

Instruction

1. This exam is **open book, open notes**, and you can use your **calculator**, including graphing calculator.
2. You are not supposed to access internet during the exam (except for downloading the questions and submitting your scanned answers).
3. Discussion is not allowed.
4. Due to the constraint of the remote exam, it may not be possible to ask questions during the exam. We have work through the questions to minimize ambiguity. If you feel there is ambiguity or you need additional information, please write down the condition you assumed. Please put a box around your assumption so the grader will see them.
5. The exam will start at 4:10 pm, and end at 5:30 pm.
6. The exam problem will be posted at 4:00 pm on class website under Exam tab.
7. **Please print out the answer sheets in advance.**
8. **You can use your tablet (e.g., iPad) to write your answers electronically if you choose to. Please convert your answer to PDF before uploading.**
9. **Please sign this cover page and submit to bCourses under Assignment: "Pre-Final" before 3 pm on 5/6 (an hour before exam). You will earn 5 points for submitting this on time.**
10. **Please scan your answer sheets (with phone camera or scan app) and upload to bCourses under Assignment: Final. 15 minutes will be allotted for scanning and uploading.**

By signing this page, I acknowledge that I have read the instruction of the exam and will fully comply with the instructions.

Name: _____

Student ID: _____

Signature: _____

Date/Time: _____

Your Name	
Student ID #	
Signature	

Problem	Page number of your answer	Points	Points Earned
1		20	
2		30	
3		40	
4		20	
Total		110	

Commonly used constants:

$\hbar = 1.054 \times 10^{-34} \text{ J}\cdot\text{s}$	$q = 1.6 \times 10^{-19} \text{ C}$	$m_0 = 9.11 \times 10^{-31} \text{ kg}$
$k_B T = 0.026 \text{ eV at } 300\text{K}$	$k_B = 1.38 \times 10^{-23} \text{ J/K}$	$\epsilon_0 = 8.854 \times 10^{-12} \text{ F/m}$
$1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$	$k_B T = 0.026 \text{ eV at } 300\text{K}$	

