Application of Spherical Mirror

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REFRERENCES

- Class X , NCERT book
- Website : Google.com, slideshare.com, teachoo.com

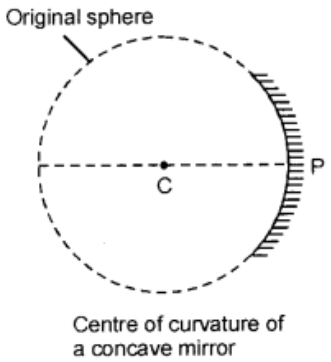
Optical Device

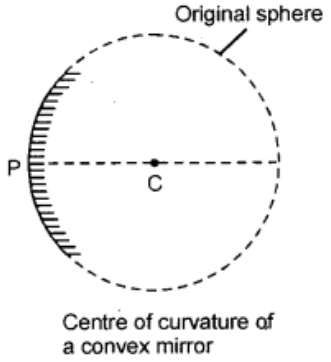
- A lens is an optical device that is used to bend light in a specific way.
- A converging lens bends light so that the light rays come together to a point.
- A diverging lens bends light so it spreads light apart instead of coming together.
- Mirrors reflect light and allow us to see ourselves.
- A prism is another optical device that can cause light to change directions.
- A prism is a solid piece of glass with flat polished surfaces.

Spherical Mirrors

- Spherical Mirror : A curved mirror formed by a part of a hollow glass sphere with a reflecting surface. Two types of spherical mirrors:

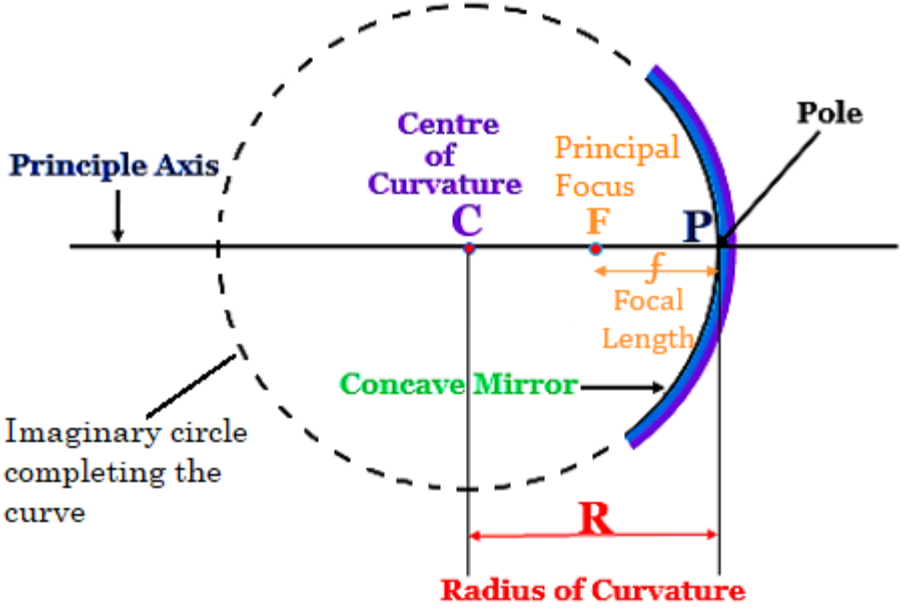
1) Concave mirror: A concave mirror is a curved mirror with the reflecting surface on the hollow side.
2) Convex Mirror : A convex mirror is a curved mirror with the reflecting surface on the outer side





