

(a) Let Q be an operator which is not a function of time, and let H be the Hamiltonian operator. Show that

$$i\hbar(\partial/\partial t)\{q\} = \{[Q,H]\}$$

Here $\{q\}$ is the expectation value of Q for an arbitrary time-dependent wave function Ψ , which is not necessarily an eigenfunction of H , and $\{[Q,H]\}$ is the expectation value of the commutator of Q and H for the same wave function. This result is known as Ehrenfest's theorem.

(b) Use this result to show that

$$(\partial/\partial t)\{p\} = [-(\partial V/\partial x)]$$

What is the classical analog of this equation?