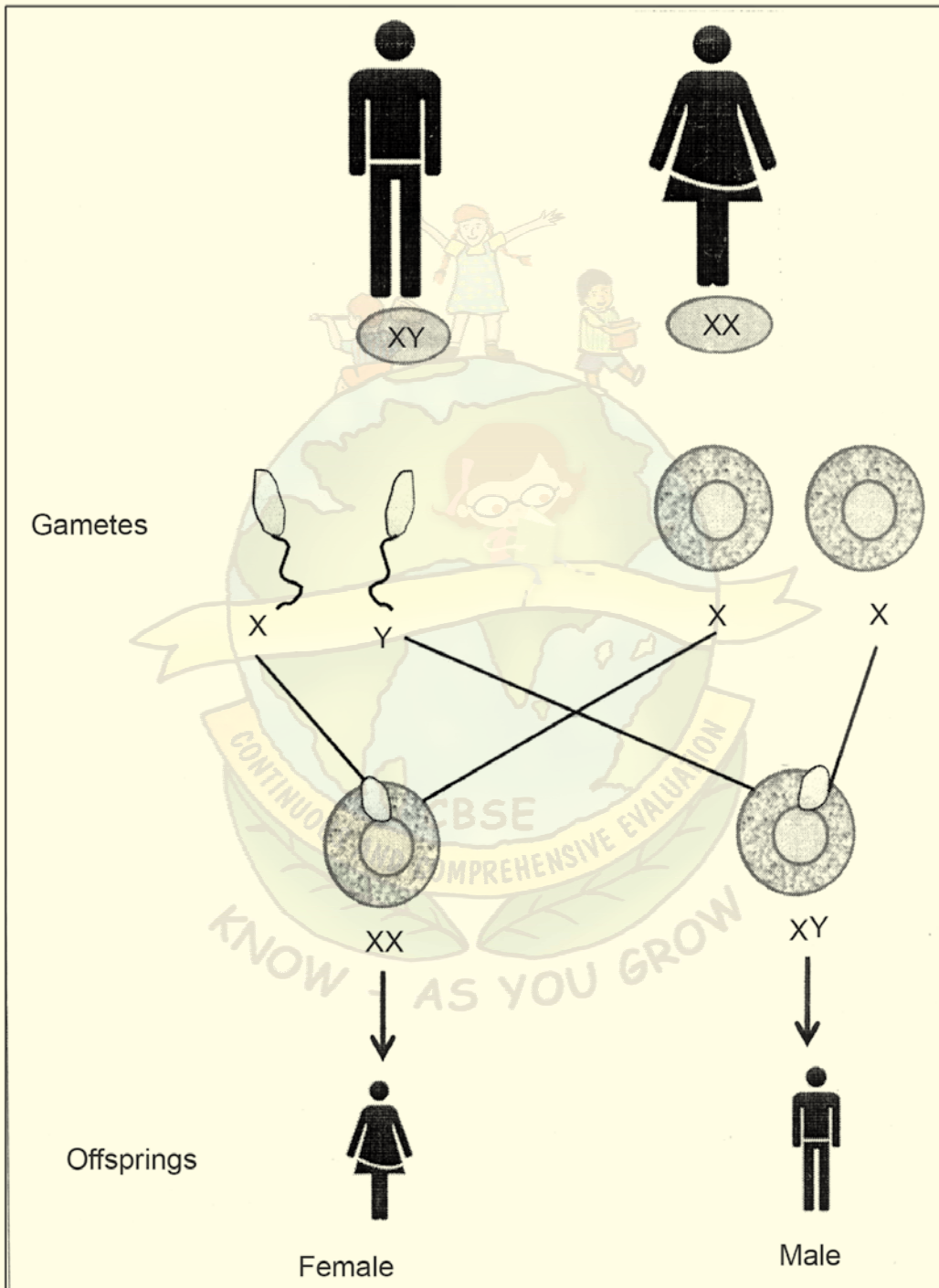
- The students are given a worksheet that has a pictorial representation of 'Sex Determination' in human beings
- The students may observe the pictorial representation and answer the questions given in the worksheet.



Student Worksheet

Time: 15 minutes

Instructions: Given below is the pictorial representation of 'Sex Determination' in human beings. Observe the pictorial representation and answer the questions given in the worksheet.



