ANALYSIS OF ERRORS IN A PENDULUM BOB GRAVITY EXPERIMENTS. (Case study): ANGLE OF OSCILLATION, AIR RESISTANCE AND THE NUMBER OF OSCILLATIONS

BY

KITEMU JULIUS

BU/UP/2018/3439

RESEARCH PROJECT REPORT SUBMMITTED TO THE DEPARTMENT OF PHYSICS IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR

THE AWARD OF BACHELOR OF SCIENCE EDUCATION DEGREE

AT BUSITEMA UNIVERSITY

DECLARATION

I KITEMU JULIUS declare that this work has been out of my own reading/research except the quotation made from different references and has not been submitted before to any university for any award.

Sign……. Date……..

APPROVAL

This project by KITEMU JULIUS was done under my supervision and is now ready for examination.

Supervisor

Sign: …… Date: ……

Mr. JOSEPH A.OWALU

DEDICATION

I dedicate this work to my beloved parents Mr wogisha Robert and Mrs Namaleya Petwa for the great contribution in paying my school and taking care of me up to this level.

ACKNOWLEDGEMENT

Firstly, I wish to extend my great thanks to the almighty God towards successful completion of this work.

I also extend my sincere thanks to my lecturers and laboratory technicians of Busitema University, my parents and friends who have helped me towards successful accomplishment of this research project.

Special thanks goes to my helpful supervisor, Mr. Owalu Joseph Anthony for your cooperation and patience in guiding me to accomplish this final year project. Without your continued support and interest, this project would not have been same as presented here.

I also extend my thanks to my parents and friends for all your moral support, prayers, love, and encouragement, financial and emotional support towards this publication.

Finally, I extend my appreciation to the entire community of Busitema University for the favorable academic environment they have rendered to me.

ABSTRACT

The aim of the study was to analyze errors due to the angle of oscillation, air resistance and the number of oscillations in a pendulum bob gravity experiment. Most students at secondary school level have been asking physics teachers how errors arise due to the angle of oscillation, air resistance and the number of oscillations during the determination of acceleration due to gravity using a pendulum bob but no clear explanation and demonstration has always been done by the teachers, this has resulted into continuous failure in the examinations, some of these students have escaped their way and have now become teachers, lecturers and they are still explaining wrong facts. The research has been conducted successfully on determining the errors that normally arose due to air resistance, number of oscillations and angle of oscillations in secondary schools when performing pendulum bob experiments. This has been a very big problem which has resulted into many people failing. However, in this research many things have been discovered and the following recommendations have been put forth to the people who will be performing pendulum bob experiments; Experiments should be performed in a closed room to avoid air resistance, Small values of the number of oscillations for accuracy must be put into consideration and experiments should be performed at small angles to avoid errors due air resistance.

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CHAPTER ONE: INTRODUCTION

1.1 Introduction

This research is designed with a practical representation which will give more evidence on the errors made due to the angle of oscillation, air resistance and the number of oscillations during the determination of acceleration due to gravity using a pendulum bob. It's intended to evidence the background, problem statement, aim, objectives, justification and the scope of the study.

The acceleration due to gravity is the acceleration of a body due to the influence of the pull of gravity. It is usually donated by "g". Acceleration due to gravity is the constant acceleration of a freely falling body. The determination of the local acceleration due to gravity is one of the oldest experiments performed in physics. Galileo was the first person to find that all objects experience uniform acceleration regardless of their masses. This finding was of great importance since it was used to refute a commonly accepted perception namely that heavier object fall faster than lighter ones. Even today determining the local value of „g" is important since it can be used to get indirect measurement on the local geological conditions under the surface soil **(Galileo, 1939).** This can be done because the greatest contribution to the acceleration of a falling object comes from the matter closest to the object. In particular, the local acceleration depends on the density of this region. Therefore, a measure of the acceleration due to gravity can be given an average density for the crust in the area, and this in turn can be used to determine subterranean composition in a manner. Thus to determine the acceleration due to gravity experimentally is very important since acceleration due to gravity have diverging values. They are caused by the varying densities of subsurface rocks, location on the surface (such as your latitude) and the elevation (which is the distance from the Centre of the earth). The value of acceleration due to gravity (g) can be determined using different methods namely simple pendulum, free fall, reversible pendulum etc. Moreover, the acceleration due to gravity has an effect on many physical quantities. This includes kinematics (motion under free fall and projectile motion), newton's law of gravitation (density of the earth and weight of a body), atmospheric pressure, escape velocity and potential energy of system etc. however the acceleration due to gravity is not constant everywhere on the surface of the earth, i.e. it varies from place to place due to the following reason; the rotation, shape and the density of the earth, the variation in latitudes and altitude.

REFERENCES

Caliendo. S.M. (1996*). Establishing the theoretical frame. Journal of Research in Science Teaching.* 33 (3), 225-227.

Cavagna.G.A (1975). *Force platforms as ergonometers. Journal of apply physiology.* 39, 174-179.

Clark.J.S (1939). *An absolute determination of the acceleration due to gravity,* Phil. Trans. Roy. Soc. London. Ser. A 238, 6S- 123.

Cook A. H (19650). *The absolute determination of the acceleration due to gravity*. Metro logia, 84- 114.

Galileo, (1642*). Essential Principle of Physics*. Enic Education Construction and Publishers *Revised Edition* 18-374

Gun stone, R.F. (1995). *Understanding of Gravity Journal at* http:www.gravityunderstanding Retrieved20/07/

Hey.H.Y, Cook (1936). *The value of gravity at Washington. .J*. Res. NBS 17, 805- 39.

James, E. (2000). *At www.accelerationduetogravity//pendulumemethod R*etrieved on 23/07/2016

Jerry D.W, Anthony J.B. (2007). *College Physic*s *6th Edition*, Pearson Education pp. 342-389.

Roll.P.G, R. Krotkov. (1964). *The equivalence of inertial and passive gravitational mass*, Ann, 26, 442- 517.

Talwani. M, Ewig, (1960), *Rapid Computation of Gravitational Attraction of Three Dimensional Bodies of Arbitrary Shape, Geophysics.*

Woolard, A.N. (1943*). Fundamental of Physics, Presses Syndicate of the Cambridge Low price* Edition 29 www.google.cvom/physicisdiagrams Retrieved 15/04/2016.