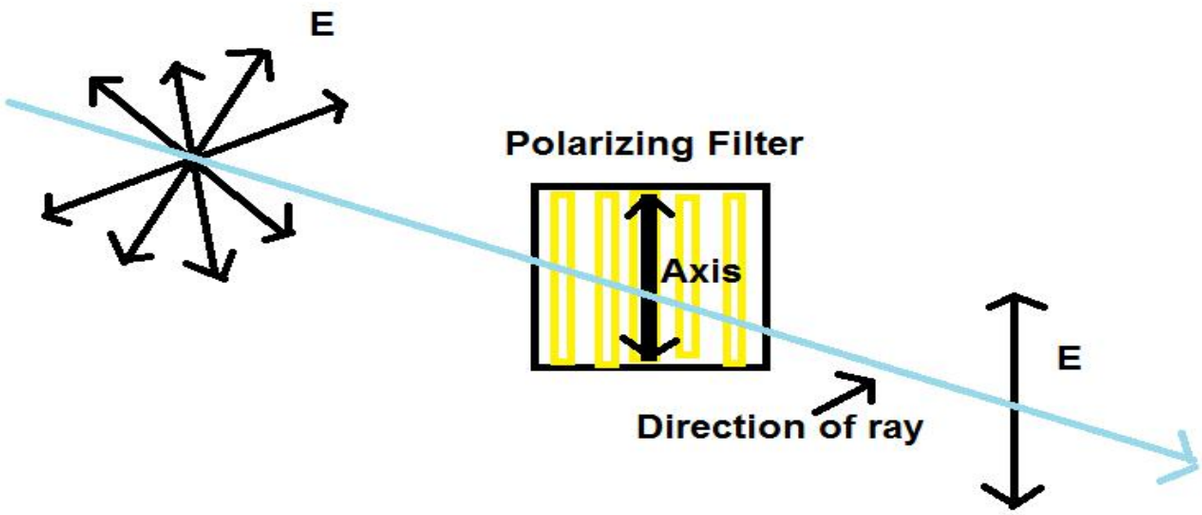
LA IMMACULADA CONCEPCION SCHOOL
SENIOR HIGH SCHOOL
GRADE 12 – STEM: GENERAL PHYSICS 2