1. Select the correct statement by putting a '✓' or a '×' in the box provided.
 - a) Women have a perfect pair of sex chromosomes while men have a mismatched pair of sex chromosomes.
 - b) Men have a perfect pair of sex chromosomes while women have a mismatched pair of sex chromosomes.
2. A woman is going to give birth to a baby. The chances of the child being born a male are _____ and female are _____.

(You may add a percentage for the answer)

3. (i) Sperms i.e. the male gametes are similar in
- (ii) Eggs i.e. the female gametes are similar in

Choose the correct words from the word bank given. Word Bank: shape, size, genetic constitution

4. (i) If the child is a male, then the chromosome inherited from the mother is _____ and from the father is _____
- (ii) If the child is a female, then the chromosome inherited from the mother is _____ and from the father is _____
5. Which sex chromosome have you inherited from your

Father : _____

Mother : _____

Criteria for Assessment :

Marks for each correctly answered question = 1 (Total Marks: $1 \times 5 = 5$)

Suggested Remediation :

- The teacher will have to ensure that students are comfortable while discussing this topic. The teacher can plan an 'ice breaker' where a TV serial or a movie or a book or an article dealing with the same issue can be discussed in the class.
- As an additional activity, the teacher may ask the students to write articles to newspapers on the same issue or a 'Poster-Making' and 'Slogan Writing' competition may be organised on the same topic.
- Sex/gender in human beings is genetically determined. The teacher may ask the students to make a 'Paper Presentation' on criteria for sex determination in different organisms.
- A few students may not be able to give satisfactory answers. The teacher may explain the concepts again and a similar worksheet may be given to them as a remedial exercise.



Light: Reflection and Refraction

Chapter 10

Assessment Technique: Diagram Based Worksheet

Objectives : To enable the learner to

- Draw correct ray diagrams showing image formation by lenses for different positions of the object.
- Differentiate between real and virtual images.
- Appreciate the specific applications of the lenses in daily life on the basis of the nature of the image formed.
- Apply Cartesian sign conventions correctly.

Task : Individual diagram based worksheet.

Assessment Time: 25 minutes.

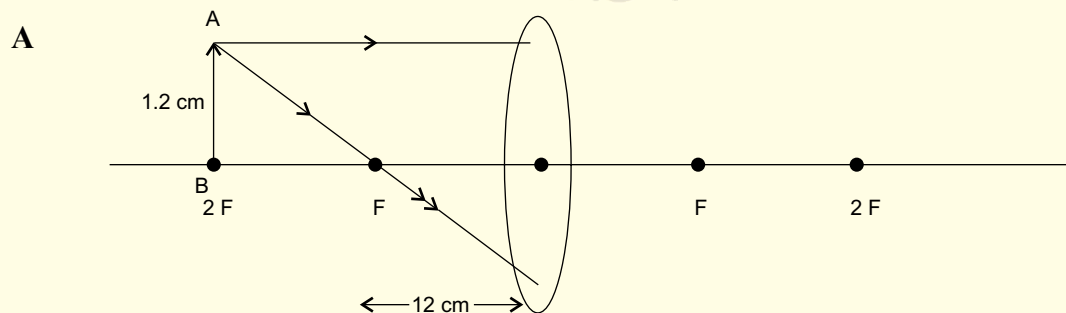
Procedure : The teacher may

- Draw and explain specific rays, used to obtain the images, in case of lenses for different position of the object.
- Discuss the nature, size and position of the images, formed by the convex/concave lenses
- State Cartesian sign conventions and explain its use by means of extensive illustrative examples

Assessment Parameters : As indicated

Student Worksheet

Instructions : Study each of the diagrams A, B, C and D given below carefully and follow the instructions in the given questions.



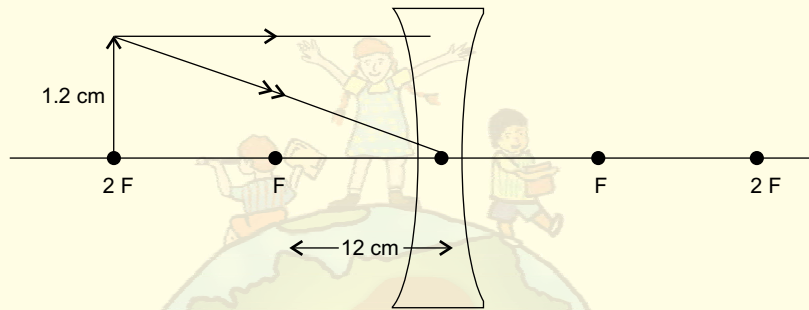
1. Complete the above ray diagram to show the image formation

