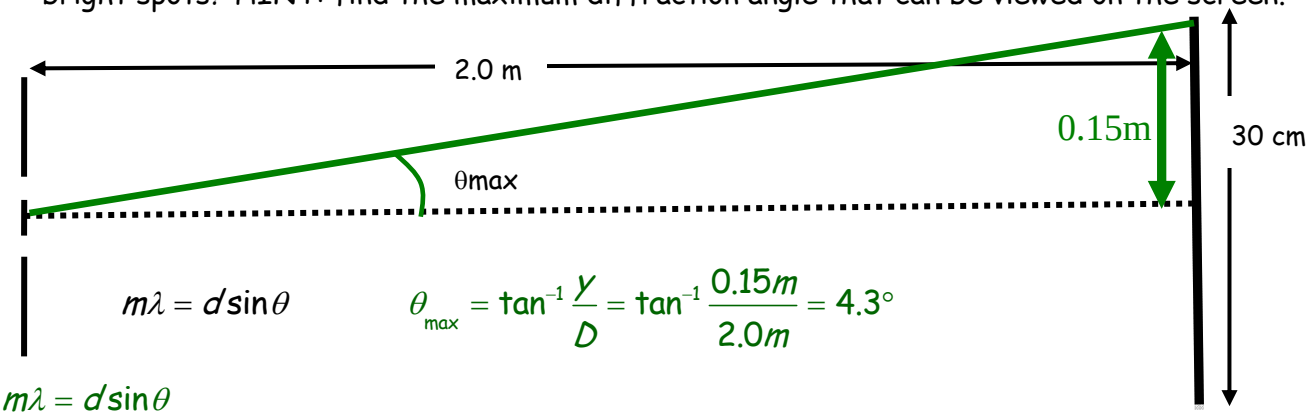
Phys 104A: College Physics

Quiz 8

Name _____

1) [6]In a Young's double slit diffraction experiment, Yellow light of a wavelength 560nm is incident on a double slit with a slit separation of 25μm. A screen of width 30 cm is placed a distance of 2.0 m from the slit. How many diffraction orders do you see? How many bright spots? HINT: find the maximum diffraction angle that can be viewed on the screen.



$m\lambda = d\sin\theta$ $\qquad \theta_{max} = \tan^{-1}\frac{y}{D} = \tan^{-1}\frac{0.15m}{2.0m} = 4.3°$

$m\lambda = d\sin\theta$

$$m = \frac{d\sin\theta}{\lambda} = \frac{25x10^{-6}\,m\sin(4.3)}{560x10^{-9}\,m} = 3.3$$

since m must be an integer, m=3

Number of bright spots =2m+1=7

2[2]. ^{237}Np (Z=93) alpha decays. Which of the following is the daughter product?

a) $^{237}_{89}Ac$
b) $^{235}_{91}Pa$
c) $^{237}_{92}U$
d) $^{233}_{91}Pa$
e) $^{233}_{89}Ac$

$${}^{A}_{Z}P \rightarrow {}^{A-4}_{Z-2}D + {}^{4}_{2}\alpha$$
$${}^{237}_{93}Np \rightarrow {}^{237-4}_{93-2}D + {}^{4}_{2}\alpha$$
$${}^{237}_{93}Np \rightarrow {}^{233}_{91}Pa + {}^{4}_{2}\alpha$$

3[2]. ^{225}Ra (Z=88) decays via beta minus. Which of the following is the daughter product?

a) $^{226}_{89}Ac$
b) $^{225}_{87}Fr$
c) $^{225}_{89}Ac$
d) $^{221}_{86}Rn$
e) $^{224}_{87}Fr$

$${}^{A}_{Z}P \rightarrow {}^{A}_{Z+1}D + {}^{0}_{-1}e + \bar{\upsilon}$$
$${}^{225}_{88}Ra \rightarrow {}^{225}_{88+1}D + {}^{0}_{-1}e + \bar{\upsilon}$$
$${}^{225}_{88}Ra \rightarrow {}^{225}_{89}Ac + {}^{0}_{-1}e + \bar{\upsilon}$$