

**EFFECT OF COGNITIVE RESTRUCTURING COUNSELLING
TECHNIQUE ON LOW-ACHIEVING SCIENCE BASED SECONDARY
SCHOOL STUDENTS IN DALA
EDUCATION ZONE KANO STATE, NIGERIA**

BY

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COUNSELLING.**

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MAY, 2018

CERTIFICATION

This is to certify that the research work for this dissertation and the subsequent write-up of (Tasiu Dahiru SPS/14/MED/00075) were carried out under my supervision.

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DECLARATION

I here declare that this work is the product of my research effort undertaken under the supervision of Dr. Isa Ado Abubakar and has not been presented anywhere for the award of a degree or certificate. All sources have been duly acknowledged.

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APPROVAL PAGE

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DEDICATION

This research work is dedicated to my beloved father late Dahiru Haruna (may his soul rest in peace), my mother AminaLawal for their guidance, encouragement, and sound moral upbringing accorded me.

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Praise be to Allah, lord of the word, the All knowing, all wisdom goes to Him, who teaches man, and overseer of everything, from Him we seeks guidance, on Him we depend and from Him we seek help. Peace be upon Prophet Muhammad (sallallahualaihiwasallam) who sends to guide the mankind.

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ABSTRACT

The study examines the effect of Cognitive Restructuring counselling techniques on low-achieving science based secondary school one students in Dala Education Zone, Kano Nigeria. The study was guided by three objectives, research questions and three null hypotheses. A quasi-experimental design, pre-test, post test was used. The population of the study covered all low-achieving science based secondary school one students (SS One) in Dala Education Zone and multi-stage sample technique was used in selecting three sample schools, 60 students have been purposively selected using science achievement test, and another science achievement test was used in post test. Descriptive statistic was used to answer research questions and t-test dependent sample and in-dependent sample was used to test three null hypotheses at 0.05 level of significant. The finding revealed that there is significant effect of Cognitive Restructuring counselling technique on low- achieving science based secondary school students in Dala education zone Kano Nigeria and there is no significant difference in the effect of Cognitive Restructuring counselling technique between male and female, Gwale and Dala low-achieving science based secondary school students in Dala education zone Kano Nigeria. Based on the findings of the study, it is concluded that Cognitive Restructuring counselling technique has tendency of improving academic achievement and the technique is not gender sensitive. However it is recommended that a similar study should be replicated to cover private schools and science school in order to make generalization or otherwise in all science secondary schools students, also further studies should conduct to focus on commerce, humanities and entrepreneurship using Cognitive Restructuring counselling techniques on low-achieving science based secondary school students in Dala education zone Kano state, Nigeria.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Low achieving occupies very important position in teaching and learning process as well as education in general. Low achieving as inability to achieved required grade after receiving instruction in teaching and learning. Schools offer a number of subjects based on career pathway Science as one of the most important subjects of studies in Nigeria curriculum and it is the key figure of the national development. No any nation can develop or sustain any form of development without the solid foundation in science .Science provide students with the ability to improve logical reasoning through the combination of scientific theories with the real life situation. The knowledge of science has brought and will continue to bring new ideas, skills and products which affect the lives and habits of societies.

Good science education is precondition for national development as it raises individual countries to a position of self-sufficiency in provision of basic needs of the society. Science education greatly contributes toward food production, crop yield are more assured through the vast array of inputs at the disposal of the farmers, fertilizer to tackle soil deficiencies, numerous techniques to combat erosion, pesticides and herbicides to control pest and weeds, respectively. In addition science education provides the basis for awareness of relevant health related issues and diseases control, knowledge of the causative agents of diseases. Conclusively advancement in technology is un- realistic without science education, this science education become inevitable in the human life.

Despite the relevance of science education to human, national and global advancement, students in secondary schools especially science students find it difficult to meet the expected

result or requirement. It shown that the students' performance in WAEC, NECO and SSQE is unfortunate.

