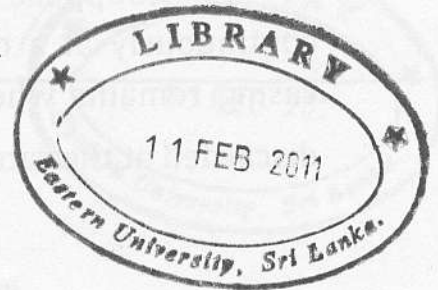


EASTERN UNIVERSITY, SRI LANKA
SECOND EXAMINATION IN SCIENCE - 2008/2009
SECOND SEMESTER (PROPER/REPEAT)

(Sep/Oct 2010)

PH 204 MECHANICS II



Time: 01 hour.

Answer ALL Questions

1. What do you mean by *Elastic collision*? What are the differences between the elastic and inelastic collision?

An electron of mass m collides head-on with an atom of mass M , which is initially at rest. As a result of the collision a characteristic amount of energy E is stored in the atom. Show that the minimum initial velocity V_0 as:

$$\left[2E \left(\frac{M + m}{Mm} \right) \right]^{\frac{1}{2}}$$

Consider a head-on collision between an electron and an atom. If the stored energy E in the atom is $2 \times 10^3 \text{ J}$, what would be the minimum initial velocity of the electron?

You may assume that the mass of an electron is $9.11 \times 10^{-31} \text{ kg}$ and the mass of the atom is twice the mass of an electron.

2. Explain the principle of conservation of linear momentum.

A rocket of total mass $(M + m_o)$ contains fuel of mass εM where $\varepsilon < 1$. The mass of the payload is m_o and the mass of the rocket casing is $(1 - \varepsilon)M$. Suppose if it is technically possible to discard the casing continuously at a constant rate whilst the fuel is burning so that no casing remains when the fuel is burnt, show that the casing must be discarded at the rate $\left(\frac{1-\varepsilon}{\varepsilon}\right)k$ if the fuel is burnt at constant rate k .

Verify that, if $\varepsilon = \frac{5}{6}$ and $m_o = \frac{M}{100}$, the rocket's final velocity will be approximately $3.8c$ where c is the exhaust velocity. All external forces on the rocket may be neglected.