1. List 10 discoveries in physics in the last 30 years which have revolutionized technology.
2. Write a short commentary on Quantum Computing.
3. Write a short commentary on quantum physics.
4. Connect the Four Maxwell's equations to Faraday's, Gauss's and Ampere's laws.
5. What is the physical meaning of each of the Maxwell's equations?
6. What is Maxwell's contribution to electromagnetic wave theory?
7. Analyze Maxell's equations in differential and integral forms.
8. Set up a second order differential eqaution to describe a travelling wave.
9. Set up a general second order differential equation by partially differentiating the wave function
10. Explain each term of the expression for wave function in detail.
11. Using a cubical cavity, set up the stable standing wave modes and count them.
12. Describe Boltzman distribution function and obtain an expression for it.
13. Study Compton's original paper and write a review on it.
14. Learn basic idea of energy according to special theory of relativity.
15. Write a note on single particle interference (the central mystery of QM) by studying Feynman Lectures Vol III
16. Write a short note on Fourier transforms and their applications
17. Heisenberg's uncertainty principle is the foundation of quantum mechanics. Can you figure out a theoretical scenario where the uncertainty principle is violated?
18. Deduce Hydrogen atom's first orbital radius using the Uncertainty principle.
19. Explore mathematical wave functions that can meet the conditions to be acceptable as quantum wave functions. List functions that are suitable.
20. Explore quantum states as elements of linear vector space (Hilbert space)
21. Prove that the Eigen values of a Hermitian operator are real.
22. Set up a differential eqaution by connecting the partial second order position and time derivatives of a a wavefunction of the type $y = a \sin(wt-kx)$.
23. Plot the graphs of the real part of $y = \exp(ikx)$ and compare with $y = \exp(kx)$. Discuss the behaviour of the functions as x goes to + infinity and -infinity.
24. Why is the Schrodinger equation that we have set up in this class called the non relativistic equation?
25. What is the physical meaning of the two parts of the spolution to the Schrodinger equation for a free particle?
26. Why do you think a free particle's energy is not quantized? Can you link this to the uncertainty principle?

27. Interpret the components of wave functions a group of particles with energy E incident on a potential step of height $V_0 < E$. Also define the term reflection coefficient with respect to step potential.

28. Solve the Schrödinger's wave equation for a group of electrons with energy E incident on a step potential of height V (E > V) and show that R + T =1.