# Solutions to Problems in Goldstein, Classical Mechanics, Second Edition

Homer Reid

August 22, 2000

# Chapter 1

#### Problem 1.1

A nucleus, originally at rost, decays radioactively by constring an electron of moancasum 1.78 MeV/c, and at right angles to the direction of the electron a neutrino with momentum 1.00 MeV/c. ( The MeV (million electron volt) is a unit of energy, used in modern physics, equal to 1.60  $\times$  10<sup>-6</sup> erg. Correspondingly, MeV/c is a unit of linear momentum equal to 5.34  $\times$  10<sup>-17</sup> gm cm/sec.) In what direction does the usedens receil? What is its momentum in MeV/c? If the mass of the residual nucleus is 3.90  $\times$  10<sup>-22</sup> gm, what is its kinetic energy, in electron volts?

Place the nucleus at the origin, and suppose the electron is conitted in the positive y direction, and the neutrino in the positive x direction. Then the resultant of the electron and neutrino momenta has magnitude

$$|\mathbf{p}_{m_1 \, \nu}| = \sqrt{(1.73)^2 + 1^2} = 2 \text{ MeV/}e$$
,

and its direction makes an angle

$$\theta = \tan^{-1} \frac{1.73}{1} = 60^{\circ}$$

with the x axis. The nucleus must acquire a momentum of equal magnitude and directed in the opposite direction. The kinetic energy of the nucleus is

$$T = \frac{p^2}{2m} = \frac{4 \text{ MeV}^2 \text{ e}^{-2}}{2 \cdot 3.9 \cdot 10^{-22} \text{ sm}} \cdot \frac{1.78 \cdot 10^{-27} \text{ gm}}{1 \text{ MeV e}^{-2}} = 9.1 \text{ ev}$$

This is much smaller than the nucleus rest energy of several hundred GeV, so the non-relativistic approximation is justified.

# **Classical Mechanics Goldstein Solutions**

**Kuo-Chang Chen** 

#### **Classical Mechanics Goldstein Solutions:**

**Introduction to Classical Mechanics** David Morin.2008 Classical Analogies in the Solution of Quantum Many-Body Problems Aydın Cem Keser, 2018-11-07 This book addresses problems in three main developments in modern condensed matter physics namely topological superconductivity many body localization and strongly interacting condensates superfluids by employing fruitful analogies from classical mechanics This strategy has led to tangible results firstly in superconducting nanowires the density of states a smoking gun for the long sought Majorana zero mode is calculated effortlessly by mapping the problem to a textbook level classical point particle problem Secondly in localization theory even the simplest toy models that exhibit many body localization are mathematically cumbersome and results rely on simulations that are limited by computational power In this book an alternative viewpoint is developed by describing many body localization in terms of quantum rotors that have incommensurate rotation frequencies an exactly solvable system Finally the fluctuations in a strongly interacting Bose condensate and superfluid a notoriously difficult system to analyze from first principles are shown to mimic stochastic fluctuations of space time due to quantum fields This analogy not only allows for the computation of physical properties of the fluctuations in an elegant way it sheds light on the nature of space time. The book will be a valuable contribution for its unifying style that illuminates conceptually challenging developments in condensed matter physics and its use of elegant mathematical models in addition to producing new and concrete results Strategic Applications of Measurement Technologies and Instrumentation Palchoudhury, Soubantika, 2018-12-07 Measurement techniques form the basis of scientific engineering and industrial innovations The methods and instruments of measurement for different fields are constantly improving and it s necessary to address not only their significance but also the challenges and issues associated with them Strategic Applications of Measurement Technologies and Instrumentation is a collection of innovative research on the methods and applications of measurement techniques in medical and scientific discoveries as well as modern industrial applications. The book is divided into two sections with the first focusing on the significance of measurement strategies in physics and biomedical applications and the second examining measurement strategies in industrial applications Highlighting a range of topics including material assessment measurement strategies and nanoscale materials this book is ideally designed for engineers academicians researchers scientists software developers graduate students and industry professionals Variational Methods and Periodic Solutions of Newtonian N-body Problems Kuo-Chang Chen, 2001

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