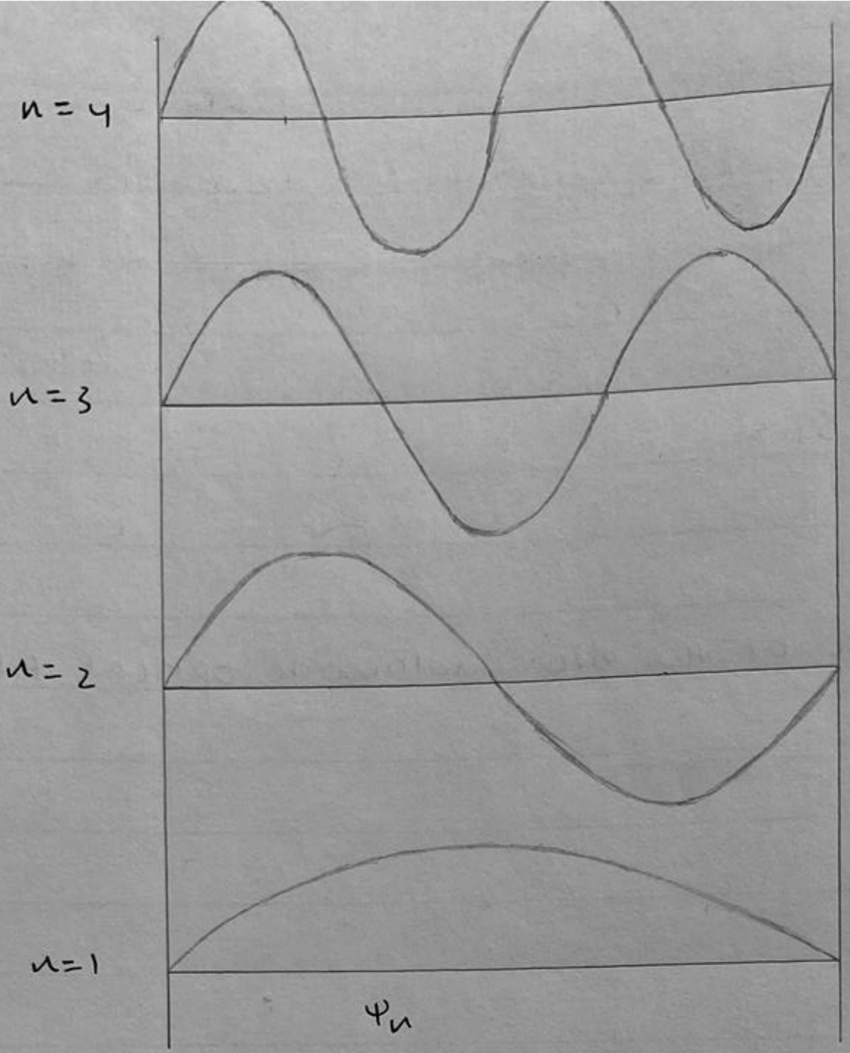
