2010 Sec 4 Physics Revision 9.1
09 Lenses

Name: _____ (   ) Class: 4/ ___   Date: _____

At the end of the activity, you should be able to :
- state the main features of a thin converging lens
- draw a ray diagram to find an image location
- name some applications of thin converging lens

9.1 Key terms for lenses

- A converging lens or _____ lens has two _____, one on each side of the lens.

- The centre of the lens is called _____ centre C.

- Light rays parallel to the _____ axis are focused onto a point called the _____ focus F.

- The distance between C and F is called the _____ length f.

- Object distance u is the distance from the _____ to the centre of the lens.

- Image distance v is the distance from the _____ to the centre of the lens.

9.2 3 rules for drawing light rays

- On the diagram below, draw the 3 rays which are commonly used to construct light ray diagrams.

lens

principal axis

F   F
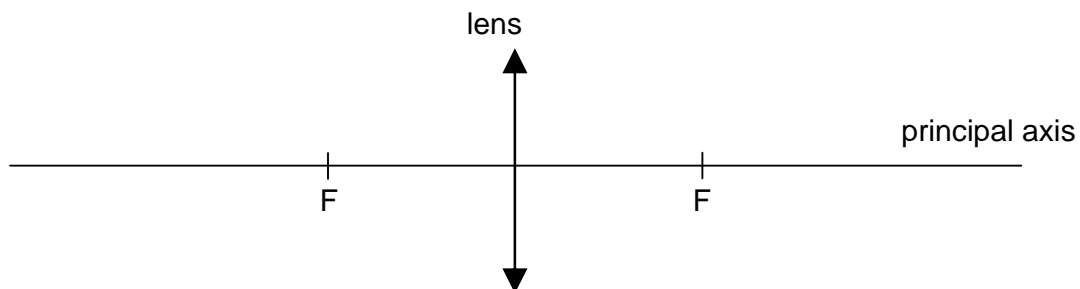
9.3 Quiz (4 questions) – Check answers online

1. Which of the following correctly describes the image formed by a thin converging lens when used as a magnifying glass?

    A. Real, upright and magnified.
    B. Real, inverted and magnified.
    C. Virtual, upright and magnified.
    D. Virtual, inverted and magnified.

2. In the diagram, F are the principal foci of the converging lens.
   An object is placed at O. At which point is the base of the image formed?
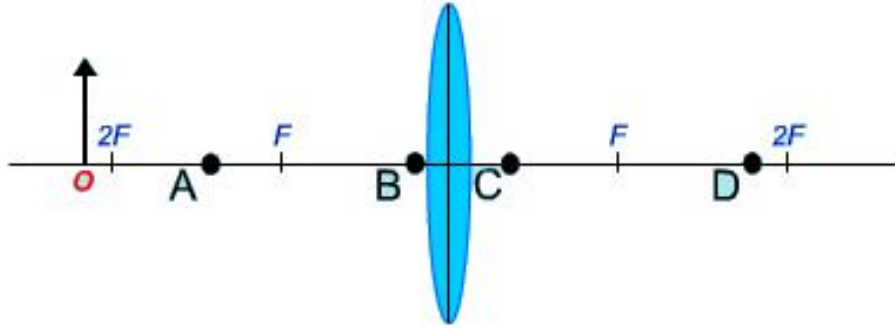
3. An object of height 5 cm is placed at 15 cm from a convex lens of focal length 10 cm.
   Find the image distance.
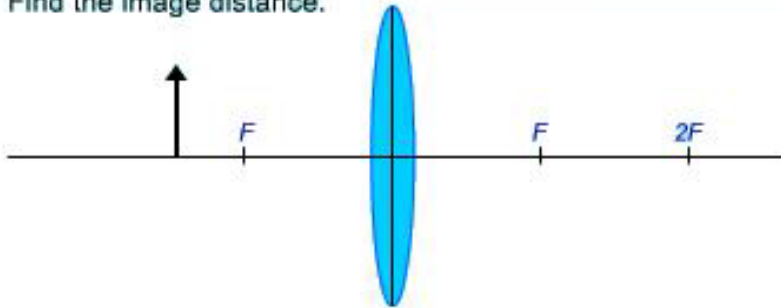
Method 1:   Use the online simulation at
http://johnlittlephysics.pbworks.com/lenses
- under **Others**: simulationactual.swf Ray diagram simulation

→ move the slider to u = 15 cm.
Draw rays on the above diagram.