The West African Examination Council (WAEC) Chief Examiners Report (2005 – 2008) indicate that students area of deficiency in school examination showed that students least understand science concepts as shown by their achievement. Most of the science students do not meet the standard requirement to pass the science subjects at credit level, science are subjects that compose theoretical knowledge and practical aspects. The Chief Examiners Report (2005) categorically stated area of students weaknesses as inability to carryout required test where appropriate, poor expression, inadequate exposure to practical works, poor knowledge of separation techniques, inability to differentiate theoretical knowledge from practical observation and many others. The rate of low achieving of science students in Nigeria resulted to economic and social wastage and this become a great concern to all stakeholders in education. For instance in 2008, only 25.94% of science students had credits in Mathematics, Biology, Physic, Chemistry and English. Also the break-down of 2009 result in West Africa Senior School Certificate Examination (WASSCE) and National Examination Council (NECO) indicated a mass failure across 36 states of the federation. The same in qualify (SSQE) examination in Kano state most of the students failed to meet the requirement for government sponsorship of any 5 credits including Mathematics and English. In the examinations science students may qualify for government Sponsorship without passing science subjects and get required credit in other subjects. The qualify result 2015 showed that the performance of students in science subjects is worrisome. It showed that only 6.25% of science students had credit in Biology, Physic, Chemistry and Mathematics.

The inability of most students to achieve acceptable grades at the WAEC, NECO and SSQE in the science subjects of Physics, Chemistry, Biology and Mathematics for admission into tertiary institution and qualify for Government sponsors.. Compel students to prefer art-based subjects at the senior secondary school then science, and educational stakeholders are curious to find appropriate measures to improve science academic achieving. Low achieving science secondary school students have many needs include physical and psychological feeling, needs for getting appropriate education, needs for getting equal education opportunity and benefit from equity of education for All. A close examination of these needs showed that guidance and counseling have significant roles which its play to ensure proper adjustment, development and progress in the life of low achieving science secondary school students. The study examined the effect of Cognitive Restructuring counseling technique on low achieving science based secondary school students in Dala education zone Kano state..

Several efforts have been made to improve students achieving in science subjects, e.g. Idelodun and Okesanjo (2015), Mary and Vera (2015) and many others. Yet the measures seem to be ineffective to give positive result, in such reason the research suggest employing cognitive restructuring counselling technique to see whether it has effect on student low achieving in science. Cognitive restructuring, is a process of recognizing, challenging, and changing cognitive distortions. Negative thought patterns can be accomplished with the help of a therapist trained in cognitive therapy or cognitive behavioral therapy (Rupke, David & Marjorie 2006).

Henceforth the Cognitive Restructuring counselling technique is seen as appropriate technique to apply for improving the academic achievement of low achieving science students. Meichenbaums (1977). Describes Cognitive Restructuring as the organizing aspect of thinking which seems to monitor and direct the choice of thought which implies an Executive processor

and holds the blueprints of thinking . That determine when to continue interrupt or changing thinking..

1.2 Statement of the Problem

Science education has importance role in all spheres of human endeavors science affect cut across area of health, food and agriculture, transport and communication, exploration and exploitation of natural resources, housing, sport and leisure. It transforms our worlds and improves the skills and new ideas in the solution of human problems. Science education is taught for a number of reasons that includes providing required skills in the world of work, acquisition of scientific literacy in the citizenry and preparation of individuals with special abilities for further education. Science education remain fundamental as far as development in all its ramification is concern for preparation of useful living within the society, preparation for high education, diversification of curriculum to cater for difference in talents, opportunities and roles posed by or open to students after their secondary school course and equipping students to live effectively in our modern age of science and technology. Thereafter the 4 year strategic plan for the development of the education sector 2011-2015 stated where we need to be as “high performing school and high achieving and functional students”.

Despite the importance of science education to the national development, if the science students remained with low achieving performance may lead to unrealistic attainments of national and global development in term of technology, education, economic and many other aspects of human Endeavour, un attainment of the objectives of secondary education, also the national need in the strategies plan for the development of the education will not be achieved. The low-achieving performance of science based secondary students may serve as the stumbling

block for most of the students to transit to higher institution of learning, which consequently resulted to inability to provide the required manpower in the area of science, technology and related field. This also constitute the students into roaming about the street, stealing, engage in political thug, drug abuse and they become nuisance to the public against social security. Science practically required in all technology and science career and profession is pre-requisite in varying degrees, admission into science, technology and related courses required credit in science subjects.

Low-achieving of science based students in secondary schools is responsible for many factors such include method of instruction/facilities, motivation, consequently developed from inferiority complex, negative goal direction, faulty assumption, discouragement toward science education, poor study habit, lack of vocational goal, low-self concept, low-socio economic status and poor family structure. Most often low achieving science secondary school students do not gain from the method of instruction consequently developed poor attitude toward science subject as a result of numerous calculation particular in physic and mathematic.

