

①

1301

Principles of Physics (10th edition) (Discussion)

Chapter 1 : Problems (3, 7, 12, 28)

Problem 3: How many miles are there in 1.0 mi/h

Solution: 1 mile = 1609.34 meter
 ≈ 1609 m

1 hour = 60 x 60 = 3600 sec

$$\Rightarrow \frac{1 \text{ mi}}{1 \text{ h}} = \frac{1609}{3600} \approx 0.45 \text{ m/sec}$$

Problem 7: Assume the legal limit of speed is 70.0 mi/h. If driving day and night without stopping for 1.00 year, what is the maximum number of miles one can drive?

Soln

$$s = \frac{d}{t} \Rightarrow d = s \times t$$

$$= 70 \frac{\text{mi}}{\text{h}} \times 1 \times 365 \frac{\text{day}}{\text{year}} \times 24 \frac{\text{h}}{\text{day}}$$

$$= 70 \frac{\text{mi}}{\text{h}} \times 8760 \text{ h}$$

$$= 613200 \text{ miles}$$

$$= \frac{613200}{10^5} \text{ miles} = 6.132 \times 10^5$$

Problem 12: The age of the universe is approximately 10^{10} years and mankind has existed for about 10^6 years, if the age of the universe were "1.0" day, "How many" seconds would mankind have existed?

في عدد من الزمن لمراتب (fraction) من عمر الكون

universe 10^{10} → mankind 10^6

1 day → ?

(2)

$$x = \frac{10^6}{10^{10}} = 10^{-4} \text{ day}$$

حزب الیوم ای شوال

$$x = 10^{-4} \text{ day} \times \frac{24 \text{ h}}{\text{day}} \times \frac{60 \text{ min}}{\text{h}} \times \frac{60 \text{ sec}}{\text{min}}$$

$$x = 8.64 \text{ sec} \times 10^{-4} \times 86400$$

$$\approx 8.6 \text{ sec}$$

Problem 28: Einsteins mass-energy equation relates mass m to energy E as $E=mc^2$, where c is speed of light in vacume. The energy at nuclear level is usually measured in Mev where $\text{Mev} = 1.60218 \times 10^{-13} \text{ J}$; the masses are measured in unified atomic mass unit (u) where

$1 \text{ u} = 1.66054 \times 10^{-27} \text{ kg}$. Prove that the energy equivalent of 1 u is 931.5 Mev

sol : $E = mc^2$

$$E = 1.66054 \times 10^{-27} \times (2.998 \times 10^8)^2$$

$$E = 1.66054 \times 10^{-27} \times 2.998^2 \times 10^{16}$$

$$= 14.9 \times 10^{-11} \text{ J}$$

$$1 \text{ u} \times E = 1.49 \times 10^{-10} \text{ J}$$

منه في الطاقة الموجودة في 1 u بالاجزاء

$$1 \text{ Mev} \rightarrow 1.60218 \times 10^{-13} \text{ J}$$

$$1.49 \times 10^{-10} \text{ J} \rightarrow ??$$

$$E = \frac{1.49 \times 10^{-10}}{1.60218 \times 10^{-13}}$$

$$= 929.9 \text{ Mev}$$

$$\approx 931 \text{ Mev}$$

$$E = 931.0$$