Phys 112 2019

Review III

Exam III

Covers 25.5 -25.7, 17, 18, 19.2 → 19.3
Waves

Bring: Calculator

2 prev 3"x5" single side cards plus
One new 3"x5" " " "

Study: Previous exams

2012 Exam 3 all Questions
Exam 2 questions

2013 Exam 3 v1 all questions
v2 all questions

Ch 25.5 -25.7

Polarization concepts.

Waves

Meaning of λ, f, wave speed $v = \lambda f$

Interference / superposition

Ch 17.1 → 17.3, 17.5-17.6

$n = c/v$ Two slit bright $d \sin\theta_m = m\lambda$ $y_m = \frac{m\lambda L}{d}$ $m = 0, \pm 1, \pm 2$

Diff grating bright $d \sin\theta_m = m\lambda$

Single slit dark $a \sin\theta_p = p\lambda$ $w = \frac{2\lambda L}{a}$ $p = \pm 1, \pm 2, \ldots$

Quiz 1 – needs wavelength info red larger
– 80%

Example: Red light with wavelength 656×10^{-9}m is incident on a single slit. A pattern is observed on a screen 0.80m away, and the width of the central bright fringe is 0.015m. The red light is replaced by yellow light and the width of the central bright fringe is 0.013m. Determine the wavelength of the yellow light

Answer: $W_{yellow} = \dfrac{2\lambda_{yellow} L}{a}$

$$\Rightarrow \lambda_{yellow} = \frac{W_{yellow}}{2L} a$$

Need "a" and can get this from red data:

$$W_{red} = \frac{2\lambda_{red} L}{a} \Rightarrow a = \frac{2\lambda_{red} L}{W_{red}}$$

$$= \frac{2 \times 656 \times 10^{-9}\text{m} \times 0.80\text{m}}{0.015\text{m}}$$

$$= 7.0 \times 10^{-5}\text{m}$$

Then:

$$\lambda_{yellow} = \frac{0.013\text{m} \times 7.0 \times 10^{-5}\text{m}}{2 \times 0.80\text{m}} = 570 \times 10^{-9}\text{m}$$ ☐

Ch 18.1 → 18.3, 18.5, 18.7

$\theta_i = \theta_r$ reflection $n_1 \sin\theta_1 = n_2 \sin\theta_2$

$\theta_c = \sin^{-1}\left(\frac{n_2}{n_1}\right)$

Lens ray tracing

$\frac{1}{s} + \frac{1}{s'} = \frac{1}{f}$ $\quad M = \frac{h'}{h}$ $\quad M = -\frac{s'}{s}$ Various sign conventions