Image distance v = _____

Method 2:   Draw an accurate ray diagram using the scale given below.
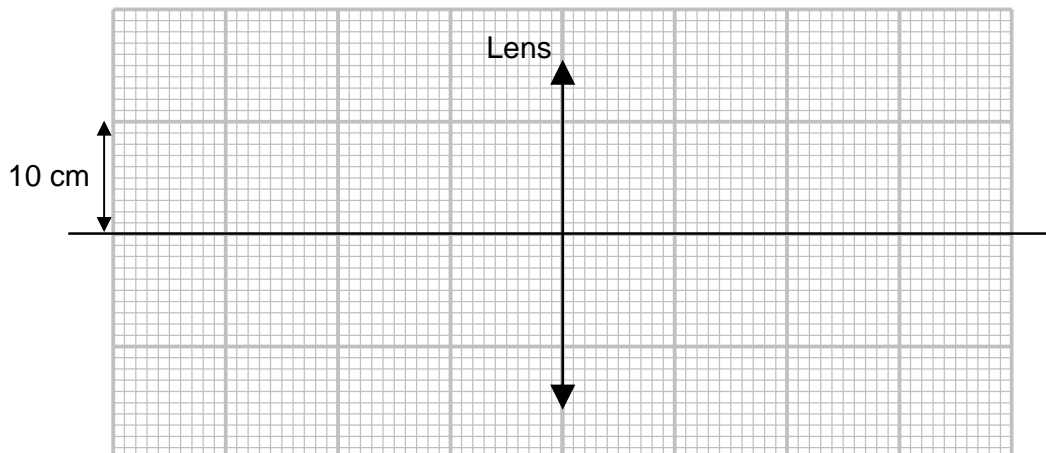

Image distance v = _____

Method 3:   Apply the lens formula   1/f = 1/u + 1/v
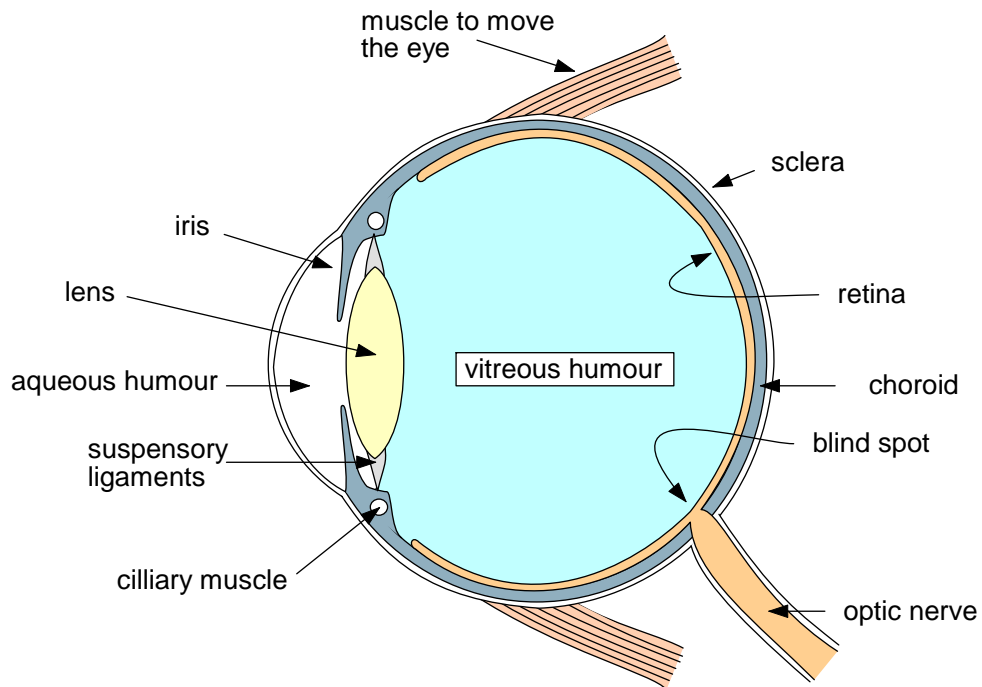
Image distance v = _____

4. Images formed by an object at different distances from a converging lens have
    different characteristics. Use any of the following words (once or more times):

     real,   virtual,   inverted,   upright,

     diminished,   magnified,   same size as the object

Object distance u	Characteristics			*Applications
	Real or virtual	**Upright or inverted**	**Size**	
0 < u < f				
u = f				
f < u < 2f				
u = 2f				
u > 2f				

* *Click on each case under* "**Images formed by a converging lens**"

9.4   The human eye

muscle to move
the eye

sclera

iris

retina

lens

vitreous humour

aqueous humour

choroid

suspensory
ligaments

blind spot

cilliary muscle

optic nerve

(a)   For the human eye, what is the condition for the object distance u?

_____

    Hint: *Click on cases under* "**Images formed by a converging lens**".

(b)   Which other application has the same condition for u as part (a)?

_____

(c)   Take a close look at the structure of the human eye.

> Website:
> From http://johnlittlephysics.pbworks.com/
> → Revise → Topic 9: Lenses   → The human eye - physics behind it

    (i)   On which part of the eye is the image focused on? _____

    (ii)   If a person is short-sighted or near-sighted, the image from a distant object
            would be focused on a point _____ _____ _____
            the retina.

    (iii)   To correct the short-sightedness, the person would wear spectacles with _
                        _____ lenses.