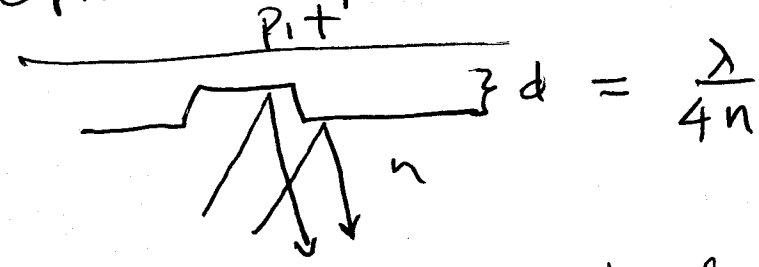
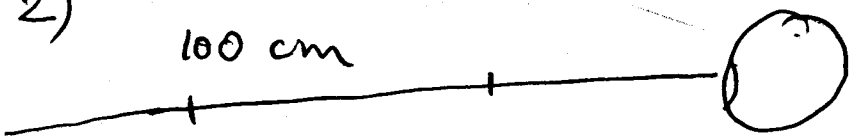
Physics 1C
Quiz 2 form A

1) Optical Compact Disc-



light hitting a pit interferes destructively with light hitting the outer surface to cause a decrease in intensity

2)



far point

To correct ~~to~~ normal vision a corrective lens must form a virtual image of an object at ∞ at the ~~f~~far point of the eye.

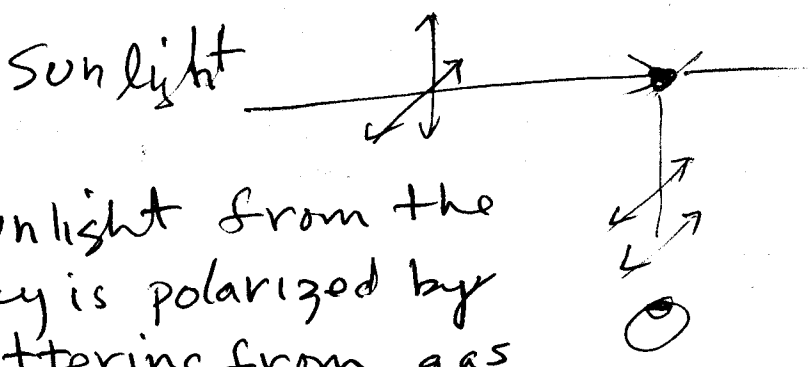
$p = \infty \quad q = -100\ cm$

$$\frac{1}{p} + \frac{1}{q} = \frac{1}{f}$$

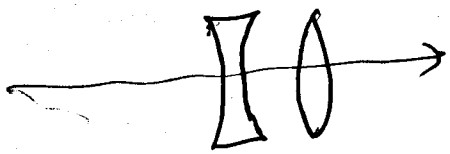
$$\frac{1}{\infty} + \frac{1}{-100} = \frac{1}{f}$$

$$f = -100\ cm = -1.0\ m$$

$$P = \frac{1}{f} = \frac{1}{-1.0} = -1.0\ \text{diopters}$$

3) 

sunlight from the sky is polarized by scattering from gas molecules in the atmosphere.

4) 

$f = 30$ cm

$f_2 = ?$ $f_2 = 20$ cm

for 2 lenses in contact.

$$\frac{1}{f_1} + \frac{1}{f_2} = \frac{1}{f}$$

$$\frac{1}{f_1} = \frac{1}{f} - \frac{1}{f_2}$$

$$\frac{1}{f_1} = \frac{f_2 - f}{f f_2} = \frac{20 - 30}{(30)(20)} =$$

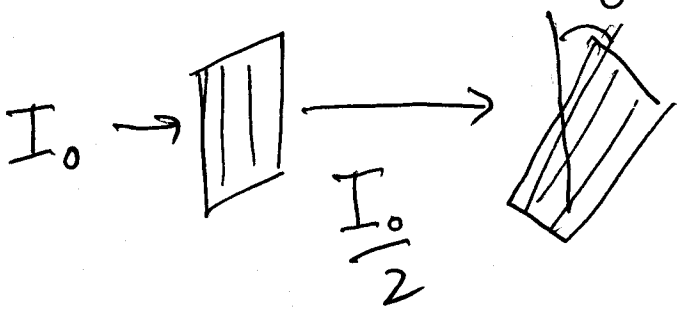
$$f_1 = \frac{30(20)}{-10} = \boxed{-60 \text{ cm}}$$

5) The magnification for a compound microscope

$$m = \left(-\frac{L}{f_{objective}}\right)\left(\frac{25 \text{ cm}}{f_{eyepiece}}\right)$$

$f_{objective}$ and $f_{eyepiece}$ must be both small for m to be large.