(2)



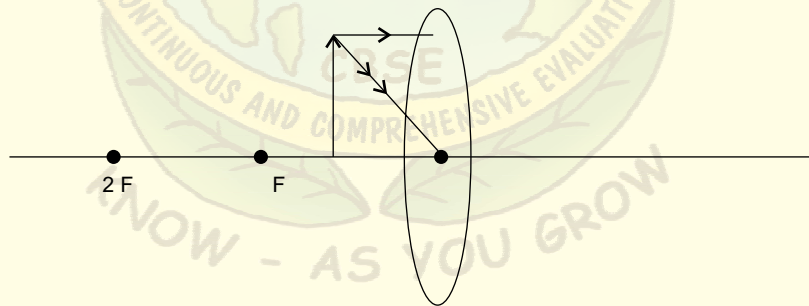
2. In the diagram $u = \dots\dots\dots$ cm
 Object size = $\dots\dots\dots$ (1)
3. For the image obtained
 $v = \dots\dots\dots$ cm
 Image size = $\dots\dots\dots$ cm (1)
4. Will the magnification obtained in this case be numerically equal to, less than or greater than unity?

B



1. Complete the above ray diagram to show the image formation (2)
2. In this figure : $f = \dots\dots\dots$ cm
 $u = \dots\dots\dots$ cm (1)
3. What is the nature of the image formed? (1)
4. Will the numerical value of magnification be equal to, more than or less than unity?

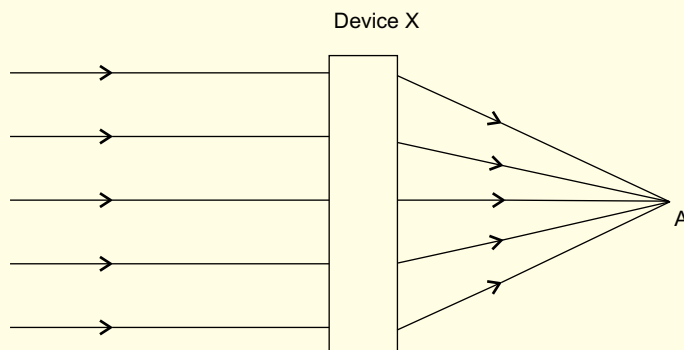
C



1. Complete the ray diagram showing the image formation. (2)
2. State the nature of the image formed. (1)
3. Will the image position and the focal length, be positive or negative? (2)
4. Give one application of this lens for this position of the object. (1)



D



1. Name the Phenomenon responsible for change in the path of rays (1)
2. Identify the device X (1)
3. What is point A called? (1)
4. Which physical quantity does the reciprocal of the distance, between the device and the Point A, denote? (1)
5. Write S I unit of the quantity named in point 4 above. (1)

Suggested Remediation :

- Some students may not understand the details of the change in the path of light rays (i) incident parallel to the principal axis, (ii) passing through the optical centre and (iii) passing through the focus. The same may be highlighted
- Difference in the nature of the images formed, i.e. real image and virtual image, may be clearly explained on the basis of the path of the light rays after refraction.
- Analyse the errors committed by the students with regard to applications of the sign conventions. The proper use of positive and negative signs, with object size, image size, object distance and image distance may be explained with the help of extensive examples.

Light: Reflection and Refraction

Chapter 10

Assessment technique

Diagram based worksheet

Objectives : To enable the learner to

Define refractive index in terms of angles of incidence and refraction

Compare the refractive indices of different media

Correlate refractive index with speed of light

Assessment Time: 20 minutes

Procedure : The teacher may

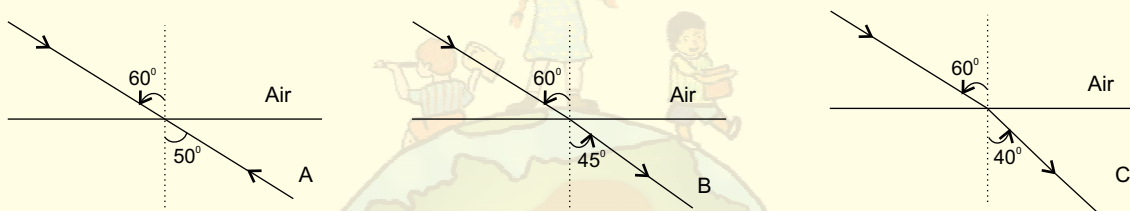


- State and explain snell's law
- Define absolute refractive index and relative refractive index
- Explain the difference between absolute refractive index and relative refractive index using illustrating examples
- Explain the correlation between refractive index and the speed of light.
- State the meaning of the term optical density'.

