Answer on Question #43238, Physics, Other

If velocity, force and time are taken to be fundamental quantities find dimensional formula for(a) Mass, and (b) Energy.

Solution.

Let the dimensions of given quantities be:

$[V] = vel$

$[F] = N$

$[t] = s$

for velocity, force and time corresponding.

From the Newton's second law we know that:

$$F = ma = m\frac{dV}{dt}$$

So, in terms of dimensions:

$$N = [m] \cdot \frac{vel}{s}$$

And we obtain:

$$[m] = \frac{N \cdot s}{vel} = N^1 s^1 vel^{-1}$$

From relation for kinetic energy we have:

$$E_K = \frac{mV^2}{2}$$

In terms of dimensions:

$[E] = [m] \cdot vel^2 = N^1 s^1 vel^{-1} \cdot vel^2 = N^1 s^1 vel^1$

Answer: $[m] = N^1 s^1 vel^{-1}$; $[E] = N^1 s^1 vel^1$

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