April 27-30, 2020

LESSON 7

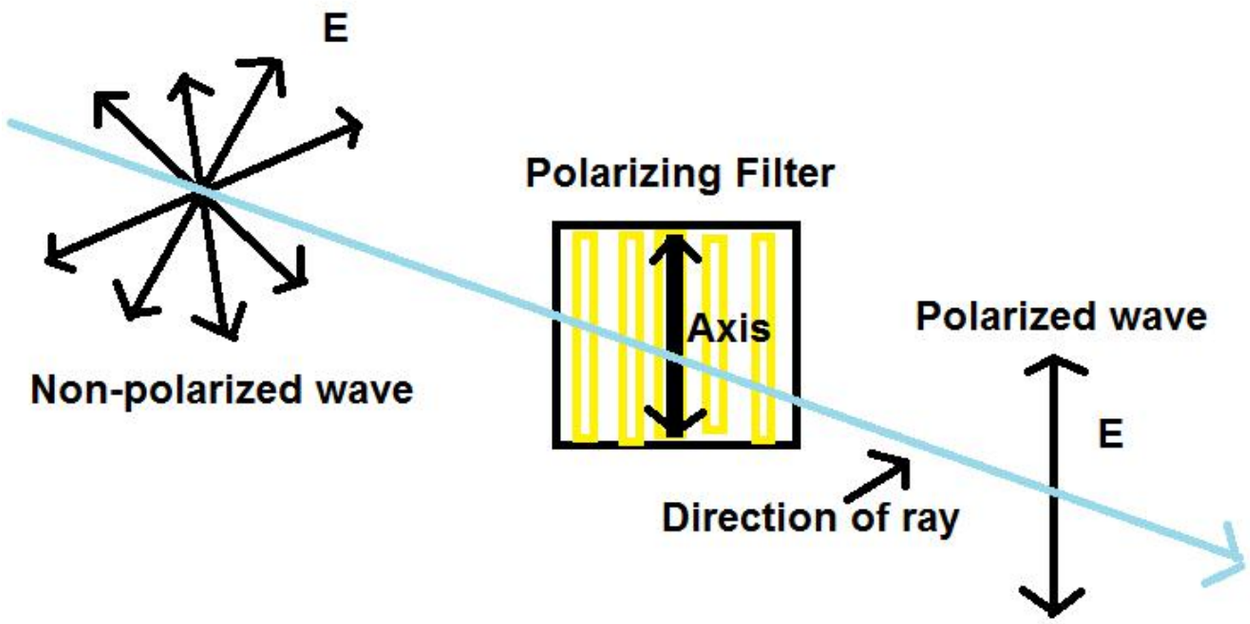
TOPIC: POLARIZATION OF LIGHT

Sunlight and almost every other form of natural and artificial illumination produces light waves whose electric field vectors vibrate in all planes that are perpendicular with respect to the direction of propagation. If the electric field vectors are restricted to a single plane by filtration of the beam with specialized materials, then the light is referred to as plane or linearly polarized with respect to the direction of propagation, and all waves vibrating in a single plane are termed plane parallel or plane-polarized



The human eye lacks the ability to distinguish between randomly oriented and polarized light, and plane-polarized light can only be detected trough an intensity or color effect, for example, by reduced glare when wearing polarized sun glasses. In effect, human cannot differentiate between the high contrast real image observed in a polarized light microscope and identical image of the same specimens captured digitally, and then projected onto a screen with light that is not polarized.

Polarization is the property of wave that can oscillate with more than one orientation. A light wave that is vibrating in more than one plane is referred to as unpolarized light. The process of transforming unpolarized light is known as polarization of light.



Depending on the orientation on the electric field, polarized light can be divided into three types:

- Linear polarization
- Circular polarization
- Elliptical polarization

Linear polarization- when an ordinary unpolarized light is reflected from a polished surface or transmission through certain materials, the electric fields vector oscillates along a straight line in one plane, and the light is said to be linearly polarized.

Elliptical polarization- The electric field of light describes an ellipse. The results from the combination of two linear components with differing amplitudes or a phase difference that is not $\pi/2$. This is the most general description of polarized light, and circular and linear polarized light can be viewed as special cases of elliptically polarized light.

Circular polarization- The electric field of light consists of two linear components that are perpendicular to each other, equal in amplitude, but have a phase difference of $\pi/2$. The resulting electric field rotates in a circle around the direction of propagation and, depending on the rotation direction, is called left or right - hand circularly polarized light.

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LESSON 7 TASK

Individual Task

Day 1 Activity/Experiment

Materials:

- ✓ White light
- ✓ At least two polarized film

Procedure

1. Open the white light and put one of the polarized film over it, vertically

2. Put another polarized file on the top of first polarized film, vertically.

3. Turn the second polarized film horizontally.

4. Describe and explain what happened on a one whole sheet of yellow paper.

Note: if you don't have a polarized film, kindly search for this video on Youtube.

https://youtube.com/watch?v=MhhHPOxTUy8 (Polarization and polarizer)

DAY 2 TASK

Direction: Give at least 3 real-life situation about the polarization. Draw, discuss and give a conclusion regarding to those phenomena. Write your answers on a yellow paper.

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LESSON 8

TOPIC: SPHERICAL MIRROR

A **spherical mirror** is a mirror which has the shape of a piece cut out of a spherical surface.There are two types of spherical mirrors: ***concave***, and ***convex***.The most commonly occurring examples of concave mirrors are shaving mirrors and makeup mirrors.As is well-known, these types of mirrors magnify objects placed close to them. The most commonly occurring examples of convex mirrors are the passenger-side wing mirrors of cars.These type of mirrors have wider fields of view than equivalent flat mirrors, but objects which appear in them generally look smaller (and, therefore, farther away) than they actually are.