Previous studies employed several counselling measured aimed at improving students achievement in science area, such include Maliki,(2006,) Mary and Verg(2015), Koyode and Rafiu(2014), Oriahi, Uhumuabi and Aquale (2010), Abiam and Odoke (2006), and many others. None of these studies consider Cognitive Restructuring counseling techniques as a mechanism for improving performance of low- achievement science based students.

1.3 Objectives of the Study

The study achieved the following objectives:

- 1, To Find out the effect of Cognitive Restructuring counselling technique on low-achieving science based secondary school students in Dala education zone Kano, Nigeria.

- 2 To find out the difference in the posttest mean scores between male and female low-achieving science based secondary school students in Dala education zone Kano, Nigeria.
3. To find out the difference in the posttest mean scores of low achieving science based secondary school students between Gwale local Government and Dala local Government students.

1.4 Research Questions

The research answered the following questions:

1. What is the effect of Cognitive Restructuring counselling technique on academic performance of low-achieving science based secondary school students?
2. What is the difference in the posttest mean scores on low-achieving science based secondary school students between male and female?
3. What is the difference in the posttest mean scores of low achieving science based secondary school students between Gwale local Government and Dala Local Government students?

1.5 Hypotheses

The following hypotheses was tested using appropriate statistical techniques:

1. There is no significant effect of Cognitive Restructuring counselling technique on low-achieving science based secondary school students in Dala Education Zone Kano, Nigeria.
2. There is no significant difference in the posttest mean scores between male and female low achieving science based secondary school students, Dala Education Zone, Kano, Nigeria.
 3. There is no significant difference in the posttest mean scores between Dala and Gwale local Government low achieving science based secondary school students.

1.6 Significance of the Study

The study is significant to the followings dimension students, parent, counsellors and policy maker. The significant of the study to the students is to help them to identify the low-achieving students and improve their academic achievement, cope with the school instruction and pass their internal and external examination to help in furthering their studies in higher institution of learning, is also significant to students in order to develop self-confidence, correction of irrational thought setting goals for their future life to become useful member of the society. The study is significant to the parent for established mutual relationship between parent and their children, it give self-confidence to them and supporting the children education by providing all necessary learning facilities.

The finding of this study made significant contribution to the students of counseling especially those are conducting research in the area of students academic achievement not only in science subjects by helping them to further understanding causing low achieving of secondary school students and also the finding of this work will provide more empirical information on effectiveness of Cognitive Restructuring counseling technique it also motivate school counselors to the technique in treatment of low academic achievement and academic performance in general.

The study is hoped to give positive contribution to the development of knowledge in the field of counselling. It serves as capsules to improve achievement of low-achieving students. It also serve as bridge that enhance mutual relationship between students/clients, in which the school counsellor treat his clients as responsible persons, as discourage not patient, to assist the students in identifying their area of strength and weakness to reach their full potentialities. It is

also significant to create awareness about the self-respects and elimination of minus situation toward gear plus situation of life and correct the students pursue of mistaken goals.

The study is also significant to the policymaker to the achievement of national objectives to create just and egalitarian society, to modifying of the irrational thought which leads mistaken lifestyles. It is also significant to encourage the society of self-reliance, whereby the individual should be encouraged to be self-dependent and take personal challenges of life through creative self. It is also significant to the fictional goal to make individual conscious of the future and developed forward looking with positive image about the future.

1.7 Scope and Delimitation of the Study

The study covers all low achieving science secondary school students, in Dala Educational Zone, of SS (I). All public and community schools include boys and girls students as target population. The study focus on Chemistry, Biology, Physic and Mathematics science achievement test was used to identify students of low achieving performance below 50% in these science subjects. The study focuses on Cognitive Restructuring .counselling techniques

Students from junior classes, senior secondary school students of class two and three were exempted from study. All students from science and technical schools and private schools students are exempted from study. Students from other education zone in Kano state were exempted from study. Other counselling techniques were also exempted from study.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

The chapter is to review related literature. The Conceptual of academic achievement, factors affecting students' academic achievement, secondary education will be review globally to Africa and finally to Nigeria, also Secondary Curriculum, correlated academic performance with gender, socio-economic status. The study will also review Cognitive restructuring Counselling techniques to guide the study, some basic component and Counselling process of Cognitive Restructuring will be used to guide the study. This study will review relevant empirical and summary and uniqueness of the study.

