

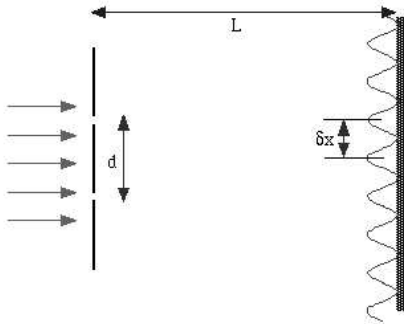
**PHY 232C, INTRODUCTORY PHYSICS II,
EXAM IV, Dec. 3, 2003**

Choose the best answer. For T/F problems, choose only ONE answer.



1. The single slit diffraction pattern shown below was made with light with $\lambda = 450 \text{ nm}$. The screen was 1.8 m from the slit, and the distance to the second minimum (indicated by the arrow) was 8 cm . What is the slit width?

- (a) $2.025 \times 10^{-2} \text{ mm}$
- (b) $3.50 \times 10^{-2} \text{ mm}$
- (c) $7.085 \times 10^{-2} \text{ mm}$
- (d) 0.165 mm
- (e) 0.625 mm

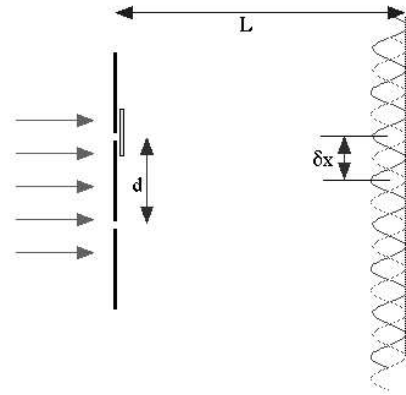


2. A pair of slits is separated by $d = 0.8 \text{ mm}$ and is illuminated with light of $\lambda = 570 \text{ nm}$ wavelength. What is the separation δx of the adjacent interference maximum on a screen $L = 2.3 \text{ m}$ away?

- (a) 0.531 mm
- (b) 0.919 mm
- (c) 1.639 mm
- (d) 2.071 mm
- (e) 4.291 mm

3. What is the energy of a photon for light of wavelength $\lambda = 223 \text{ nm}$?

- (a) 1.832 eV
- (b) 3.643 eV
- (c) 4.084 eV
- (d) 5.561 eV
- (e) 7.903 eV



4. A pair of slits separated by $d = 1.4 \text{ mm}$, is illuminated with light of $\lambda = 310 \text{ nm}$ wavelength and falls on a screen $L = 2 \text{ m}$ away. A piece of glass with index of refraction $n = 2$ is placed at one slit. If the maxima shift by $\delta x/2$ where δx is the distance between maxima, what was the glass thickness?

- (a) $0.115 \mu\text{m}$
- (b) $0.155 \mu\text{m}$
- (c) $0.515 \mu\text{m}$
- (d) $0.755 \mu\text{m}$
- (e) $2.915 \mu\text{m}$

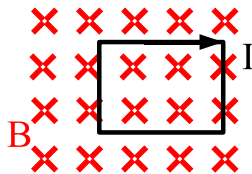
5. Select the single TRUE statement.

- (a) Black body radiation of stars like our sun occurs predominantly in the x-ray region of the spectrum.
- (b) A single photon has an energy proportional to its frequency.
- (c) If two sources emit the same number of photons per second, one near the red end of the spectrum will emit more energy than one near the blue end.
- (d) If a photon and an electron have the same wavelength, then they have the same energy.
- (e) If a proton and an electron have the same wavelength, then they have the same velocity.

6. The nucleus of a neutral atom is labeled by the symbol ${}^{14}_6\text{C}$. Which single statement is TRUE? If all are true select (e).

- (a) There are 14 neutrons in the nucleus.
- (b) The ground state electronic configuration is $1s^2 2s^2 2p^6 3s^2 2p^2$.
- (c) The atomic weight of the nucleus is 14.
- (d) The nucleus has 8 more electrons than protons.
- (e) All statements are true.

7. A ping pong ball of mass $m = 3.1 \text{ g}$ is precisely measured in position to an accuracy of 10^{-10} m . What must be the uncertainty in its velocity?
- 2345.2 m/s
 - 1.91 m/s
 - $9.02 \times 10^{-4} \text{ m/s}$
 - $4.01 \times 10^{-11} \text{ m/s}$
 - $1.69 \times 10^{-22} \text{ m/s}$
8. What is the total energy of one electron in the $n = 13$ level of the Bohr hydrogen atom?
- 1.051 eV
 - 0.6533 eV
 - 0.2391 eV
 - 0.1012 eV
 - 0.0805 eV
9. Given that the half life of ^{14}C is 5730 years, how many decays per second do you expect for $8 \mu\text{g}$ of the material?
- 1.32×10^6
 - 2.32×10^6
 - 3.32×10^6
 - 4.32×10^6
 - 5.32×10^6
10. You start with $640 \mu\text{g}$ of material with a half life of 30 seconds. How much is left after three minutes?
- 256.0 μg
 - 128.0 μg
 - 80.0 μg
 - 40.00 μg
 - 10.0 μg



11. Consider the square coil immersed in a magnetic field as shown above. Choose the ONE FALSE statement from the list (a – d). If none of statements is false, choose e.
- A current will be induced in the loop by pulling the loop out of the region where there is a field.
 - A current can be induced in the loop by rotating the loop.
 - A current will be induced in the loop by a steady magnetic field B .
 - A current will be induced in the loop by a decreasing magnetic field.
 - None of these statements is false.