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② Single - stranded RNA SARS - COV-2 structure mathematical model is represented as :-

$$x(t) = \frac{\sqrt{8}\ \sqrt{1-\cos 2t}}{\sqrt{2}}$$

$$y(t) = \sqrt{8}\ \sin(t+90)$$

$$z(t) = t$$

Simplifying the equations :-

$$x(t) = \frac{2\sqrt{2}\ \sqrt{1-\cos 2t}}{\sqrt{2}}$$

$$= 2\sqrt{1-\cos 2t} \qquad \because \cos 2t = 1-2\sin^2 t$$

$$= 2\sqrt{1-(1-2\sin^2(t))}$$

$$= 2\sqrt{2\sin^2 t}$$

$$x(t) = 2\sqrt{2}\ \sin t \quad \text{——} ①$$

$$y(t) = \sqrt{8}\ \sin(t+90) \qquad \because \sin(t+90) = \cos t$$

$$= 2\sqrt{2}\ \cos t \quad \text{——} ②$$

we can use these simplified equations to plot the 3D line plot representing the Single - Stranded RNA SARS - COV-2 Covid-19 Structure at different values of t (~~time~~).

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Length of the RNA SARS - COV - 2 structure from $0 < t < 3$

From the ~~eqt~~ 3D line plot we have observed that the equations corresponds to a parametric curve. Therefore, I will use:.

Arc length formula for Parametric curve:-

$$L = \int_0^3 \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2 + \left(\frac{dz}{dt}\right)^2} dt \quad \text{—③}$$

$$\rightarrow \frac{dx}{dt} = 2\sqrt{2} \cos t \quad \text{—④}$$

$$\frac{dy}{dt} = -2\sqrt{2} \sin t \quad \text{—⑤}$$

$$\frac{dz}{dt} = 1 \quad \text{—⑥}$$

put the values of ④, ⑤ & ⑥ in ③

$$L = \int_0^3 \sqrt{(2\sqrt{2}\cos t)^2 + (-2\sqrt{2}\sin t)^2 + (1)^2} \, dt$$

$$= \int_0^3 \sqrt{8\cos^2 t + 8\sin^2 t + 1}\ dt$$

$$= \int_0^3 \sqrt{8(\cos^2 t + \sin^2 t) + 1}\ dt$$

$$= \int_0^3 \sqrt{8(1) + 1}\ dt$$

$$= \int_0^3 \sqrt{9}\ dt$$

$$= \int_0^3 3\,dt$$

$$= 3t\,\Big]_0^3$$

$$L = 3(3) - 3(0)$$

$$L = 9$$

∴ The length of the RNA SARS-CoV-2 structure from $0 < t < 3$ is 9.