

Physics 10164 - Summer 2019 - Exam #4A

Partial credit will be given provided you show all work and are solving parts of the problem correctly. Points will be deducted if you don't show your work even if you get the right answer. Clearly indicate your answer with a circle or a box and remember to include correct units and significant figures.

1. (25 pts) Light of wavelength 432 nm is incident on two slits separated by 0.033 mm. The interference pattern from these slits is centered on a square screen located 4.7 meters away from the slits. At a distance of 40.0 cm from the center of the pattern, is there a maximum, a minimum or some intermediate condition? Justify your answer.

2. (25 pts) A 615-nm thin film of soap ($n = 1.35$) is in the ring of a child's bubble-blower, sandwiched on both sides by air. Which wavelengths of visible light are brightly reflected by the film?

#3. (25 pts) A cloud of interstellar gas is emitting Balmer-alpha radiation (when the electron transitions from $n = 3$ to the level $n = 2$). The total amount of energy emitted at this wavelength is measured to be 3.8×10^{-5} Watts.

- a) What is the wavelength (in nm) of the Balmer-alpha radiation?
- b) How many photons are emitted by the gas each second?

4. (25 pts) Cobalt-60 has an atomic mass of about 60 amu and a half-life of 5.27 years. It is a common by-product of an atomic bomb. If a sample is contaminated with 4.2 grams of Co-60, how long (in years) will it take for the radioactivity of the sample to drop below a threshold of 2.4×10^{-6} Ci? Answer with 2 SF.