

NORTHERN ILLINOIS UNIVERSITY

PHYSICS DEPARTMENT

Physics 283 – Modern Physics

Spring 2024

Problem Set #6

Problem Set Due: Thurs., Oct. 17, 2024

Read Krane: Chapter 7.1-7.5

There will be a Quiz #2 on Tuesday, Oct 22

1. **OpenStax University Physics Vol. 3: Section 1.3:** Problem 39
2. **OpenStax University Physics Vol. 3: Section 1.4:** Problem 47
3. **OpenStax University Physics Vol. 3: Section 1.5:** Problem 55

4. **Krane: Problem 1** **page 233** (just show calculation)
5. **Krane: Problem 6** **page 233** (just show calculation)
6. **Krane: Problem 8** **page 233** (just show calculation)
7. **Krane: Problem 10** **page 233** (just show calculation)
8. **Krane: Problem 12** **page 234** (***plot radial probability density***)
9. **Krane: Problem 14** **page 234** (just show calculation)

10. Go back to **Krane: Problem 39** on **page 176** and answer part (a):

- (a) In the infinite one-dimensional well, what is p_{av} ? (Use a symmetry argument—no calculation necessary)
- (b) Calculate the expectation value of p using the operator relation for the momentum

explained in class: $\hat{p} = -i\hbar \frac{\partial}{\partial x}$ where $p_{av} = \langle p \rangle = \int_{-\infty}^{\infty} \hat{p} |\psi(x)|^2 dx$.

note: $|\psi(x)|^2 = \psi(x)\psi^*(x)$

Does your result agree with part (a)?