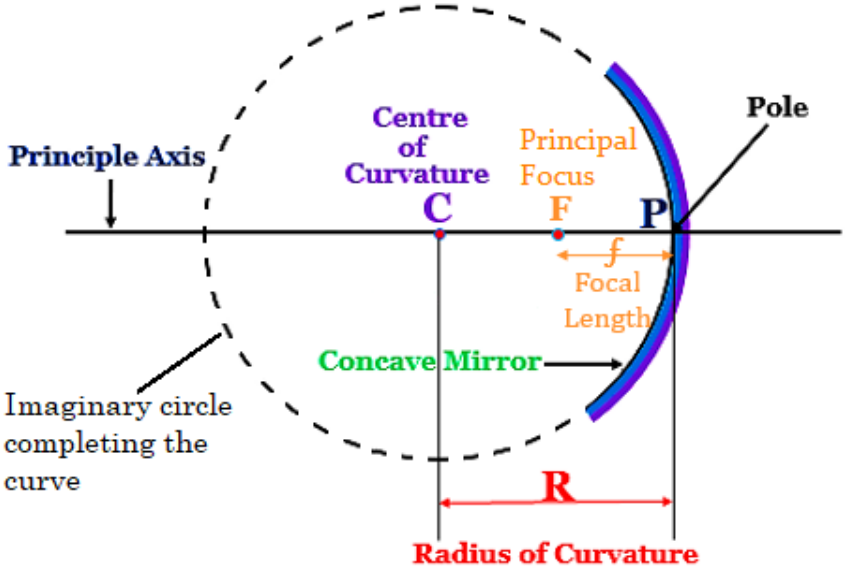
Spherical Mirrors...

- **Centre of Curvature** : The centre of curvature of a curved mirror is defined as the center of the hollow glass sphere of which the curved mirror was (previously) a part.
- **Radius of curvature**: The radius of the hollow glass sphere of which the spherical mirror was a part.



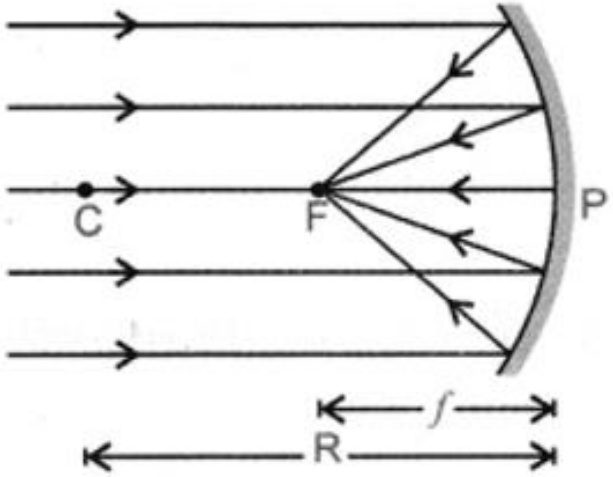
Spherical Mirrors...

- **Principal Axis** : The imaginary line passing through its pole P and center of curvature C.
- **Pole** : The pole is defined as the geometric centre of the curved mirror.
- **Focus(F)** :The principal focus is defined as the point on The principal axis where the light rays travelling parallel to the principal axis after reflection actually meet.

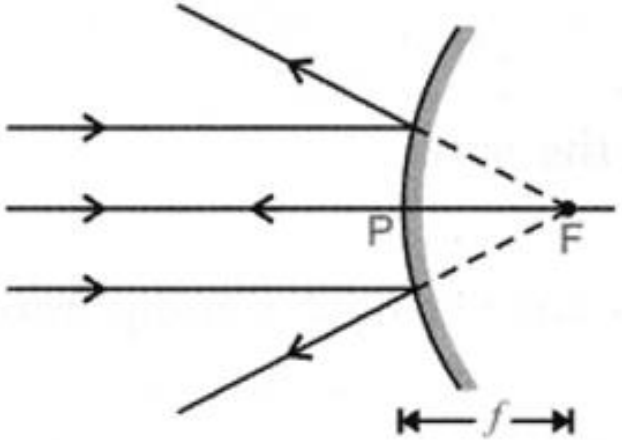


Focal Length

- The focal length is the distance between the pole P and the Principal focus F of a curved mirror.
- The focal length is half the radius of curvature. Focal Length = Radius of Curvature/2 Focal length



