Name: _____( ) *Class:* _____

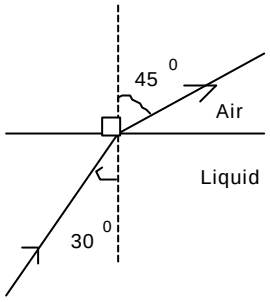
CHAN SHU KUI MEMORIAL SCHOOL

S.3 PHYSICS

REVISION EXERCISES - SOLUTIONS

Answer ALL the questions. Full Mark: 60

1. The below diagram shows a light ray travelling from liquid to air. Find the refractive index of the liquid. (5 marks)



By Law of refraction,

$n_i \sin i = n_r \sin r$

$n_{liquid} \sin 30 = (1) \sin 45$

$n_{liquid} = \dfrac{\sin 45}{\sin 30} = 1.41$

Find the critical angle of the liquid. (5 marks)

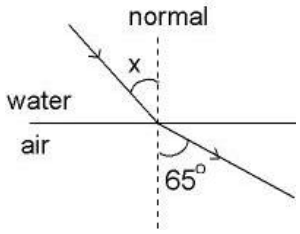
$C = \sin^{-1}(1/n_{liquid}) = \sin^{-1}(1/1.41) = 45.2^o$

What happens if the angle of incidence greater than the critical angle?

Total internal reflection (2 marks)

2. Find the unknown angle x in the following diagrams. (10 marks)
(Refractive index of water = 1.33; refractive index of glass = 1.5)

(a)



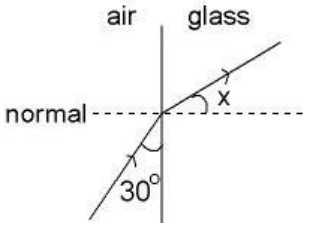
$n_i \sin x = n_r \sin 65$

$(1.33) \sin x = (1) \sin 65$

$\sin x = \dfrac{\sin 65}{1.33}$

$x = 43^o$

(b)



