

- How many atoms are there in a person of 73 kg if the composition (by mass) of human body is 65%  $O_2$ , 18.5%  $C_2$ , 9.5%  $H_2$ , 3.3%  $N_2$ , 1.5%  $Ca$ , 1%  $P$  and 0.35% other elements? (Hint: Ignore other elements)  
(H. C. Ohanian, "Physics", Pr. 1.22)

- The motion of a rocket burning its fuel at a constant rate while moving through empty interstellar space can be described by

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

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)

- Suppose you throw a stone straight up with an 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)

- 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)