

Dr. Mar² Htay.

**Ministry of Education
Department of Higher Education
University of Monywa**

**Monywa University
Research Journal**

Vol. 7, No. 1

December, 2016.

Contents

	Page
Preliminary Phytochemical Screening and Elemental Analysis of Some Aquatic Plants in Chindwin River Near Monywa Township Dr Thant Thant Htwe	171
Transmission Probability Through Asymmetric Double Rectangular Potential Barriers Tin Aye	179
A Study of Properties inside the Blackhole Zaya Aung	187
Fabrication of Organic Solar Cell Thet Thet Naing	201
Crystalline Phase and Photocatalysis Activity of Electrochemically Anodized Titania Nanotubes Min Min Thein	207
Calculation of Momentum Transfer in Hyperon Production Mar Mar Htay	212
In Investigation into Radon Concentrations at Lying Pagoda, Aung Satkyar Pagoda and Laykyun Setkyar Standing Budha Statue on Maha Baw Di 1000 Hill Yin Mar Aung	224
Study of Paddy Plant Induced by Gamma and Alpha Radiation Win Khaing	237
Analysis of Producer Gas From Rice Huck Gasifier Aye Aye Kyi	245
Some Mathematical Tricks Which are Familiar in Myanmar Society Myo Nyunt	250
Evaluation of some Metal Levels in the Muscles of some Fish Species from the Chindwin River(Monywa Segment) Kyi Kyi Thaw	255
The Survival and Growth of Freshwater Mussels from Taungtha Man Lake Maung Maung Aye	263
Preliminary Phytochemical Test and Antibacterial Activities of Fruit Rind of <i>Garcinia mangostana</i> L. (Min-gut) used for Dysentery in Traditional Medicine San San Maw	277
Phytochemical and Antibacterial Activity of <i>Phyllanthus emblica</i> L. Used for Diarrhea in Traditional Medicine Ni Win Moht Moht	286
Meiotic Characters of <i>Phaseolus lunatus</i> L. and <i>Phaseolus vulgaris</i> L. Cultivated in Monywa Township Shwe San	296
Petrogenetic Interpretation Based on Petrographic Characters of Pelitic Metamorphic Rocks exposed in Pinwe-Mawlu Area, Indaw Township, Sagaing Region Aung Khin Soe	307

Calculation of Momentum Transfer in Hyperon Production

Mar Mar Htay¹

Abstract

We calculated momentum transfer of the reactions such as $K^- + n \rightarrow \Lambda + \pi^-$, $\pi^+ + n \rightarrow \Lambda + K^+$ and $K^- + p \rightarrow \Xi^- + K^+$ by using Newton-Raphson method. Firstly, we study four-vector and product of two four-vector which is invariant for any frame. We calculated the threshold energies of these reaction by using four-vector. The threshold energies are obtained as 238.9MeV, 898.07MeV and 1156.62MeV respectively. We solved numerically to obtain momentum transfer of three reactions for various incident momentum. It is observed that we can produce Λ -hyper nuclei for $K^- + n \rightarrow \pi^- + \Lambda$ reaction and $\pi^+ + n \rightarrow K^+ + \Lambda$ reaction and hyperon for $K^- + p \rightarrow K^+ + \Xi$ reaction.

I. Introduction

The discovery of various elementary particles was followed by an extensive study of their characteristic properties. This led to the determination of their mass, charge, life time, quantum numbers, decay schemes, interactions etc.

As regards the classification, the elementary particles may be classified in a number of different ways depending on their masses, interactions, statistics etc. Commonly, however, they are classified into such categories as : (i) photons (ii) leptons and (iii) hadrons. Hadrons are further classified as (a) mesons and (b) baryons. The names refer to the masses – baryon means heavy, meson means intermediate or medium and lepton means small. Photon is stable and neutral having no rest mass and no rest energy, but possesses by virtue of its motion, a rest energy $h\nu/c^2$. Its spin is 1. Leptons – Leptons are weakly interacting particles. There are six leptons. These are electrons, muons, tauons and three neutrinos : electron-neutrino, muon-neutrino and tau-neutrino.

