A collaborative LaTeX document

Class of ID2090, Third Trimester of 2021 batch

June 14, 2022

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1 Introduction

This file includes tex files from the folders of each student. The students are expected to update the file named after their roll number and place any images in the same folder. Students do not have to edit this master document. Once the student has sent a pull request which is accepted and processed successfully, his/her assignment submission is deemed to be complete.

You are also welcome to add references and cite them. Examples on how to do that are on the course repository [**?**].

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Assignment 4 Khobragade Kashish Vinod me21b088 June 2022

23.1 Heisenberg Uncertainty Principle

23.1.1 Equations

$$\Delta x \cdot \Delta p \geq \frac{h}{4\pi} \tag{1}$$

$$\Delta x \cdot m\Delta v \geq \frac{h}{4\pi} \tag{2}$$

$$\Delta E \cdot \Delta t \geq \frac{h}{4\pi} \tag{3}$$

Symbols	Meaning of Symbols
Δx	uncertainty in displacement
Δp	uncertainty in momentum
Δv	uncertainty in velocity
ΔE	uncertainty in energy
Δt	uncertainty in time
h	planck's constant value is $6.63 * 10^{-34}$ Jsec
m	mass

According to Heisenberg, it is impossible to measure both the position and momentum of moving particle with accuracy.

1. If value of position is small, it can be measured accurately but not momentum.
2. If value of momentum is small it is measured accurately but not the position.

23.1.2 Explanation

1. Suppose we need to measure position accurately, then we need to use light.
2. So, that the photon of light must strike the electron and reflected photon is seen with microscope.
3. Due to hitting, the position and velocity of electron is changed.
4. But to pin point position, the light of shorter wavelength should be used.
5. The shorter wavelength means high frequency and high energy.
6. So, this high energy photon may change the speed and direction of particle.

23.1.3 Figure 1

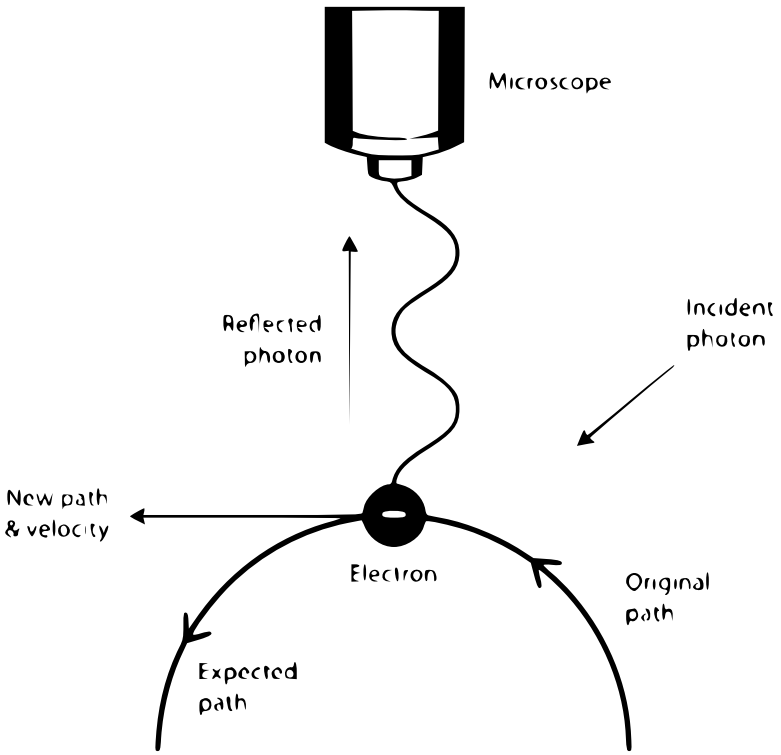

Figure 1. Heisenberg Uncertainty Principle: The observation of an electron with a microscope requires reflection of a photon off of the electron. This reflected photon causes a change in the path of the electron.

23.1.4 Significance

This holds good only for microscopic particles, as energy of photon is enough to change the position and velocity of bigger bodies, So, in our daily routine it has no significance.

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44 Conclusions

If this master tex file could be compiled successfully, it means that the class has learnt the concepts of Git as well as LaTeX properly.

45 References

References

[1] Repository for id2090 course. `https://github.com/gphanikumar/mm2090`. Accessed: 2022-06-13.