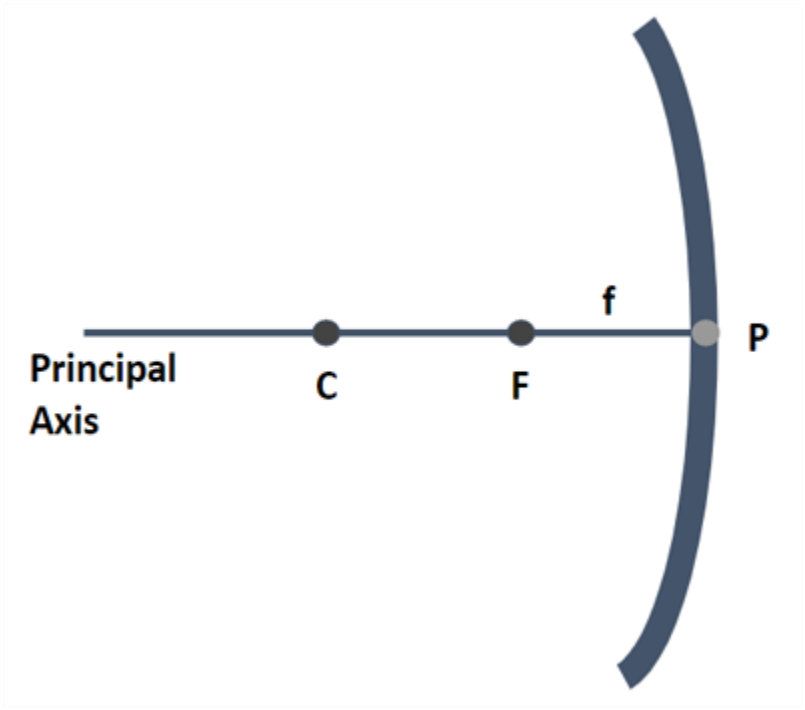
Focal length of concave mirror

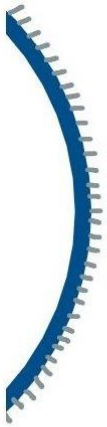


Focal length of convex mirror

Concave Mirror

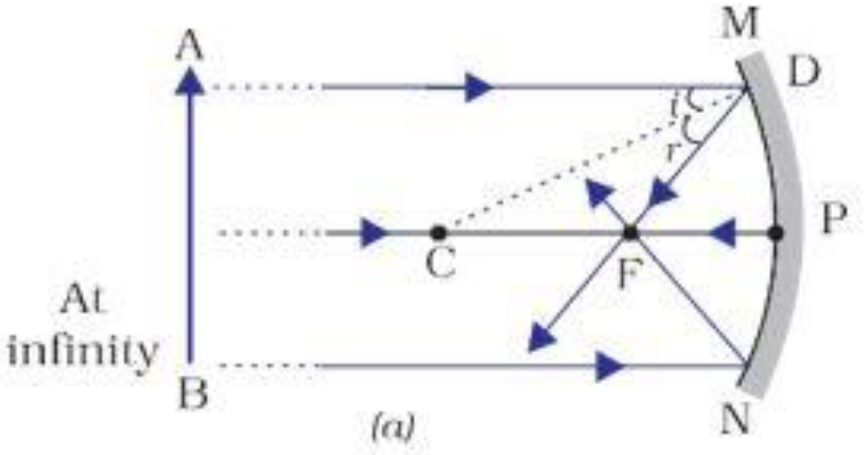
- A mirror is a curved mirror with the reflecting surface on the hollow side.
- Also known as ‘converging mirror’.





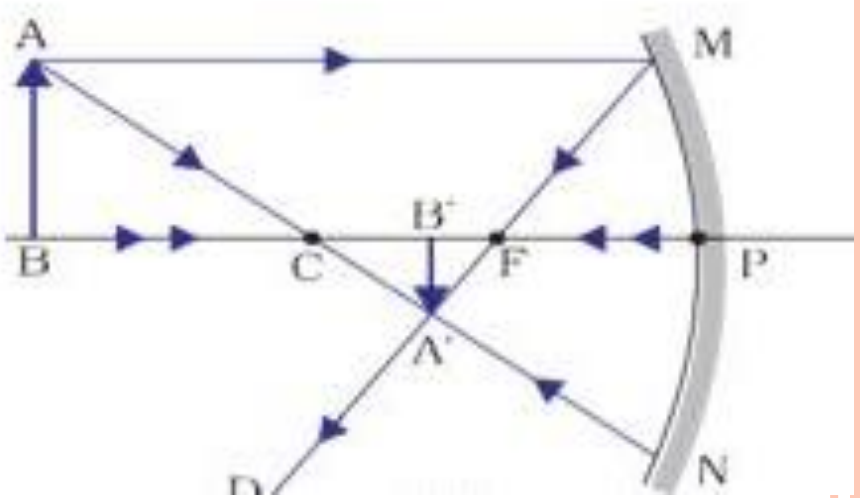
Concave Mirror

Ray diagrams of concave mirror



1. If the object is at infinity
   Image will be formed at
   - Focus
   - Highly diminished (dot like)
   - Real image

2. If the object is beyond centre of curvature **Image will be formed**
   - Between centre of curvature and focus
   - Diminished
   - Real image
   - Inverted