Quiz 2 90%

Quiz 3 30% - 50%

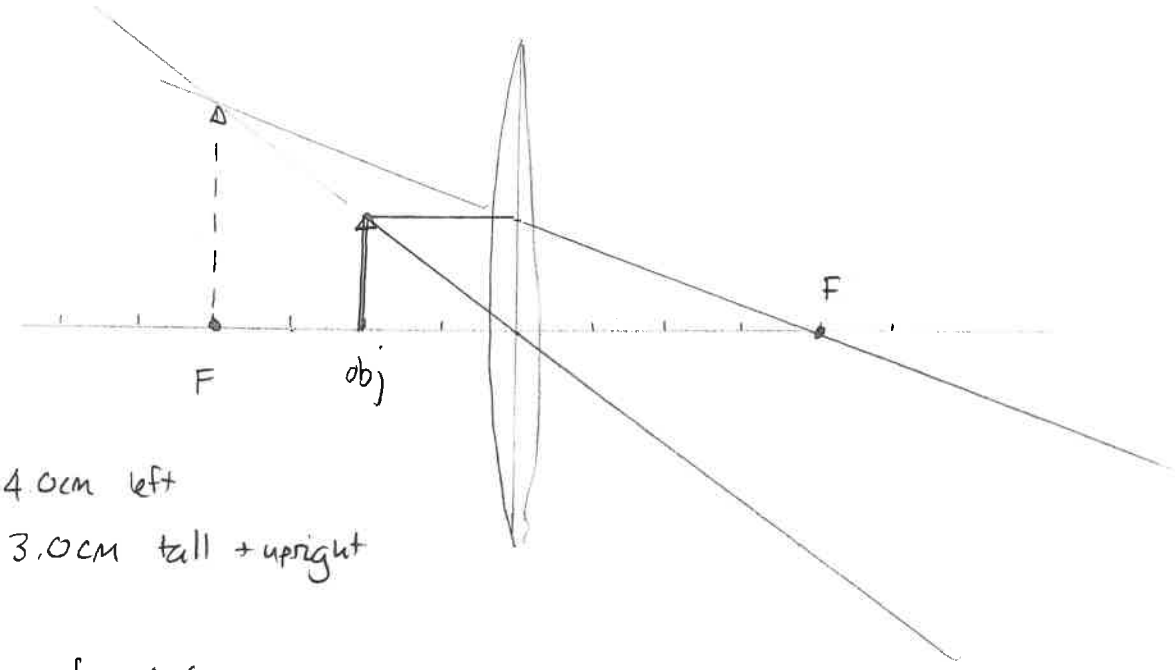
Example: A converging lens has focal length 4.0cm. An object is 2.0cm left of the lens. Determine the location and size of the image using: Lo and has height 1.5cm

a) ray tracing

b) equations

Answer:

a)



4.0cm left

3.0cm tall + upright

b) $f = 4.0\text{cm}$

$s = 2.0\text{cm}$

$$\frac{1}{s} + \frac{1}{s'} = \frac{1}{f}$$

$$\Rightarrow \frac{1}{2.0\text{cm}} + \frac{1}{s'} = \frac{1}{4.0\text{cm}}$$

$$\Rightarrow \frac{1}{s'} = \frac{1}{4.0\text{cm}} - \frac{1}{2.0\text{cm}} = -\frac{1}{4.0\text{cm}} \Rightarrow s' = -4.0\text{cm}$$

$m = h'/h \Rightarrow h' = mh$

But $m = -s'/s = -\frac{-4.0\text{cm}}{2.0\text{cm}} = 2.0$

Thus $h' = 2.0 \times 1.5\text{cm} = 3.0\text{cm}$

Chapter 19.2 → 19.3

$$M = \frac{S_{new}}{f}$$

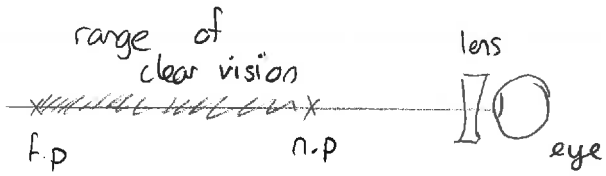
Quiz 4 ~20%

Example: A person has a far point of 2.0m.

a) Determine the (maximum) focal length corrective lens needed to be able to view a very distant star

b) If the person uses a corrective lens with focal length -3.0m, what is the furthest distance at which the person can observe an object clearly.

Answer: a) object at infinity
Image at 2.0m



$s = \infty$

$s' = -2.0m$

$\frac{1}{s} + \frac{1}{s'} = \frac{1}{f} \Rightarrow \frac{1}{\infty} + \frac{1}{-2.0m} = \frac{1}{f} \Rightarrow$ $f = -2.0m$

b) Need to find s s.t $s' = -2.0m$.

$\frac{1}{s} + \frac{1}{s'} = \frac{1}{f} \Rightarrow \frac{1}{s} + \frac{1}{-2.0m} = \frac{1}{-3.0m}$

$\Rightarrow \frac{1}{s} = \frac{1}{2.0m} - \frac{1}{3.0m} = \frac{1}{6.0m}$

$\Rightarrow s = 6.0m$.