

**SENATE . . . . . No. 1380**

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By Mr. Bertonazzi, a petition (accompanied by bill, Senate, No. 1380) of Louis P. Bertonazzi, Marie J. Parente and the State Police Association of Massachusetts, by Ronald J. Bellanti, president, for legislation to require the Registrar of Motor Vehicles to issue two number plates to all classes of motor vehicles with the exception of motorcycles. Public Safety.

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**The Commonwealth of Massachusetts**

In the Year One Thousand Nine Hundred and Eighty-four.

AN ACT TO REQUIRE THE REGISTRAR OF MOTOR VEHICLES TO ISSUE TWO NUMBER PLATES TO ALL CLASSES OF MOTOR VEHICLES WITH THE EXCEPTION OF MOTORCYCLES.

PREAMBLE: Whereas, the deferred operation of this act would tend to defeat its purpose, which is to require forthwith the registrar of motor vehicles to issue two number plates to all motor vehicles, with the exception of motorcycles, in order to aid and assist law enforcement officers in the enforcement of motor vehicle law, therefore it is hereby declared to be an emergency law, for the immediate preservation of the public's safety and well-being.

*Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same, as follows:*

- 1 Chapter 90, Section 6B of the Massachusetts General Laws
- 2 is hereby amended by striking out the first paragraph and in-
- 3 serting in place the following section: —
- 4 Notwithstanding any contrary provision of law the registrar
- 5 of motor vehicles is required to issue two number plates in-
- 6 stead of one for all motor vehicles with the exception of motor-
- 7 cycles. Such plates shall be displayed on both the front and
- 8 rear of the vehicle for which they are issued, and all consis-
- 9 tent provisions of law or of rules and regulations relating to
- 10 number plates shall apply to such plates.

### The Hamiltonian of a Harmonic Oscillator

Consider a particle of mass  $m$  moving in a one-dimensional potential  $V(x)$ . The total energy is given by the Hamiltonian  $H$ :

$$H = \frac{p^2}{2m} + V(x)$$

For a harmonic oscillator, the potential is  $V(x) = \frac{1}{2}kx^2$ . The Hamiltonian becomes  $H = \frac{p^2}{2m} + \frac{1}{2}kx^2$ . The energy levels are given by  $E_n = \hbar\omega \left( n + \frac{1}{2} \right)$ , where  $\omega = \sqrt{k/m}$  is the angular frequency. The wavefunctions are given by  $\psi_n(x) = N_n H_n(\alpha x) e^{-\alpha^2 x^2 / 2}$ , where  $N_n$  is a normalization constant,  $H_n$  is the  $n$ -th Hermite polynomial, and  $\alpha = \sqrt{m\omega/\hbar}$ .

The expectation value of the position  $\langle x \rangle$  is zero for all energy levels  $n$ . The expectation value of the momentum  $\langle p \rangle$  is also zero for all energy levels  $n$ .

The uncertainty in position  $\Delta x$  and momentum  $\Delta p$  are given by  $\Delta x = \sqrt{\langle x^2 \rangle - \langle x \rangle^2}$  and  $\Delta p = \sqrt{\langle p^2 \rangle - \langle p \rangle^2}$ . For the harmonic oscillator,  $\Delta x \Delta p = \hbar \left( n + \frac{1}{2} \right)$ . The minimum uncertainty is achieved for the ground state  $n=0$ , where  $\Delta x \Delta p = \frac{\hbar}{2}$ .