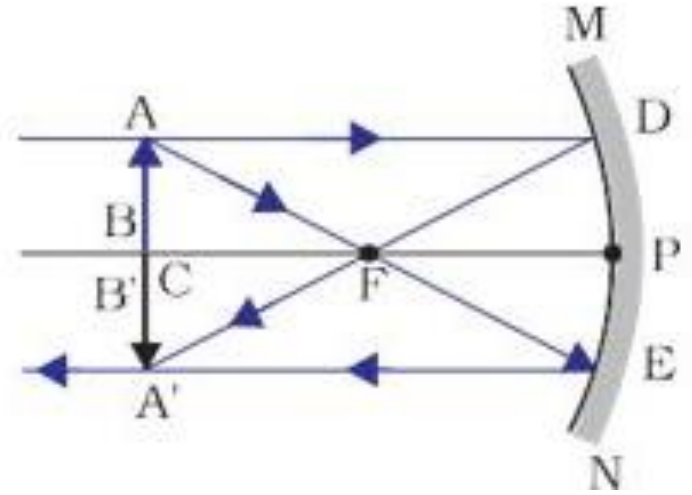


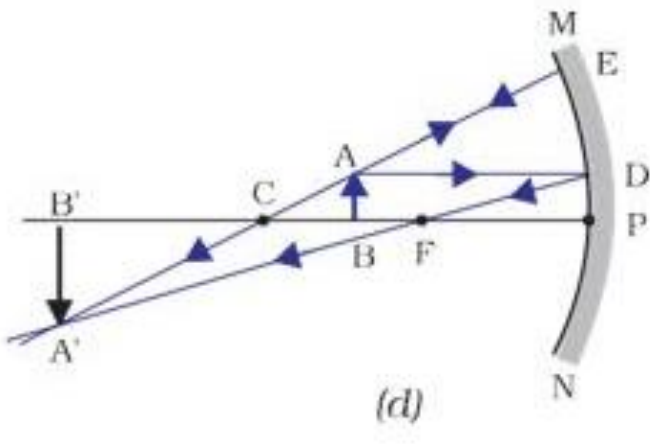
RAY DIAGRAMS OF CONCAVE MIRROR...

3. If the object at centre of curvature

Image will be formed

- At centre of curvature and focus
- Same size
- Real image
- Inverted





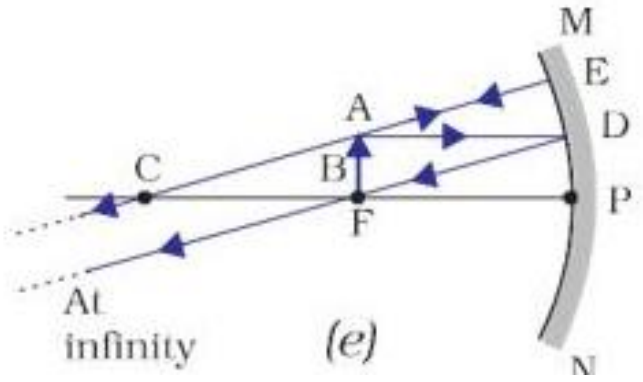
(d)

4. If the object is beweent centre of curvature and focus

Image will be formed

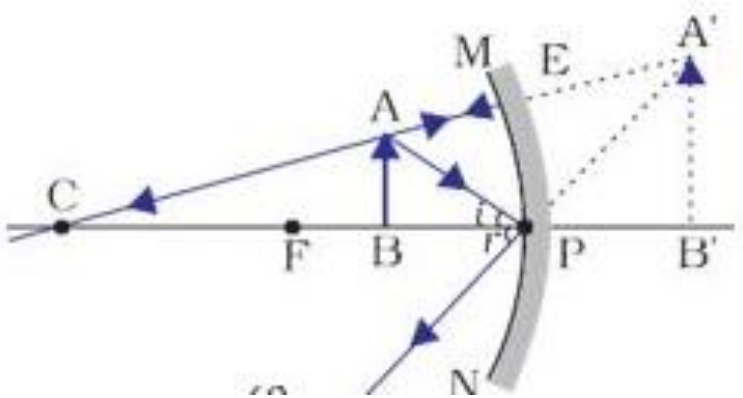
- Beyond centre of curvature(c)
- Enlarged
- Real image
- Inverted

RAY DIAGRAMS OF CONCAVE MIRROR...