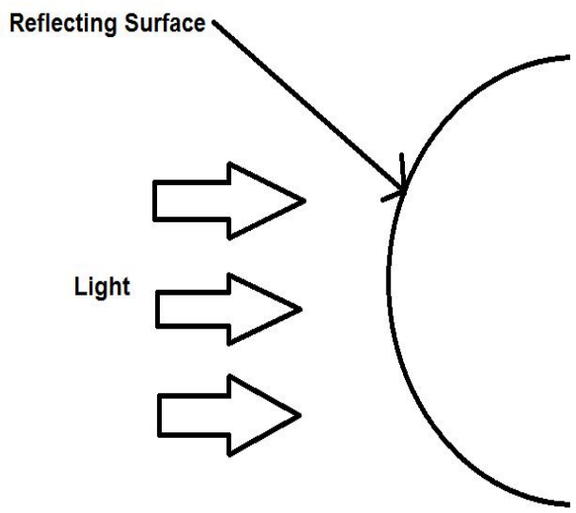


Figure 1. Convex Mirror

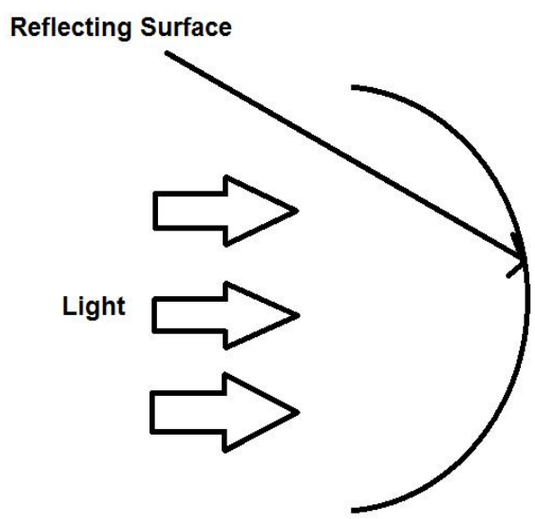


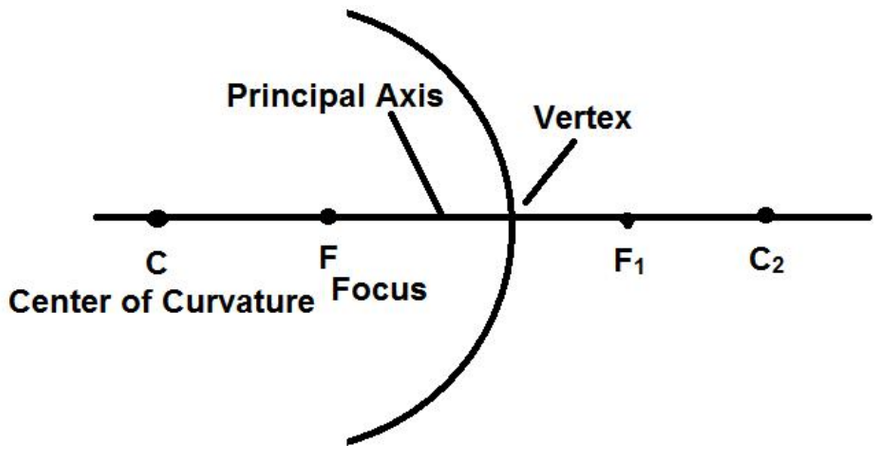
Figure 1.1 Concave Mirror

Image formation by a concave mirror

The graphical method of locating the image produced by a concave mirror consists of drawing light-rays emanating from key points on the object, and finding where these rays are brought to a focus by the mirror. This task can be accomplished using just *four* simple rules:

1. An incident ray which is parallel to the principal axis is reflected through the focus F of the mirror.
2. An incident ray which passes through the focus F of the mirror is reflected parallel to the principal axis.
3. An incident ray which passes through the centre of curvature C of the mirror is reflected back along its own path (since it is normally incident on the mirror).
4. An incident ray which strikes the mirror at its vertex V is reflected such that its angle of incidence with respect to the principal axis is equal to its angle of reflection.

