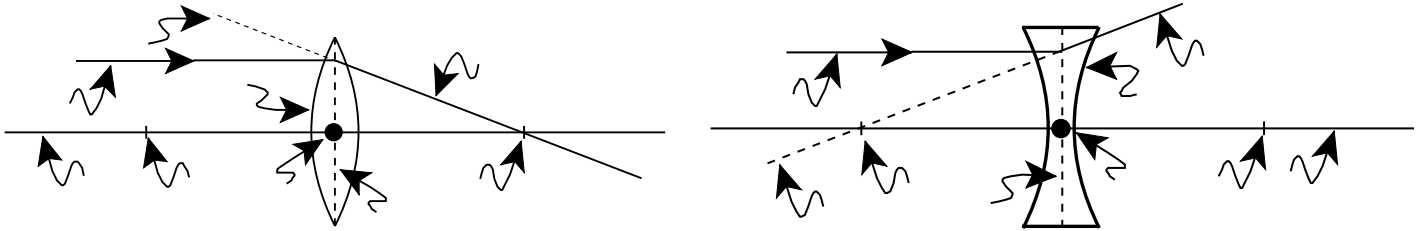


{6} **PART 1 - CONVERGING/DIVERGING LENS TERMINOLOGY (P.450)**

Locate the items below in the diagrams. Each diagram uses all the items once.

- |                        |                      |                 |
|------------------------|----------------------|-----------------|
| ① Principal Axis (PA)  | ④ Optical Centre (O) | ⑦ Incident Ray  |
| ② Principal Focus (F)  | ⑤ Axis of Symmetry   | ⑧ Refracted Ray |
| ③ Secondary Focus (F') | ⑥ Lens               | ⑨ Virtual Ray   |

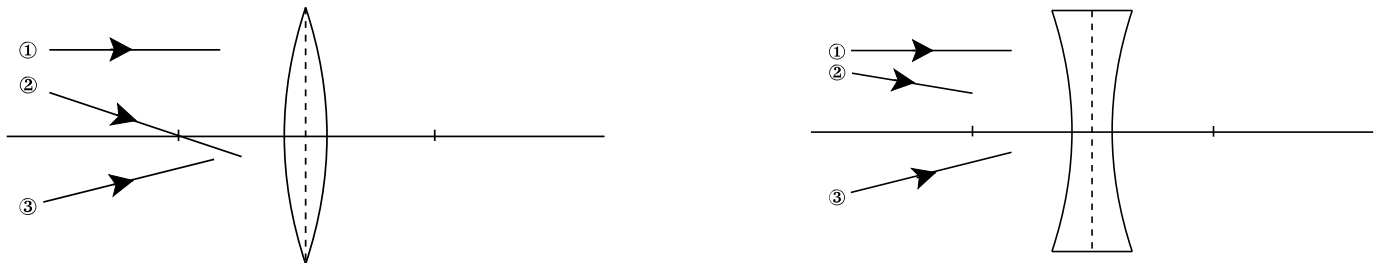


NOTE: Since light can enter a lens from either side, there are two principal foci. The notation F is always given to the primary principal focus, the point at which the rays converge or from which they appear to diverge; the secondary principal focus is usually expressed as F'.

{3} **PART 2 - CONVERGING/DIVERGING LENS RAY DIAGRAM RULES (P.452 & 454)**

Label F and F' on the following diagrams and then use the rules below to complete the incident/refracted/virtual rays.

- ① An incident ray parallel to the principal axis is refracted through (or appears to pass through) the principal focus (F).
- ② An incident ray that passes through (or appears to pass through) the secondary focus (F') is refracted parallel to the principal axis.
- ③ An incident ray that passes through the optical centre (O) goes straight through, without bending.



NOTE: To simplify the ray drawing assume that all refraction takes place along the axis of symmetry.