5. If the object at focus
   Image will be formed
- At infinity
- Highly enlarged
- Real image
- Inverted

6. If the object between '**f**' and pole
   Image will be formed
- Beyond the mirror
- Enlarged
- Real image
- Erect



Uses of concave mirror

- Headlights of car

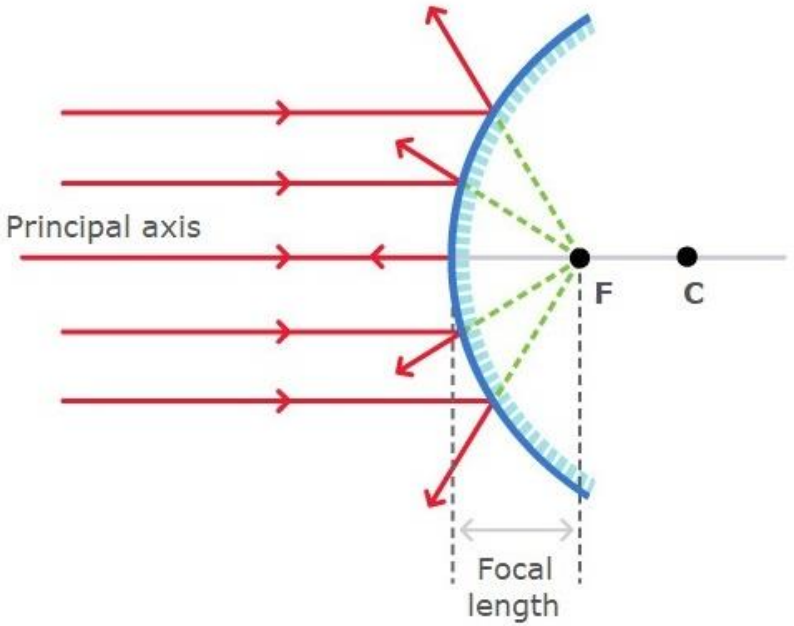
- Make-up mirror

- Antennas /satellites

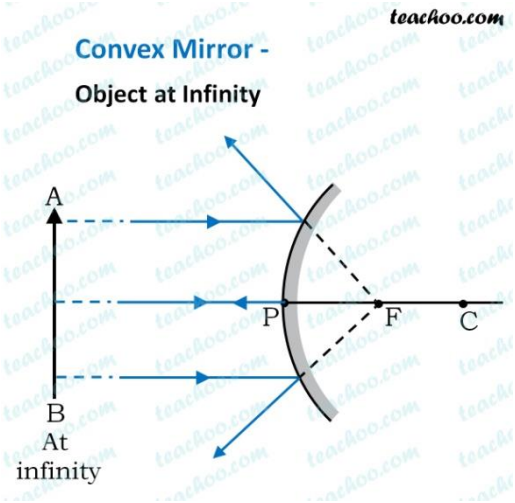
- Dentist mirror

Convex mirror

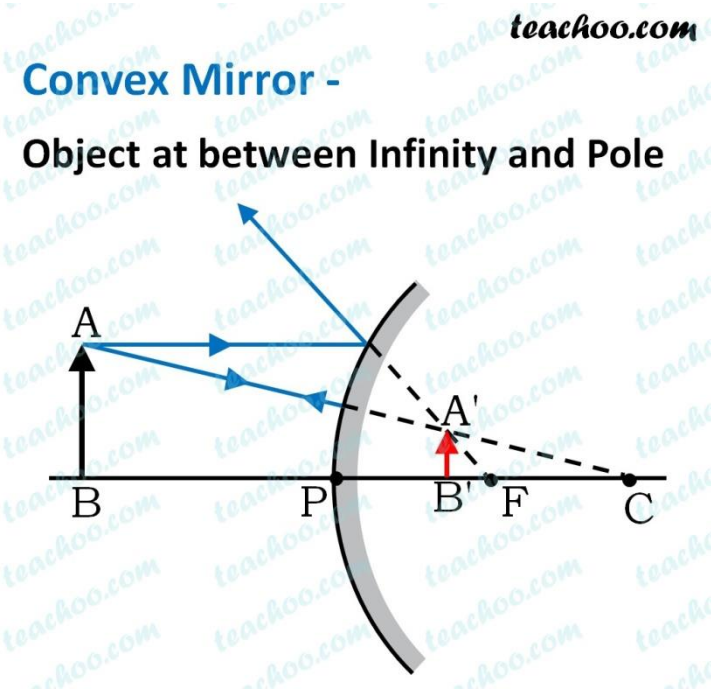
- A convex mirror is **a diverging mirror in which the reflective surface bulges towards the light source**. They are not used to focus light as they reflect light outwards. The image formed by convex mirrors are smaller than the object but gets larger as they approach the mirror.



Ray diagram of convex mirror



1. If the object is at infinity
   Image will be formed at focus, on the opposite side of mirror.



2. If the object is between infinity and pole
   Image will be formed between focus and pole, on the opposite side of mirror.

Uses of convex mirror

Rear View Mirror for Vehicles

Shop Security Mirrors
(Traffic Mirrors)

Mirror formula

$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$$

- **f: The focal length**