Key Parts of Ray Diagram of a Concave Mirror



1. **Principal Axis** -a line that is normal (perpendicular) to the center of the mirror.
2. **Vertex** - the point at which the principal axis meets a mirror
3. **Focus or focal point** - The point which converging light rays meet
4. **Center of Curvature** - the center of a circle which passes through a curve at a given point and has the same tangent and curvature at that point.

Rules for image formation by a concave mirror		
Position of object	***Position of image***	***Character of image***
At infinite	At F	Real, zero size
Between infinite and C	Between F and C	Real, inverted,diminished
At C	At C	Real, inverted, same size
Between C and F	Between C and infinite	Real, inverted, magnified
At F	At infinite	
Between F and Vertex	From negative infinite to Vertex	Virtual and upright
At Vertex	At Vertex	Virtual, upright and same size

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LESSON 8 TASK

Individual Task

Day 1 Task

Direction: On a short bond paper, draw a ray diagram of a concave mirror and its image formation in the given position of the object.

1. At infinite

2. At C

3. Between C and F

4. At F

5. Between F and Vertex

6. At Vertex

Day 2 Task

Direction: On a yellow paper, make a Venn Diagram of a spherical mirror and a plane mirror

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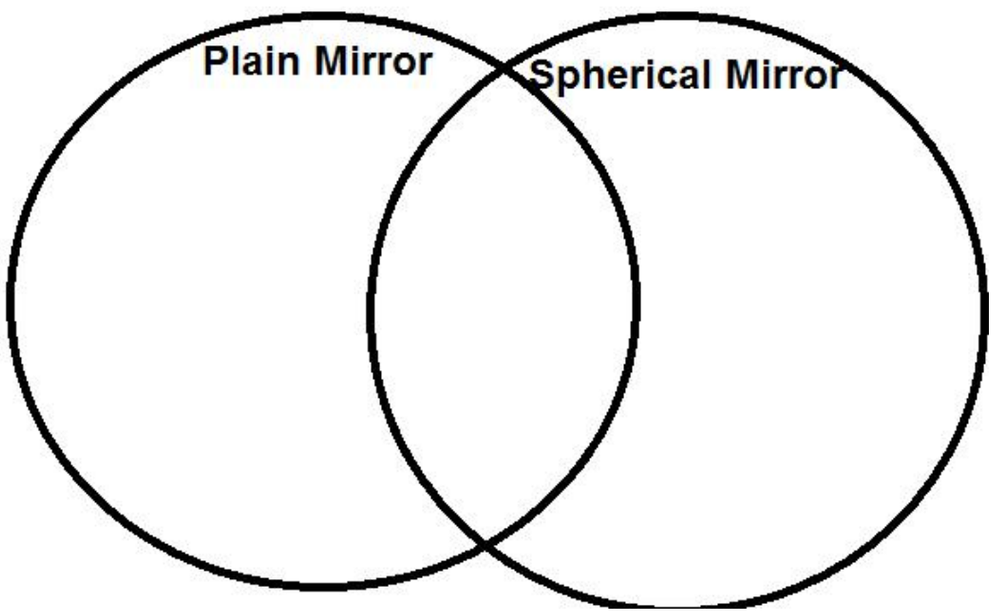

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LESSON 9

TOPIC: CONVEX MIRROR

A mirror is a part of a smooth and highly polished reflecting surface. Most commonly used mirrors are plane mirrors. A spherical mirror is a part of a spherical reflecting surface. There are two type of spherical mirrors- convex mirror and concave mirror. We are done discussing concave mirror, now lets tackle about convex mirror.

Convex mirror is a curved mirror for which the reflecting surface bulges out towards the light source. Convex mirrors reflect light outwards (diverging light rays) and therefore they are not used to focus light. The image is virtual, erect and smaller in size than the object, but gets larger (maximum up to the size of the object) as the object comes towards the mirror. Such mirrors are also called diverging mirrors.

