**Derivation from position momentum uncertainty principle.** To obtain the time energy uncertainty principle from position momentum uncertainty relation consider the case of an electron of mass $m$ moving with a velocity $v$ so that its kinetic energy

$$E_k = \frac{1}{2} mv^2$$

Taking the mass of the electron to be constant, the uncertainty in the measurement of $E_k$ is given by

$$\Delta E_k = \Delta\left(\frac{1}{2} mv^2\right) = m\nu\, \Delta v = v \Delta p$$

Now the velocity $$v = \frac{\Delta x}{\Delta t}$$

$\therefore$ $$\Delta E_k = \frac{\Delta x}{\Delta t} \Delta p$$

or $$\Delta x . \Delta p = \Delta E_k . \Delta t \geq h$$

More accurately $$\Delta x . \Delta p = \Delta E_k . \Delta t \geq \frac{1}{2} . \frac{h}{2\pi} = \frac{1}{2} \hbar.$$

EC-(26)

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2. Subject — PHYSICS
3. Paper — ✓
4. Class — TDC — III
5. Topic — Time - momentum uncertainty Principle

Date — 16-04-22