$n_i \sin(90-30) = n_r \sin(90-x)$

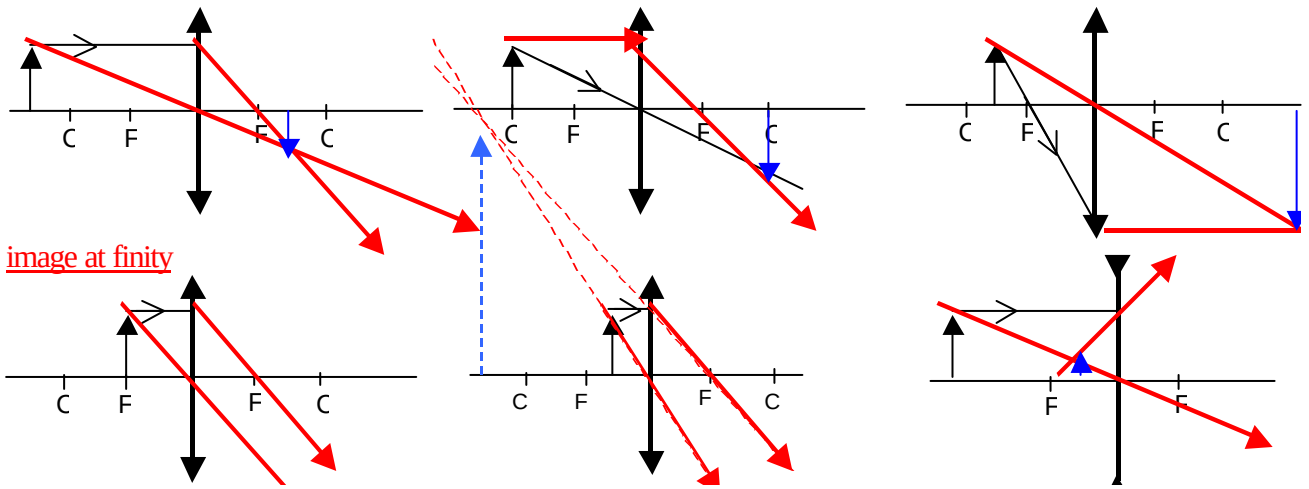
$(1) \sin 60 = (1.5) \sin(90-x)$

$\sin(90-x) = \dfrac{\sin 60}{1.5}$

$(90-x) = 35.3^o$

$x = 90 - 35.3 = 54.7^o$

3. Complete the following rays diagrams. (18 marks)



4. Vincent cannot see distant objects clearly. The figure shows how he sees objects with the help of spectacles.

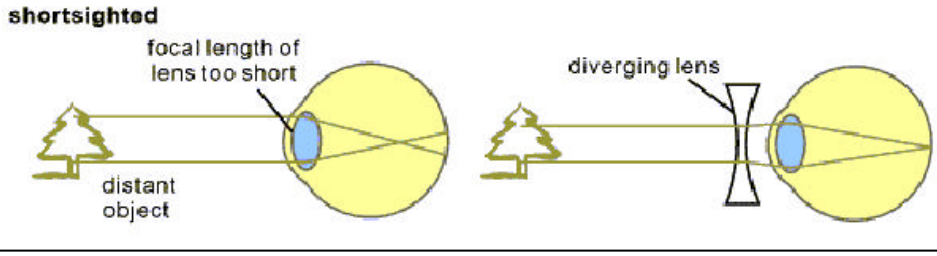
a) What kind of defect is he suffering from? (2 marks)

Short sight

b) What kind of spectacles should he wear? (2 marks)

Concave lens

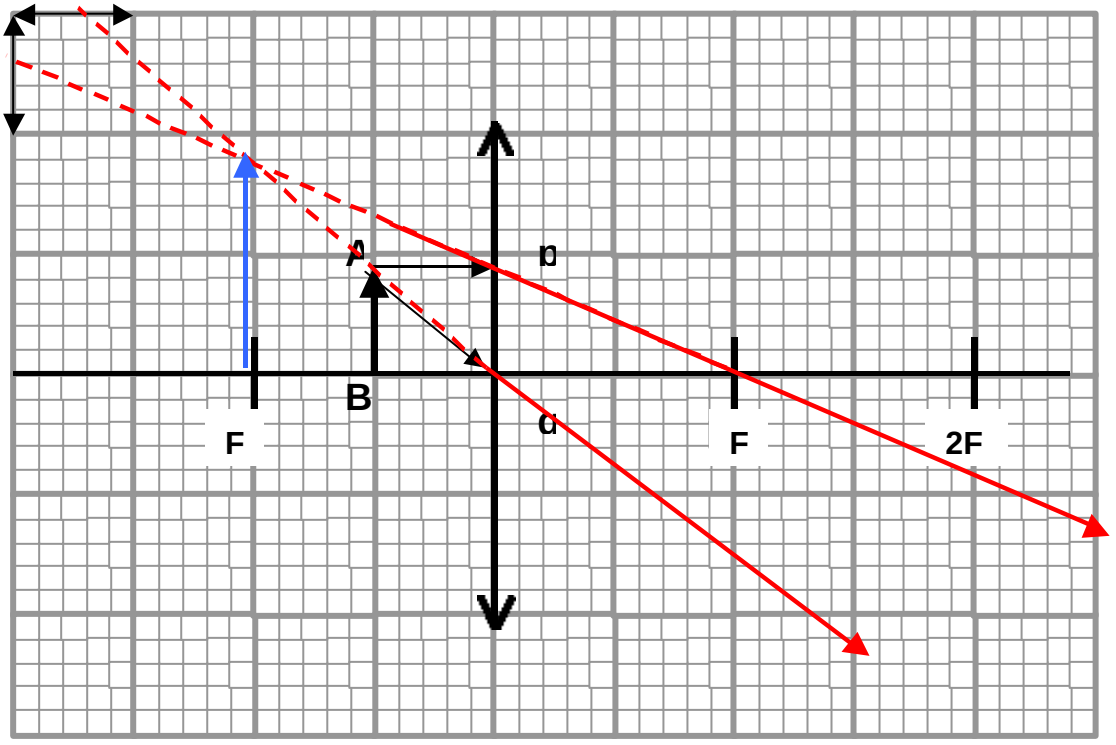
c) Draw a ray diagram to show how this defect is corrected. (6 marks)



5. In the following figure, an object AB is 4.5cm in height placed 5 cm in front of a convex lens. The focal length of the lens is 10 cm.