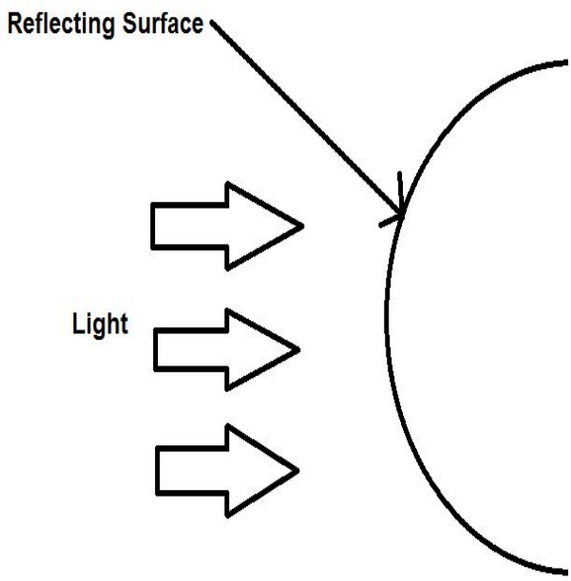

Figure 1. Convex Mirror

Image formation by a concave mirror

The graphical method of locating the image produced by a convex mirror consists of drawing light-rays emanating from key points on the object, and finding where these rays are brought to a focus by the mirror. This task can be accomplished using just *four* simple rules:

1. An incident ray which is parallel to the principal axis is reflected as if it came from the virtual focus F of the mirror.
2. An incident ray which is directed towards the virtual focus F of the mirror is reflected parallel to the principal axis.
3. An incident ray which is directed towards the centre of curvature C of the mirror is reflected back along its own path (since it is normally incident on the mirror).
4. An incident ray which strikes the mirror at its vertex V is reflected such that its angle of incidence with respect to the principal axis is equal to its angle of reflection.

Key Parts of Ray Diagram of a Convex Mirror

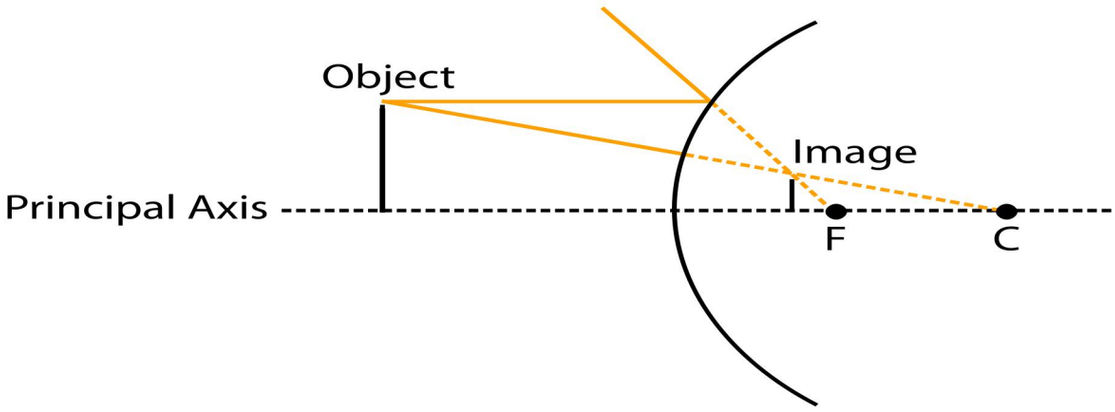

Figure 2 from isaacphysics.org

1. **Principal Axis** -a line that is normal (perpendicular) to the center of the mirror.
2. **Vertex** - the point at which the principal axis meets a mirror
3. **Focus or focal point** - The point which converging light rays meet
4. **Center of Curvature** - the center of a circle which passes through a curve at a given point and has the same tangent and curvature at that point.

Rules for image formation by a convex mirror		
Position of object	***Position of image***	***Character of image***
At infinite	At F	Virtual, zero size
Between infinite and V	Between F and V	Virtual, upright, and diminished
At V	At V	Virtual, upright, and same size

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LESSON 9 TASK

Individual Task

Day 1 Task

Direction: On a short bond paper, draw a ray diagram of a concave mirror in the given position of the object.

1. At infinite

2. Between infinite and V

3. At V

Day 2 Task

Direction: On a yellow paper, write the difference between convex and concave mirrors:

	Concave mirror	**Convex mirror**
What are convex and concave mirrors?		
Image		
Size		
Position		