- How many atoms are there in a person of 73 kg if the composition (by mass) of human body is 65% O<sub>2</sub>, 18.5% C<sub>2</sub>, 9.5% H<sub>2</sub>, 3.3% N<sub>2</sub>, 1.5% Ca, 1% P and 0.35% other elements? (Hint: Ignore other elements) (H. C. Ohanian, "Physics", Pr. 1.22)
- 2. The motion of a rocket burning its fuel at aconstant rate while moving through empty interstellar space can be described by

$$x = u_{ex}t + u_{ex}(\frac{1}{b} - t)\ln(1 - bt)$$

where  $u_{ex}$  and b are constants ( $u_{ex}$  is the exhaust velocity of the gasses at the tail of the rocket and b is proportional to the rate of fuel consumption).

- (a) Find a formula for the instantaneous velocity of the rocket
- (b) Find a formula for the instantaneous acceleration.

(c) Suppose that a rocket with  $u_{ex} = 3.0 \times 10^3 \ m/s$  and  $b = 7.5 \times 10^{-3} \ /s$  takes 120 s to burn all its fuel. What is the instantaneous velocity at  $t = 0 \ s$ ? At  $t = 120 \ s$ 

(c) What is the instantaneous acceleration at t = 0 s? At t = 120 s?

- (H. C. Ohanian, "Physics", Pr. 2.21)
- 3. Suppose you throw a stone straight up with as initial speed of 15.0 m/s.

(a) If you throw a second stone straight up 1.00 s after the first, with what speed must you throw this second stone if it is to hit the first at a height of 11.0 m? (There are two answers. Are both plausible?)

(b) If you throw the second stone 1.30 s after the first, with what speed must you throw this second stone if it is to hit the first at a height of 11.0 m

(H. C. Ohanian, "Physics", Pr. 2.51)

4. Show that  $\vec{A} \times (\vec{B} \times \vec{C}) = \vec{B}(\vec{A} \cdot \vec{C}) - \vec{C}(\vec{A} \cdot \vec{B})$ (H. C. Ohanian, "Physics", Pr. 3.46)