- **v :Distance of image away from mirror**
- **u:The object distance from mirror**
- **h': Height of image**
- **h: Height of object**

$$m = \frac{\text{height of image}}{\text{height of object}} = \frac{h'}{h}$$

or

$$m = -\frac{\text{image distance}}{\text{object distance}} = -\frac{v}{u}$$

NUMERICAL

1. A convex mirror used for rear-view on an automobile has a radius of curvature of 3.00 m. If a bus is located at 5.00 m from this mirror, find the position, nature and size of the image

2. Suppose Object distance is 3 cm in front of the mirror. Image distance is 12 cm in front of the mirror. Find Magnification

SOLUTIONS

1. Radius of curvature = 3 m

We know that

$$\text{Focal length} = \frac{Radius\ of\ curvature}{2}$$

$$= \frac{3}{2}$$

$$= 1.5 \text{ m}$$

Since the focus of convex mirror is behind the mirror,

the focal length will be positive

SOLUTIONS...

2. Given

Object Distance = u = −3

Image Distance = v = −12

u and v are negative because they are in front of the mirror

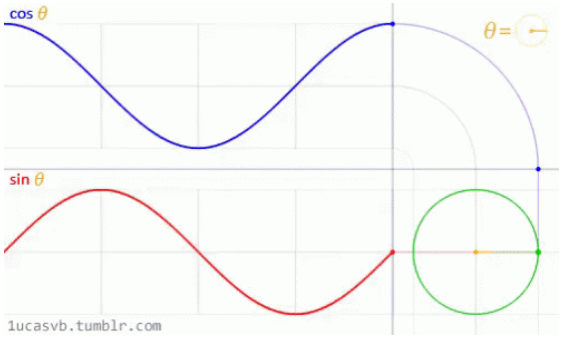
So Magnification m is given by

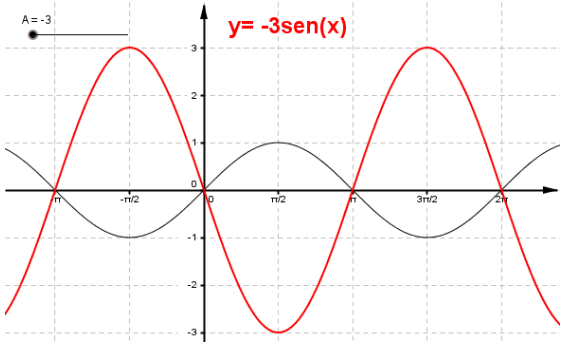
$$m = \frac{-v}{u}$$

$$m = \frac{-(-12)}{(-3)}$$

$$m = \frac{-12}{3}$$

$$m = -4$$





- Any query refer to:- imarshbir@gmail.com