Assessment Parameter : One more for every correct answer.

Student Worksheet

Instructions : The path of a light ray, from air to three different media A, B, and C, for a given angle of incidence, is as shown. Study the diagrams carefully and answer the following questions



1. Which of the three media A, B or C has maximum optical density? (1)
2. Through which of the three media, will the speed of light be maximum? (1)
3. Will the refractive index of B relative to C be more than unity or less than unity? (1)
4. Will the light traveling from A to B bend towards or away from the normal? (1)
5. If n_a , n_b and n_c denote refractive indices of the three media, arrange n_a , n_b and n_c in descending order? (1)
6. What inference can be drawn about the optical density of the three media from the above diagram? (1)
7. For which ray of light, incident on any of the three media, will these three media show identical behaviour. (1)
8. If a ray of light is incident in medium, at an angle of 40° , what will be its angle of refraction in air? (1)
9. If angle of incidence is increased, what will be the change in the angle of refraction? (1)

Suggested Remediation :

- Some of the students may not be able to understand the difference between relative refractive index and absolute refractive index. The same may be clearly explained.
- The fact that the absolute refractive index is always greater than unity, whereas the relative refractive index may be more or less than unity should be clearly highlighted
- The dependence of speed of light, on refractive index may be clearly explained.



Light: Reflection and Refraction

Chapter 10

Assessment Technique

Numerical based worksheet

Objectives : To enable the learners to

- Use the expression for magnification, and the lens formula to solve simple numerical problems.
- Correlate the situation given in the problem with the images formed by the lenses.
- Appreciate why a given lens finds a specific application in daily life.
- To express all the given physical quantities, in consistent units, for use in a specific numerical problem.

Assessment task : Individual numerical based worksheet.

Assessment Time: 15 minutes

Procedure : The teacher may

- Explain the nature of images formed by spherical lenses for different positions of the object.
- Discuss nature of the images formed by (i) a concave lens (always virtual and diminished) and (ii) a convex lens (real: smaller/magnified and virtual; only enlarged).
- Give illustrative examples for the formulae learnt and the relevant diagrams through simple numerical problems
- Emphasise that all the physical quantities given in a numerical problem should be expressed in consistent units.

Assessment parameter : One mark for every correct answer.

Student Worksheet

Instructions :

Study the following situation carefully and answer the questions that follow:-

A lens produces an erect image, of size 12 mm, when an object of size 6 mm is placed 12 cm from its optical centre.

1. What is the nature of the lens?
2. What is the magnification produced?
3. What can we say about the position of the object to get an image of the type given?



4. Draw the relevant diagram to justify your answer to the above question.
5. Calculate the image distance and the focal length of the lens.
6. What is the power of this lens?
7. Give an application, in daily life, of this type of lens, in a situation similar to the one given here.

Suggested Remediation :

- Generally, the students find it difficult to solve even simple numerical problems. Sufficient practice should be given to the students in solving of the numerical problems based on different types of images formed by lenses.
- The numerical situations given should be correlated with the relevant diagrams to enable the students to guess the expected range of the unknown parameter, viz u, v or f.
- The virtual image produced by a convex lens is always magnified while that produced by a concave lens is always diminished. This fact should be strongly highlighted.
- Some students may not convert the given quantities in consistent units. The need for the same should be strongly emphasized.

Light: Reflection and Refraction

Chapter 10

Assessment Technique

Numerical based Worksheet

Objectives : To enable the learner to

- Use sign conventions in case of spherical mirrors
- Use mirror formula relating u, v and f to calculate any one of three unknown quantities
- Use the expression $m = \frac{v}{u} = \frac{I}{O}$, for magnification
- Relate a given numerical situation with the relevant appropriate diagram for image formation.

Assessment Task : Individual numerical based worksheet

Assessment Time: 15 minutes

Procedure : The teacher may

- Discuss the nature of images, formed by spherical mirrors for different positions of the object.
- Give examples to illustrate the use of sign convention.



- Define magnification and explain that its numerical value may be equal to, more than, or less than unity
- Explain the use of the mirror formula relating u , v and f to calculate any one of these quantities when the other two are given.

