

**Question:**

How far should an object be placed from a concave spherical mirror of radius 38cm to form a real image of one-ninth its size?

**Solution:**

If radius of spherical mirror is  $R=38\text{sm}$  then focal length of mirror is

$$F=R/2=19\text{cm}$$

Because we have real image of one-ninth its size we get the object's position as  $S>2F$ ,

We have  $D/S=m$ ,  $D=S*m$  (here  $m=1/9$  is the magnification,  $D$  is image position) and

$$1/S+1/D=1/F$$

So, we arrive at

$$\frac{1}{S}\left(1 + \frac{1}{m}\right) = \frac{1}{F}$$

And substituting values we get the answer:

$$S = F \frac{m+1}{m} \approx 21\text{sm}$$