1. Is there a fundamental limitation on the lower limit of the error of physical measurements in classical physics?

2. How is the Heisenberg uncertainty principle related to the error of physical measurements?

For stepped barrier:

3.) Show that for potential barrier for ($E < U_0$) the flux of particles (probability density current), moving towards the barrier (incident particles) is $j_i = \frac{\hbar k_1}{m} A^2$.

4. Show that for potential barrier ($E < U_0$) the flux for reflected particles (reflected from barrier) is $j_r = \frac{\hbar k_1}{m} B^2$

5. Show that transmitted flux (inside of barrier for $E<U_0$) is zero due to the fact that the wave function inside the barrier is a real function.

6. Physical meanings for reflection (R) and transmission (T) coefficients and its measurements units. How looks like dependence of R and T on energy for stepped barrier in classical physics?

7. Calculate the energy dependencies of R(E) and T(E) for a stepped barrier in the case of E<U0. Why don't particles penetrating the barrier create a probability current density inside the barrier and what does the reflection process look like?

For rectangle barrier:

8. How is looks like Schrodinger equation for tunnel effect (topic 4.3) for regions 1,2, and 3 ? Derive equations.

9. What does the Schrödinger equation and the continuity conditions looks like for the tunneling effect in the case $E>U_o$? Derive equations.

10. How looks like dependence of R and T on energy for rectangle barrier in classical physics? What does it mean the tunnel effect for rectangle barrier?

11. What does the transparency window mean for a rectangular barrier and the conditions for its appearance?

12. The electron falling on the barrier. The Kinetic energy of particle is 5 eV and height of barrier 10 eV. How large the probability of transmission of electron through barrier. The width of barrier is 0.5 A.