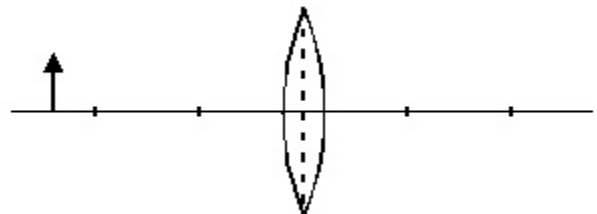
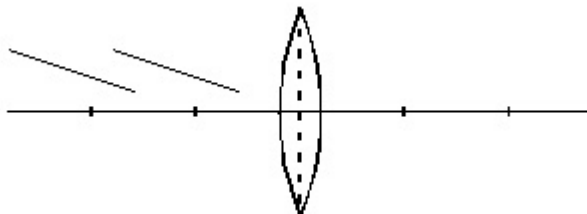
**PART 3 - RAY DIAGRAMS FOR CONVERGING LENSES (P.453 & 458)**

An object is located in front of a converging lens in each of the following diagrams. Use the converging lens ray diagram rules explained above to help locate the image formed. Describe the image formed (if any) in the table on the next page. Be sure to label F and F' on these diagrams as well.

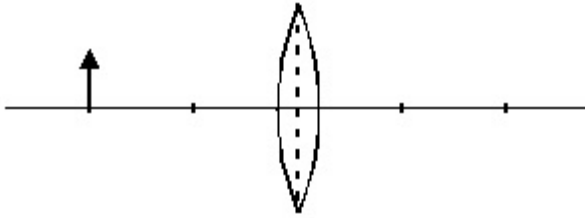
NOTE: The object (real) is always shown as a solid erect arrow. Any two rays are drawn from the tip of the object. The place where the rays intersect, or appear to do so after refraction, gives the location of the tip of the image. The third ray (if it can be used) serves as a check. A real image is always drawn as a solid arrow (because real rays were used to help locate it). A virtual image is always shown as a dotted arrow (because virtual rays were used to help locate it).

{7} ① **Distant object (rays parallel to each other)**

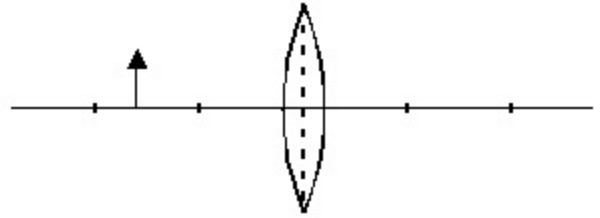
② **Object outside 2F'**



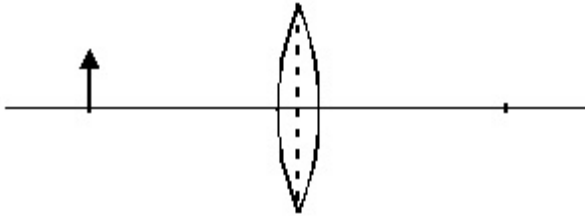
{8} ③ **Object at 2F'**



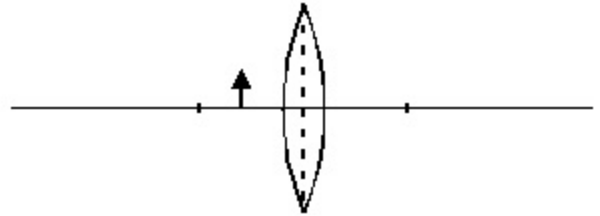
④ **Object between F' and 2F'**



{7} ⑤ **Object at F'**



⑥ **Object between F' and O**



{6}

Object Position	Image Characteristics			
	Size	Attitude	Location	Type
Distant				
Outside 2F'				
At 2F'				
Between 2F' and F'				
At F'				
Between F' and O				

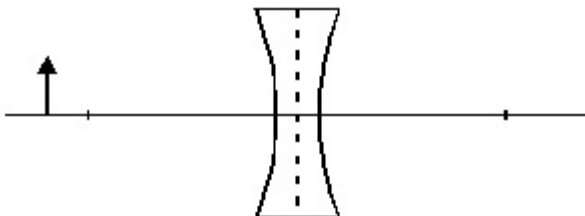
{2} Q1. What is important about the first ray diagram (i.e. a distant object)?

{2} Q2. What happens to the image as the object approaches the lens from a distance?

**PART 4 - RAY DIAGRAMS FOR DIVERGING LENSES (P.452)**

An object is located in front of a diverging lens in the following diagram. Use the diverging lens ray diagram rules explained earlier to help locate the image formed. The image has already been described for you. Be sure to label F and F' on this diagram as well.

{4} ① **Object in front**



Unlike the converging lens, which produces real or virtual images depending on the location of the object, the diverging lens produces only **virtual** images. These virtual images are all:

- ① erect
- ② smaller than the object, and
- ③ located between the object and the lens.