Assessment parameter : One mark may be given for each correct answer.

Student Worksheet

Instructions : Study the following situation carefully and answer the questions that follow.

A spherical mirror produces an image 48cm, in front it, when an object is positioned 12cm from its pole.

1. Identity the nature of the mirror. (1)
2. Is the image magnified or diminished ? (1)
3. State whether the image formed is real or virtual. (1)
4. Is the image formed erect or inverted ? (1)
5. In the above situation $u = \dots\dots\dots$ cm
 $v = \dots\dots\dots$ cm (1)
6. Calculate the focal length of the mirror. (1)
7. Calculate the magnification of the image. (1)
8. Draw the ray diagram, showing the formation of the image in the above case (1)
9. If the object size is 5mm, calculate the size of the image formed. (1)
10. Write any two applications of the type of spherical mirror used here. (1)

Suggested Remediation :

1. Some of the students may not comprehend the correlation of the relative size of the image, with the given values of object and the image distances. The same may be explained with the help of the formula

$$m = \frac{I}{O} = \frac{v}{u}$$

2. The fact that only a real image can be formed in front of a spherical (concave) mirror may not be clear to the students. This point needs to be strongly emphasised.
3. Some students may find it difficult to apply the sign convention correctly. The same may be clarified through a number of different examples.



Light: Reflection and Refraction

Chapter 10

Assessment Technique

Diagram based Worksheet

Objectives : To enable the learner to

- Differentiate between converging and diverging mirrors.
- Differentiate between concave, convex and plane mirror on the basis of the nature of the image formed by these.
- Draw the path of a few specific rays after reflection from the surface of a spherical mirror.
- Appreciate the applications of mirrors in daily life

Assessment Task : Diagram based individual worksheet

Assessment time : 10 minutes

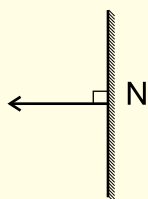
Procedure : The teacher may

- Familiarize the students with different types of mirrors.
- Explain the converging nature of a concave mirror and the diverging nature of a convex mirror in terms of the law of reflection.
- Draw the path of few specific rays, i.e. (i) incident parallel to the principal axis, (ii) incident through the focus and (iii) incident through the centre of curvature of the mirror.
- Explain the nature of images formed by spherical mirrors for different positions of the object.
- Discuss the possible applications of mirrors in daily life, based on the nature of images formed by them.

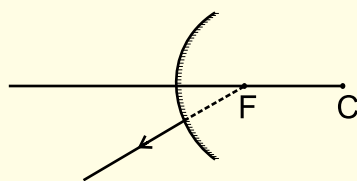
Assessment parameters : $\frac{1}{2}$ mark for every correct answer

Student Worksheet

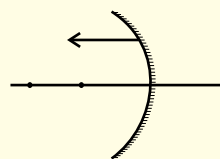
Instructions : Study the diagrams given below carefully and answer the following questions



Mirror A
Fig.-1



Mirror B
Fig.-2



Mirror C
Fig.-3



1. Which of the three mirrors is a convex mirror?
2. Identify the mirror which reflects a parallel incident beam of light as (i) parallel beam (ii) a converging beam
3. For the reflected rays, shown in the above diagrams, draw the corresponding incident rays in (i) Fig (1), (ii) Fig (2), (iii) Fig (3).
4. Which of the three mirrors always produces an image equal in size to the size of the object?
5. Which of the three mirrors can produce a diminished as well as an enlarged image?
6. Which of the mirrors always produces an image of size smaller than that of the object ?
7. Which of the three mirrors, A, B and C, is used by a dentist to observe cavities in the teeth?
8. Which mirror is used by doctors to focus light on a particular part of the human body, say inside the nose, throat etc.?
9. Which of the mirrors is used to check shop-lifting?
10. Which of these three mirrors is used as the rear-view mirror in automobiles?

Suggested Remediation :

- The learners response may be analysed carefully to identify the types of errors committed. The mistakes may be highlighted and the correct answers may be given with explanation.
- Many students do not understand why a ray of light, parallel to the principal axis, bends towards the principal axis in the case of a concave mirror but goes away from the principal axis in the case of a convex mirror. The same may be explained clearly through the laws of reflection.
- The three incident rays, commonly used to get the details of the images formed by a concave/convex mirror may be discussed and enough practice given in their use.
- The use of the mirrors for specific purposes should always be correlated with relevant diagram to enhance the drawing skills and the application of the same in our daily life.