6) Two polarizers — θ



Intensity reduced to $0.3 I_0$

$$\frac{I_0}{2}\cos^2\theta = 0.30 I_0$$

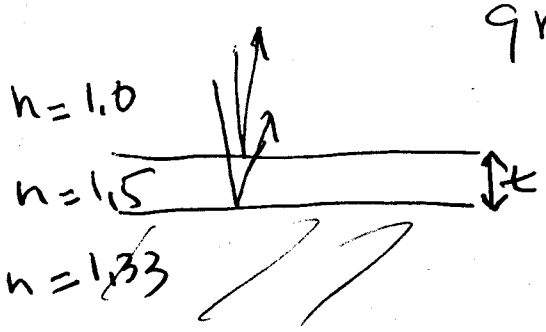
$$\frac{\cos^2\theta}{2} = 0.3$$

$$\cos^2\theta = 0.6$$

$$\cos\theta = \sqrt{0.6} = 0.775$$

$$\boxed{\theta = 39^\circ}$$

7) Thin film of benzene on water reflects green light $\lambda = 500\ nm$ — The smallest thickness t — is given by

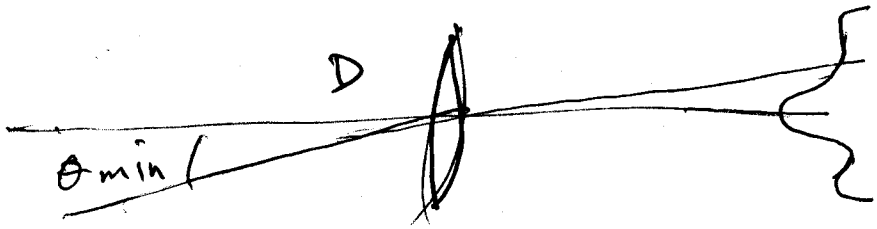


$$2t = \frac{1}{2}\frac{\lambda}{n_{benzene}}$$

since there is a phase shift difference between the two reflected waves —

$$t = \frac{1}{4}\frac{\lambda}{n_{benzene}} = \frac{1}{4}\frac{500\ nm}{1.50} = \boxed{83\ nm}$$

8)



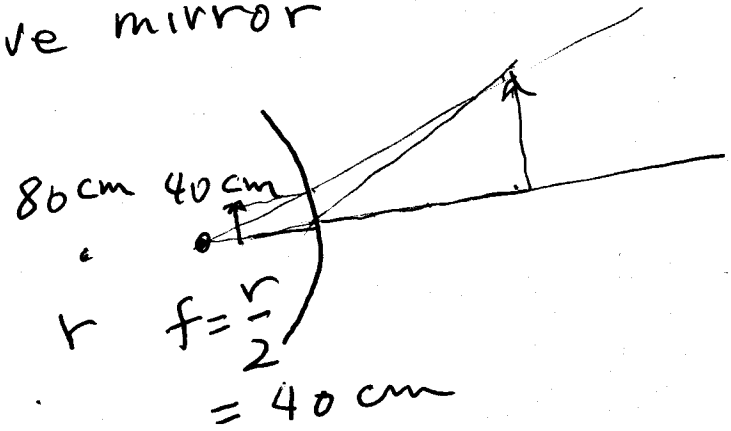
The minimum angle for 2 objects to be resolved is given by the Rayleigh criterion

$$\theta_{min} = \frac{1.22\lambda}{D}$$

$$D = \frac{1.22\lambda}{\theta_{min}} = \frac{1.22(500\times10^{-9}\,m)}{10^{-5}}$$

$$D = 6.1\times10^{-2} = \boxed{6.1\ cm}$$

9) Concave mirror



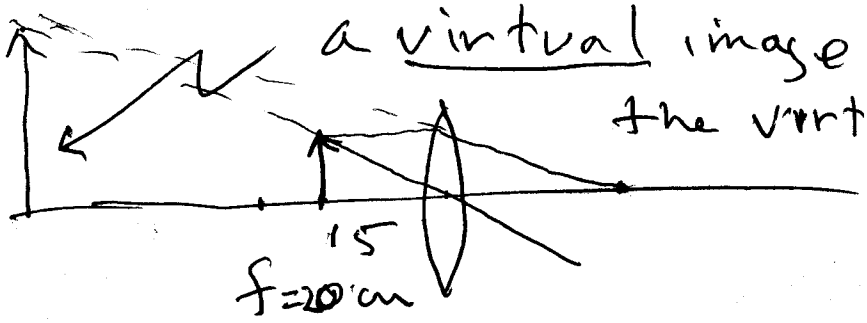
$$m = 4 = -\frac{q}{p} \quad \text{(magnification = 4)}$$

$$q = -4p$$

$$\frac{1}{p} + \frac{1}{q} = \frac{1}{f}$$

$$\frac{1}{p} + \frac{1}{-4p} = \frac{1}{f}$$

$$\frac{4-1}{4p} = \frac{1}{f} \Rightarrow p = \frac{3}{4}f = \frac{3}{4}(40) = \boxed{30\ cm}$$

10) 

a virtual image is formed on the virtual side - to the left of the lens

$$\frac{1}{p} + \frac{1}{q} = \frac{1}{f}$$

$$\frac{1}{q} = \frac{1}{f} - \frac{1}{p} = \frac{p-f}{fp}$$

$$q = \frac{fp}{p-f} = \frac{(20)(15)}{15-20} = -60 \text{ cm}$$

virtual image