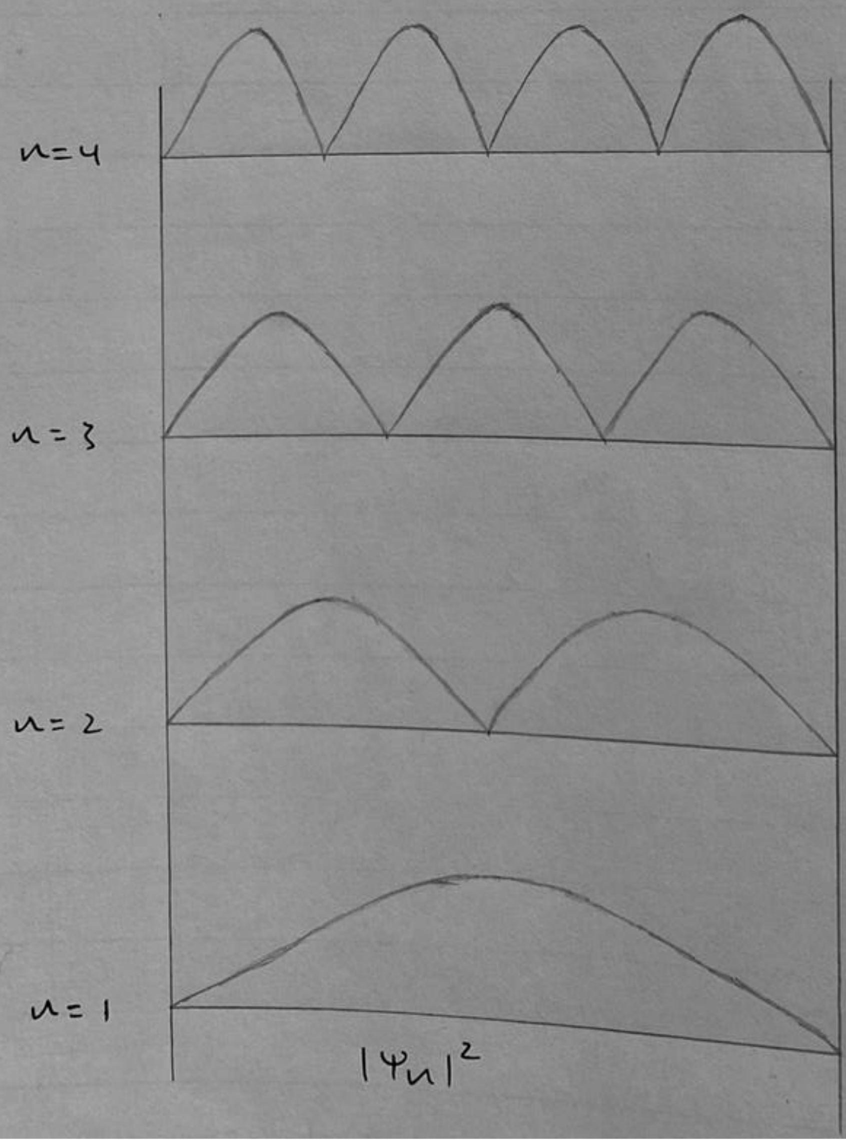