Light: Reflection and Refraction

Chapter 10

Assessment Technique : Drawing skill based worksheet

Objective: To enable the learner to

- Draw 'to the scale' ray diagrams for images formed by a convex lens for different object positions.
- Measure and tabulate the changes in image positions and sizes with change in object position.
- Interpret data and draw inferences based on her/his interpretation.



Assessment Task: Individual drawing of 'to the scale' ray diagrams.

Assessment Time: 25 minutes

Procedure: The teacher may discuss with the students:

- The difference between real image and the virtual image
- The prominent rays used to obtain the image, formed by lenses for different positions of the object.

Assessment Parameter :

1. 3 Marks for each 'to the scale' ray diagram.
2. 2 Marks for each inferences drawn.

Student Worksheet

Instructions : Read the followings instructions carefully and do as directed:

- Consider a convex lens of focal length 60cm and an object of size 12cm
- Choose a scale where 6cm corresponds to 1cm
- Take the object to be at a distance of 45cm from the convex lens and draw the corresponding ray diagram for image formation.
- Repeat for object distances of 30cm, 24cm, 15cm..
- Complete the table given below:

Object Size = 12 cm Focal Length = 60 cm

Object Distance	Image		
	Distance	Size	Nature
45 cm			
36 cm			
30 cm			
24 cm			

Complete the 'inference statements' based on your interpretation of the data collected by you:

For an object kept within the focus of a convex lens

- a. the image is in nature.



- b. The image moves to /from the focus as the object is moved progressively closer to the optical centre.
- c. The image size keeps on progressively as the object is moved progressively away from the focus of the lens.
- d. For all object distances less than the focal length, the image is with respect to the object.

Suggested Remediation : Some of the students may fail to appreciate why the given scale has been selected. The teacher will guide students about

- Choosing an ‘appropriate scale’ in each situation.
- Drawing ‘to the scale’ ray diagrams.
- Observing any regularity/pattern present in a (given) data
- Drawing conclusions on the basis of observed regularity/pattern in the (given) data.

[**Note:** the ‘focal length,’ ‘object size’ and ‘object distances’ values given here are only Suggestive in nature and the teacher can make appropriate changes in these for assigning work to different students].

Light: Reflection and Refraction

Chapter 10

Assessment Technique : Drawing skill based worksheet

Objective : To enable the learner to :

- Draw ‘to the scale’ ray diagrams for images formed by a concave lens.
- Measure and tabulate the (small) changes, in image positions and sizes, with changes in object position.
- Interpret data and draw inferences based on his/her interpretation.

Assessment Task : Careful individual drawing of 'to the scale' ray diagrams.

Assessment Time : 30 minutes

Procedure : The teacher will ask the students to

- Consider a concave lens having a focal length of magnitude 50 cm and an object of size 10 cm
- Choose a scale where 5cm corresponds to 1cm
- Draw ray diagrams corresponding to object distances of 100 cm, 75 cm, 50 cm, 40 cm and 25 cm.
- Measure the image distance and image size in each case and tabulate her/his data.



- Complete the following ‘inference statements’: for a concave lens:
 - (a) the image formed is always in nature
 - (b) the image formed moves to/from the optical centre as the object moves closer to the optical centre of the lens. With the object distance more than the magnitude of the focal length of the lens.
 - (c) The image formed movesto/from the optical center as the object moves closer to the optical center of the lens with the object distance less than the magnitude of the focal length of the lens.
 - (d) The image size keeps on as the object moves closer to the optical centre of the lens
 - (e) The image/size is ----- than the size of the object.

Assessment Parameters : 3 marks for each ‘to the scale’ ray diagram 1 marks for each of the inferences drawn

Student Worksheet

Instructions : Read the followings instructions carefully and do as directed.

- Consider a concave lens having a focal length of magnitude 50cm and an object of size 10 cm
- Choose a scale where 5cm corresponds to 1cm
- Take the object to be at a distance of 100cm from the concave lens and draw the corresponding ray diagram
- Repeat for object distances of 75cm, 50cm, 40cm and 25cm
- Complete the table given below:

Object Size = 10 cm Focal length magnitude = 50 cm

Nature of lens taken: concave

Object Distance	Image		
	Distance	Size	Nature
100 cm			
75 cm			
50 cm			
40 cm			
25 cm			

