

Introduction to Quantum Mechanics

Homework Seven

College of the Atlantic

Due Friday 23 May, 2014

1. What is the de Broglie wavelength of an electron with an energy of 80 keV?
2. What is the de Broglie wavelength of a neutron with an energy of 1 MeV?
3. What is the wavelength of a 10 eV photon?
4. Suppose 100 keV electrons are sent through a two-slit apparatus. The separation between the slits is 400 nm and a screen is 30 cm from the slits. How far apart are the regions of constructive interference on the screen?
5. Encode the following message using the word “quantum” as a repeating key:

THE TRUTH IS OUT THERE

6. The phrase below was encoded using the repeating word “bohr.”

U V L A V W J V N O J Y J B L D V G A S F R L J U F V P F R

Decode the message.

7. **Optional.** The following message was encoded using a simple substitution scheme. I.e., each letter is encoded as some other letter. Decode the message.

R yldre svzex zj r grik fw kyv nyfcv, trccvu sp lj "Lezmviyv", r grik czdzkvu ze kzdv reu jgrtv. Yv vogvizvetvj yzdjvcw, yzj kyflxykj reu wvvczexj rj jfdvkyzex jvgrirkvu wifd kyv ivjk r bzeu fw fgkztrc uvcljzfe fw yzj tfejtzfljevjj. Kyzj uvcljzfe zj r bzeu fw gizjfe wfi lj, ivjkiztkzex lj kf fli gvijferc uvjzivj reu kf rwwvtkzfe wfi r wvn gvijfej evrivjk kf lj. Fli krjb dljk sv kf wivv flijvcmvj wifd kyzj gizjfe sp nzuvezex fli tzitcv fw tfdgrjjzfe kf vdsirtv rcc czmzex tivrklijv reu kyv nyfcv fw erkliv ze zkj svrlkp. Efsfup zj rscv kf rtyzvmv kyzj tfdgcvkvcv, slk kyv jkizmzex wfi jlty rtyzvmv dvek zj ze zkjvcw r grik fw kyv czsvirkzfe reu r wfleurkzfe wfi zeevi jvtlizkp.