n = 4
n = 3
n = 2
n = 1
ψn


n = 4
n = 3
n = 2
n = 1
|ψn|²

Experiment 9

Shrodingers Equation

Inferences from Theory:

1. When a given particle is confined to a finite space, its momentum (p) and energy (E) are discrete. The minimum energy or the ground state energy is called 'zero-point' which is not 0.

2. In the ground state, the particle has highest probability at the centre of the confinement. This idea can be extended to 3-dimensional confinement too.

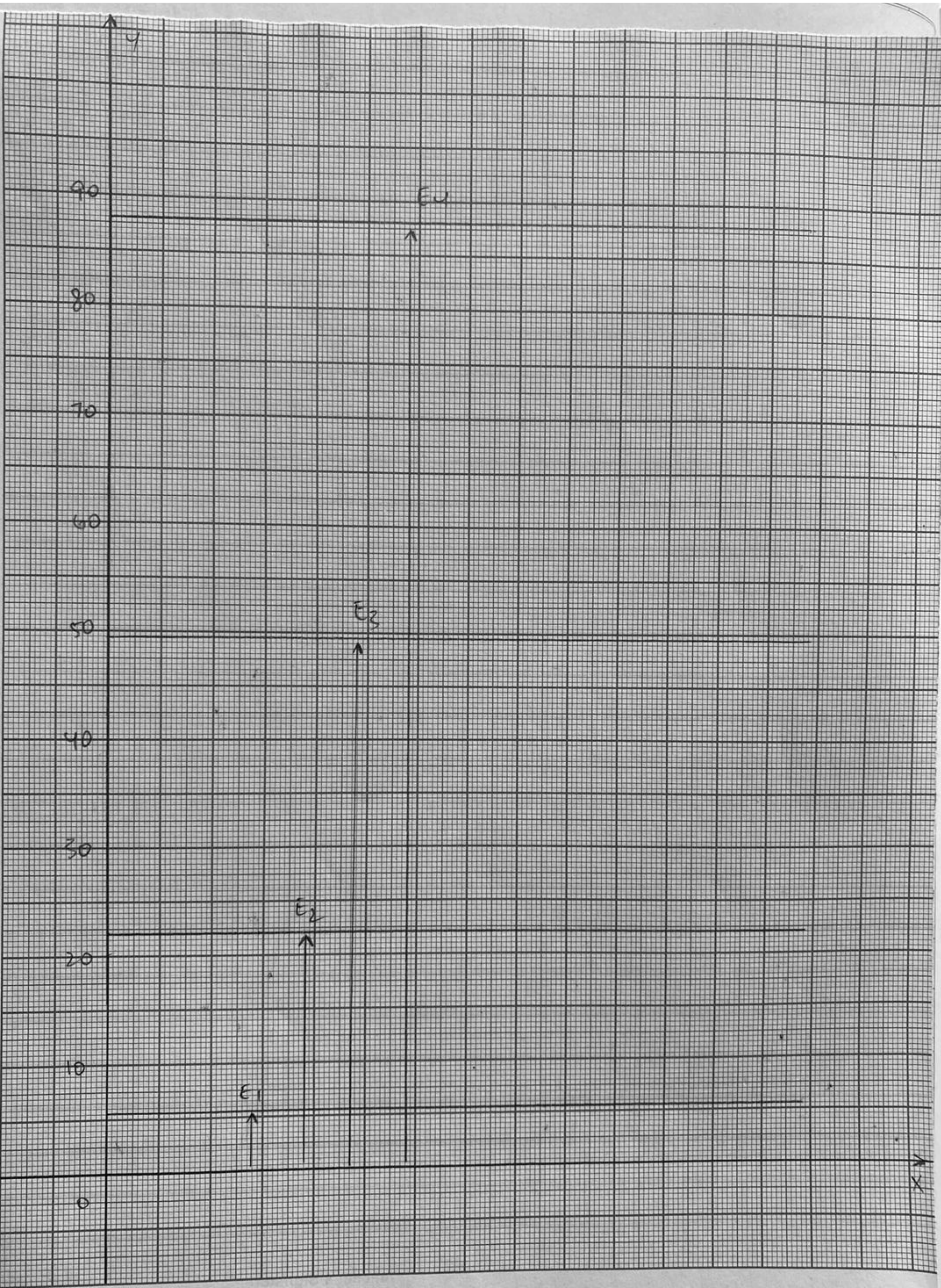
3. The number of positions with the maximum probability will increase as the particle attains highere energy. The number of positions with maximum probability is proportional to the quantum number 'n'.

4. Calsical limit is obtained when we consider very high values of quantum number which will have 'n' possible values of maximum probability. In other words, 'n' tends to infinity, there will be infinite positions with maximum probability. This also means that all the possible positions within the confinement is equally probable. The corresponding wave function and energy are as follows.

$$\psi_n = \frac{\sqrt{2}}{\sqrt{L}} \sin \frac{n\pi x}{l}$$

$$E_n = \frac{n^2 h^2}{8mL^2}$$

where $n = 1, 2, 3 \ldots$



y
90
E4
80
70
60
E3
50
40
30
E2
20
10
E1
0
x

observations:

1. calculated the magnitude of energy values for ground state and first 3 excited states for particle confined in one dimensional space of 10 nm.

calculations:

$$E_n = \frac{n^2 h^2}{8 m L^2}$$

Taking $n=1$, $L = 10$ nm, $h = 6.626 \times 10^{-34}$ Js

$E_n = n^2 . 5.488 \times 10^{-50}$ J

$E_1 = 5.488 \times 10^{-50}$ J

$E_2 = 21.952 \times 10^{-50}$ J

$E_3 = 49.392 \times 10^{-50}$ J

$E_4 = 87.808 \times 10^{-50}$ J