5 cm

5 cm



(b)

$$M = \frac{v}{u} = \frac{10}{5} = 2$$

(a) Draw the refracted rays p, q, and sketch the image of AB. (10 marks)

(b) Find the magnification of the image. (4 marks)

(c) State the nature of image. (6 marks)

Virtual, erect, magnified

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Bonus Questions

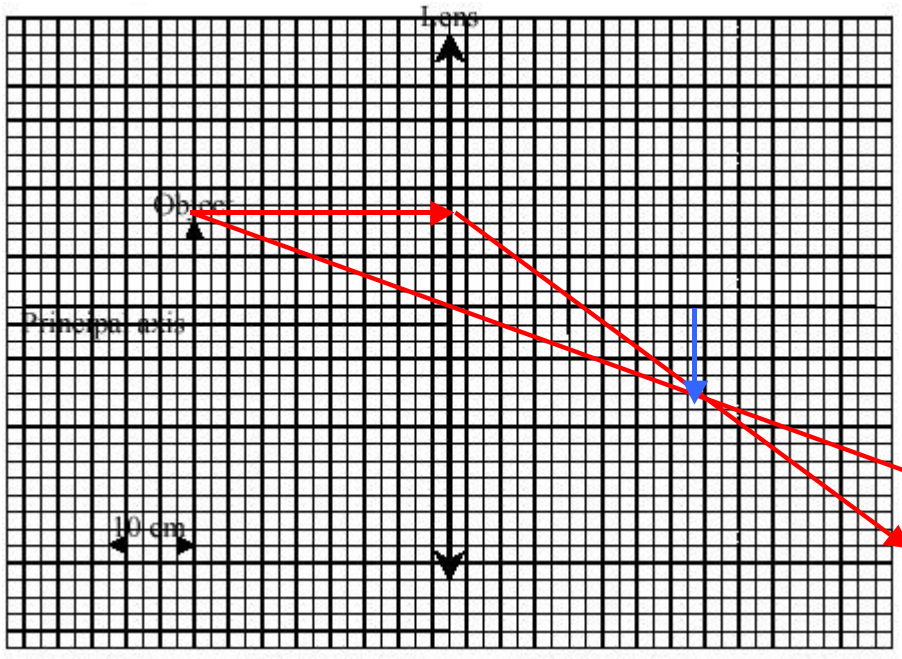
6. An object is placed 30 cm in front of a convex lens and a sharp image is formed on a screen on the other side of the lens. The image is of the same size as the object.

(a) Is the image real or virtual ? Explain your answer. (2 marks)

real image, as only real image can form image on the other side of convex lens.

(b) In Figure 1, draw a ray diagram to show how the image of the illuminated object is formed. Hence, or otherwise, determine the focal length of the lens.

(4 marks)



Focal length is 8 cm.

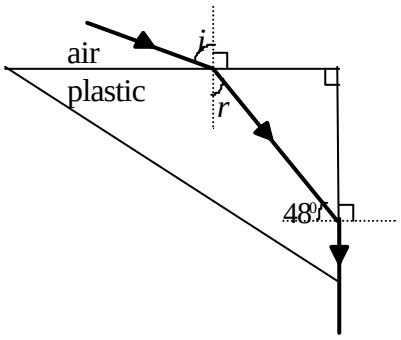
Figure 1

7. The figure below shows the path of a light ray passing through a plastic from air.

(a) What is the critical angle of the plastic ? (4 marks)

(b) What is the refractive index of the plastic ? (4 marks)

(c) Find the angle *i* & *r*. (4 marks)



(a) 48^o

(b) $n = \frac{1}{\sin C} = \frac{1}{\sin 48} = 1.35$

(c) since $\angle r + \angle 48 = 90 \qquad \angle r = 42^o$

$n_{plastic} \sin r = n_i \sin i$

also $(1.35)\sin 42 = (1)\sin i$

$i = 64.6^o$

****The suggested solutions of this exercises is posted on the following website after June 12, 2003*

http://www.hkedcity.net/ihouse/lc951120