Electrons are the first elementary particles discovered. They are negatively charged, stable having a rest mass 9.11×10^{-31} kg and a rest energy $0.511 \text{ MeV}/c^2$. It is a spin $\frac{1}{2}$ particle. Muons were first observed in cosmic radiation and have a mass about $200m_e$. Muons are spin $\frac{1}{2}$ particle. Tauons have recently been discovered, having a large mass ($1784.2 \text{ MeV}/c^2$). They are unstable and decay into muons and two neutrinos. $\tau^- \rightarrow \mu^- + \bar{\nu}_\mu + \nu_\tau$. The neutrinos were first discovered in β - emission, and thereafter other neutrinos were obtained in other nuclear reactions. All neutrinos are stable, having zero charge, spin $\frac{1}{2}$ and negligible mass. All leptons interact weakly with other particles and they are all fermions as they obey the Fermi-Dirac statistics. Hadrons : Mesons – These particles have mass between that of a π -meson and of a nucleon and are strongly interacting. These include pions ($\pi^{\pm,0}$), Kaons ($K^{\pm,0}$), meson (η^0), charmed mesons ($D^{\pm,0}$) and beautiful mesons (B). Pions that can be either positively and negatively charged or neutral particles have got zero spin and are responsible

¹ Lecturer, Dr., Department of Physics, University of Monywa

short range nuclear forces and information about pions have been given in an earlier chapter. K-mesons or Kaons are produced due to the interactions of high energy particles at very short range due to strong nuclear forces. A detailed study of kaons would be made shortly. The η^0 exists as a neutral particle which has a very short life time. Baryons – Particles having rest mass intermediate between that of a nucleon and deuteron are called baryons which are further subdivided as :

(i)Nucleons – These consists of the first two baryons : protons and neutrons. The proton is stable. A free neutron is unstable with a mean life of 920 s and decays into a proton, an electron and an electron-antineutrino. (ii)Hyperons – Other baryons, called hyperons, include lambda (Λ^0), sigmas ($\Sigma^{\pm,0}$), Xis ($\Xi^{-,0}$) and omega (Ω^-). Hyperons are unstable particles first discovered in cosmic rays. All the baryons are fermions obeying the Fermi-Dirac statistics.

1.1 Classification of Collisions

The reason for introducing energy and momentum is, of course, that these quantities are conserved in any physical process. In relativity, as in classical mechanics, the cleanest application of these conservation laws is to collisions. A classical collision, in which object A hits object B, producing objects C and D. its nature, a collision is something that happens so fast that no external force, such as gravity, or friction with the track, has an appreciable influence. Classically, mass and momentum are always conserved in such a process; kinetic energy may or may not be conserved.

Classical Collisions

1. Mass is conserved, $m_A + m_B = m_C + m_D$.
2. Momentum is conserved, $p_A + p_B = p_C + p_D$.
3. Kinetic energy may or may not be conserved.

In fact, we may distinguish three types of collisions: “sticky”, ones in which the kinetic energy decreases (typically, it is converted into heat); “explosive” ones, in which the kinetic energy increases (for example, suppose A has a compressed spring on its front bumper, and the catch is released in the course of the collision so that spring energy is converted into kinetic energy); and elastic ones, in which the kinetic energy is conserved.

Type of Collisions (Classical)

- (a) Sticky: Kinetic energy decreases, $T_A + T_B > T_C + T_D$.
- (b) Explosive: Kinetic energy increases, $T_A + T_B < T_C + T_D$.
- (c) Elastic: Kinetic energy conserved, $T_A + T_B = T_C + T_D$.

In the extreme case of type (a), the two particles stick together, and there is really only one final object: $A + B \rightarrow C$. In the extreme case of type,(b) a singleobject decays into two, $A \rightarrow C + D$.In a relativistic collision, energy and momentum are always conserved. In other words all four components of the energy-momentum four-vector are conserved. As in the classical case, kinetic energy may or may not be conserved.

Relativistic Collisions

1. Energy is conserved, $E_A + E_B = E_C + E_D$.
2. Momentum is conserved $p_A + p_B = p_C + p_D$.
3. Kinetic energy may or may not be conserved.