

Quantum Mechanics
Physics 237
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Announcements

- Homework # 8 is due on Friday April 1.
- Exam # 2 is/will be returned this week during recitations.
- **Reminder:**
 - Requests to regrade certain parts of Exam # 2 will need to be submitted via email to Prof. Wolfs in writing (with a copy of the graded exam) by Thursday April 7.

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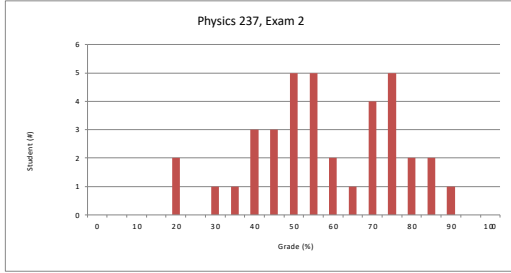
Results Exam # 2.

Score (points)	Blue	Black	Red	Green
0-5	19	13	1	0
6-10	10	7	1	3
11-15	2	7	7	3
16-20	4	7	14	11
21-25	2	3	14	20

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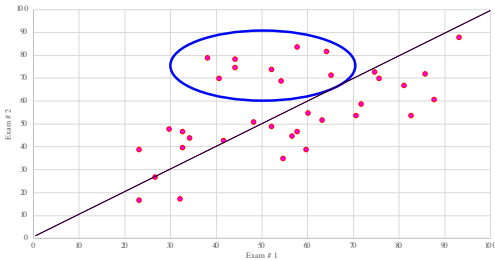
Results Exam # 2.



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Some dramatic improvements on Exam # 2.



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Sometimes I give useful hints

Exam # 2: knowing the wavefunction in different regions ($V > E$ and $V < E$) is important.

State	Physical Quantity	Physical Unit	Probability Density	Significance
Zero	Phase ϕ	Energy	Wavefunction ψ	Relative and by other particles
Step	Classical reflection	Transmission	Wavefunction ψ	Probability of incident light
Barrier	Wavefunction ψ	Wavefunction ψ	Wavefunction ψ	Partial reflection
Well	Wavefunction ψ	Wavefunction ψ	Wavefunction ψ	Partial reflection
Barrier	Wavefunction ψ	Wavefunction ψ	Wavefunction ψ	Partial reflection
Well	Wavefunction ψ	Wavefunction ψ	Wavefunction ψ	Partial reflection
Barrier	Wavefunction ψ	Wavefunction ψ	Wavefunction ψ	Partial reflection
Well	Wavefunction ψ	Wavefunction ψ	Wavefunction ψ	Partial reflection

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But what happens when $E = V$?

When $E = V$, the Schrödinger equation reduces to $(\nabla^2 \psi) = 0$ and the solution is $\psi = Cx + D$

Exam # 2: one more comment.

- Transitions between states are possible when the expectation value of the dipole moment is non-zero

$$\langle \vec{p} \rangle_{fi} = e \langle \vec{r} \rangle_{fi}$$

- This requires you to evaluate the expectation value of the vector \vec{r} , not the expectation value of the radial distance r .

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Digital Obsolescence. It can happen quickly!!!

Figure 17. The voltage gain V_{out}/V_{in} is plotted as a function of ω for the circuit in Fig. 16. The gain is the ratio of the output voltage to the input voltage as a function of ω . The voltage gain is plotted as a function of ω for the circuit in Fig. 16. The gain is the ratio of the output voltage to the input voltage as a function of ω .

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Figure 18. The voltage gain V_{out}/V_{in} is plotted as a function of ω for the circuit in Fig. 16. The gain is the ratio of the output voltage to the input voltage as a function of ω . The voltage gain is plotted as a function of ω for the circuit in Fig. 16. The gain is the ratio of the output voltage to the input voltage as a function of ω .

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I started the conversion to latex. A slow process but it will allow me fix mistakes!

Figure 19. The voltage gain V_{out}/V_{in} is plotted as a function of ω for the circuit in Fig. 16. The gain is the ratio of the output voltage to the input voltage as a function of ω . The voltage gain is plotted as a function of ω for the circuit in Fig. 16. The gain is the ratio of the output voltage to the input voltage as a function of ω .

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Figure 20. The voltage gain V_{out}/V_{in} is plotted as a function of ω for the circuit in Fig. 16. The gain is the ratio of the output voltage to the input voltage as a function of ω . The voltage gain is plotted as a function of ω for the circuit in Fig. 16. The gain is the ratio of the output voltage to the input voltage as a function of ω .

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The Boltzmann distribution. Particle distributions at constant density.

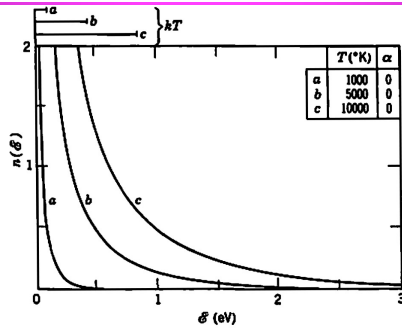
	$T(^{\circ}\text{K})$	α
a	1000	-2.84
b	5000	-0.42
c	10000	0.62

The Boltzmann distribution $n(E)$ is plotted as a function of E (eV) for the circuit in Fig. 16. The gain is the ratio of the output voltage to the input voltage as a function of ω . The voltage gain is plotted as a function of ω for the circuit in Fig. 16. The gain is the ratio of the output voltage to the input voltage as a function of ω .

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The Bose distribution.



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2 Minute 56 Second Intermission.

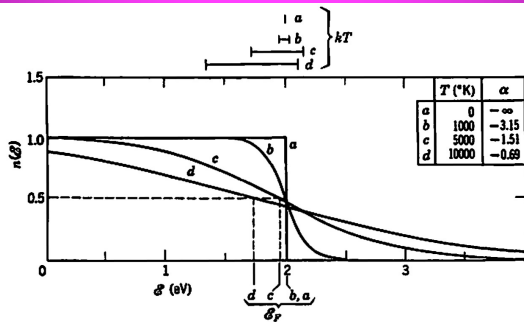
- Since paying attention for 1 hour and 15 minutes is hard when the topic is physics, let's take a 2 minute 56 second intermission.
- You can:
 - Stretch out.
 - Talk to your neighbors.
 - Ask me a quick question.
 - Enjoy the fantastic music.



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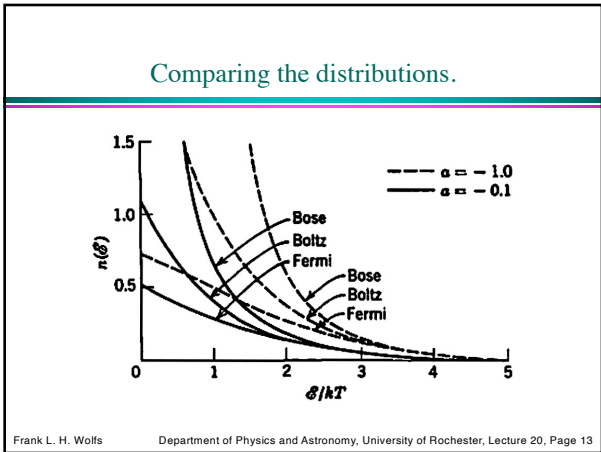
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The Fermi Distribution.



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ENOUGH FOR TODAY?

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