

Huygens' principle: All points on a wavefront act as point sources of spherically propagating "wavelets" that travel at the speed of light appropriate to the medium. At a short time  $\Delta t$  later, the new wavefront is the unique surface tangent to all the forward-propagating wavelets.

"Problem 1", videos (1) – (7)

1A) According to Huygens' principle, all points on a wavefront serve as point sources of secondary wavelets. For a material body, give an atomistic physical explanation of this principle.

1B) Does the mechanism in A suggest that the secondary wavelets have the same frequency or wavelength as the incident wavefront. Explain.

"Problem 2", videos (8) – (10)

You want to create a real image of a bunch of flowers that is the same size as the actual bunch, has the flowers above the stems (i.e., looks natural, "right-side up"), is above the central axis of the mirror.

If you use a concave mirror of radius 40 cm, explain (equations and diagram)

(A) the distance you place the actual flowers with respect to the mirror?

(B) Are the actual flowers placed "right-side up" or "upside-down"?

(C) Are the actual flowers placed above or below the central axis of the mirror?

"Problem 3", videos (11) – (13)

(A) Draw a diagram of the rays of light from a distant object as focused by a near-sighted (myopic) eye. The diameter of the eye is 2.5 cm.

(B) If this eye can see clearly as far away as 400 cm and as close as 22 cm, what is its focal length...

(i) ... in the condition of maximum tension of the ciliary muscles?

(ii) ... in the relaxed state of the ciliary muscles?

(iii) In which of (i) and (ii) is the lens more round (smaller radius of curvature)?

Explain.