PHYS 2326 University Physics II – Class number

HOMEWORK- SET #4
CHAPTERS: 36,37,38,39

(DUE AUGUST 6, 2013)

Ch. 36 .==========

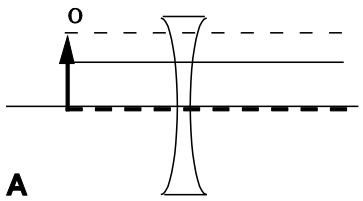
1. A clown 2 m tall looks at himself in a full-length mirror (floor-to-ceiling). Where in the mirror must he look to see his feet?

   a. 1 m from the floor
   b. 50 cm from the floor
   c. 25 cm from the floor
   d. at the bottom of the mirror
   e. 1.5 m from the floor

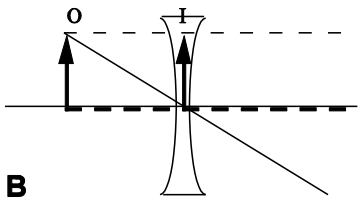
2. A concave mirror has a focal length of 20 cm. What is the position (in cm) of the object if the image is upright and is two times larger than the object?

   a. 30
   b. 20
   c. 10
   d. 40
   e. 60

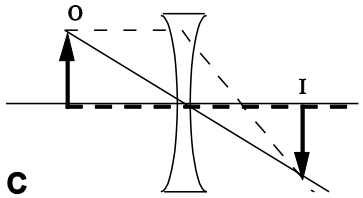
3. Which ray diagram is correct? The three rays in each diagram are distinguished by different types of lines.



A



B



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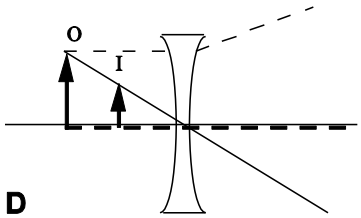
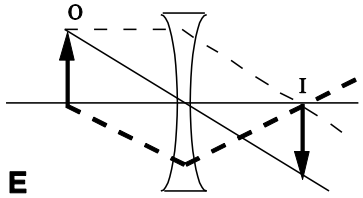


D



E

a. A
b. B
c. C
d. D
e. E

4. A telescope is constructed with two lenses separated by a distance of 25 cm. The focal length of the objective is 20 cm. The focal length of the eyepiece is 5 cm. Calculate the angular magnification of the telescope.

a. 6
b. 4
c. 8
d. 10
e. 5

---------- Chapter-37 ----------

5. A laser beam (λ = 694 nm) is incident on two slits 0.100 mm apart. Approximately how far apart (in m) will the bright interference fringes be on the screen 5.00 m from the double slits?

   a. 3.47×10^{-3}
   b. 3.47×10^{-2}
   c. 3.47×10^{-4}
   d. 3.47×10^{-6}
   e. 3.47×10^{-5}

6. Two slits are illuminated with green light (λ = 540 nm). The slits are 0.05 mm apart and the distance to the screen is 1.5 m. At what distance (in mm) from the central maximum on the screen is the average intensity 50% of the intensity of the central maximum?

   a. 1
   b. 3
   c. 2
   d. 4
   e. 0.4

7. The electric fields arriving at a point P from three coherent sources are described by $E_1 = E_0 \sin \omega t$, $E_2 = E_0 \sin (\omega t + \pi/4)$ and $E_3 = E_0 \sin (\omega t + \pi/2)$. Assume the resultant field is represented by $E_p = E_R \sin (\omega t + \alpha)$. The amplitude of the resultant wave at P is

   a. E_0.
   b. $1.5E_0$.
   c. $1.7E_0$.
   d. $2.7E_0$.
   e. $2.9E_0$.

8. The superposition of two waves $E_1 = E_0 \sin(\omega t)$ and $E_2 = E_0 \sin(\omega t + \phi)$ arriving at the same point in space at the same time is $E =$

a. $2E_0 \sin(\omega t)\cos(\frac{\phi}{2})$.
b. $2E_0 \sin(\omega t)\cos(\phi)$.
c. $2E_0 \sin(\omega t + \frac{\phi}{2})\cos(\frac{\phi}{2})$.
d. $2E_0 \sin(\omega t + \frac{\phi}{2})\cos(\phi)$.
e. $2E_0 \cos(\omega t + \frac{\phi}{2})\cos(\frac{\phi}{2})$.

---------- Chapter-38 ----------

9. Helium-neon laser light ($\lambda = 6.33 \times 10^{-7}$ m) is sent through a 0.30 mm-wide single slit. What is the width of the central maximum on a screen 1.0 m from the slit?

a. 2.0 cm
b. 4.2 mm
c. 1.1 cm
d. 2.0 mm
e. 0.70 mm

10. How wide must a narrow slit be if the first diffraction minimum occurs at ±12° with laser light of 633 nm?

a. 3×10^{-6} m
b. 3×10^{-5} m
c. 6×10^{-6} m
d. 6×10^{-5} m
e. 1.5×10^{-6} m

---------- Chapter-39 ----------

11. A 1000-kg automobile moving with a speed of 24 m/s collides with a 500-kg car initially at rest. If the two stick together, what is the velocity (in m/s) of the two cars after the collision relative to an automobile moving in the same direction at 15 m/s?

    a. 14
    b. 16
    c. 24
    d. 48
    e. 1.0

12. A fancy sports car moves past an observer on a corner at a speed of 0.6 *c*. When the observer indicates a one-second interval has passed, what time interval will be shown on the driver's watch?

    a. 1.67 s
    b. 0.8 s
    c. 1.25 s
    d. 0.6 s
    e. 1.0 s

13. The half-life of a muon is 2.2 μs as measured in a stationary reference frame. What is the half life of the muon (in μs) when it is moving with a speed of v = 0.800 c?

    a. 8.13
    b. 2.75
    c. 3.67
    d. 15.8
    e. 1.32

14. A meterstick is shot from a meterstick projector at a speed of 0.90 *c*. How long will it be relative to an observer's frame of reference?

    a. 2.3 m
    b. 0.91 m
    c. 1.0 m
    d. 0.44 m
    e. 0.81 m