Chem. 542
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Time Evolution Basics – Problem 4

(a) For a time-independent Hamiltonian $\hat{H}$, show that energy is conserved during time evolution. (Hint: write the expectation value of the Hamiltonian at a time t and use the time evolution operator to express the time-dependent state in terms of the initial state in the bra and the ket.)

(b) Derive the same result again, this time starting from Heisenberg's equation of motion for the expectation value of the Hamiltonian.

(c) What if the Hamiltonian depends explicitly on time? Will the energy be conserved in that case?

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