2.2 Conceptual Framework

2.2.1 Academic Achievement

In the educational system scores earned by a student determines his grade within instructional contents, schooling or learning period, and how much the students had learnt within that period. Sunday and Blessing (2015) viewed academic achievement as the scorers or grades received by an individual from and other assessments. Olufemi (2014) expressed academic performance as that behaviour exhibited by a person that is noticeable after undergoing a programme of instruction in a school; the programme could be a course work, syllabus or scheme of work for a particular class, over a period of time. Hussain(2006) note that used GPA to measure students' performance because the main focus is on the students' performance for the particular semester. Measurement of secondary school student's academic performance depend on two ways; standardize test and teacher made test. Onu (2012)seen academic performance is perceived as the child/student ability to score high in particular course of instruction.

2.2.2 Factors Affecting Academic Achievement

Mushtaq and Nawaz (2012) explore four factors that affect students' academic achievement. These factors are student's communication skills, learning facilities, proper guidance and family stress. Ohanaka (2008) stated that, the achievement and attainment of better grades have never been ascribed to one single factor or variable, this is because students' academic achievement is a reflection and interplay of various factors which could range from age, intelligence, lack of basic facilities, shortage of qualified and good teaching staff, lack of motivation, study habits, parents educational attainment among others. Also Adebule (2006) noted that many reasons have been adduced to students' academic achievement at both internal and external examination, which are beyond classroom actors, other important factors such as the socio-psychological factors which determine what, why and how individual learns. Also Ohanaka (2008) claimed that some factors that influence academic achievement of students are heredity, environment, time and some that are residents in the students, the family, the school and the society. Those factors resident in the students include physical, health, truancy, emotional problems, personality factors, poor study habit, self-concept, and continued failure, lack of basic cognitive skills and examination strategies or restiveness

Many indices or factors affect students' academic achievement as perceive by scholars and researchers .Asikhia (2010)noted that other factors such as societal factors which include poor quality of teaching staff, inadequate curriculum, poor interpersonal relationship, e.g. principal- teacher- students, family relate factors such as economic resource of the family, home discipline/tradition, parental academic background. Child/students related factors which embrace poor achievement motivation, lack of basic cognitive, physical and healthy factors among other are responsible for students' academic achievement.

Okeye and Madueke (2016) expressed that the class size has significant effects of students' academic achievement which noted that the students in smaller class performed better than students in large classes. Nuthana and Yenagi (2009) described that students' academic achievement is interwoven by the various indices that affects positively or negatively, he illustrated some factors were intellectual ability, poor study habit, achievements motivation, lack of vocational goals, low self-concept low socio-economics status of the family, poor family structure among others. Silverrious (2014) explained that children growing up in poverty may suffer from more developmental delay s and learning disabilities than children from higher income home. This may cause an impact on the overall learning and achievement. Also parent's educational level affects students' academic achievement, parent from formal occupation had better position and assurance of helping students at home than those from the informal occupation Ajai and Imoko (2015) .Indicated that male and female students differ in their academic performance, they stated that there are gender differences in performance. But the Josiah and Adjoke (2014) stated that male and female students did not differ significantly in their academic performance.

2.2.3 Cognitive Restructuring Counselling Technique

Cognitive restructuring was originally developed by Albert Ellis (1989). It is a psychotherapies process of learning to identify and dispute irrational or maladaptive thought. This process of learning that identifies and challenge of irrational or maladaptive thoughts using strategies, such as logical identification. It also a process of replacing cognitive distortion with the thought that are more accurate and useful. Cognitive restructuring involves paying attention to thought, recognizing when they are irrational thoughts, challenging them, and learning replacement

thoughts and behaviors, says Connolly. People learn healthy ways to talk to themselves so that they can let go of the self-defeating talk (Diana, 2013).

Cognitive restructuring, is a process of recognizing, challenging, and changing cognitive distortions. Negative thought patterns can be accomplished with the help of a therapist trained in cognitive therapy or cognitive behavioral therapy (Rupke, David & Marjorie 2006).

Cognitive restructuring and the disputing of dysfunctional or irrational beliefs of people who have emotional and behavioral disturbances date back to the ancient times, particularly early Asian Greek and Roman Philosophers who took to constructivist view of humans. A contemporary of the period called Epictetus concluded that people are disturbed not by the events that happen to them, but by their views of these events (Jane & Steven 2003)

Cognitive restructuring, also called cognitive reframing, is a behavioral technique associated with cognitive therapy. Cognitive restructuring involves learning how to think differently, to change faulty thinking, and replace it with more rational, realistic, and perhaps positive thinking, through cognitive restructuring, we can learn how to control our thoughts not simply be optimistic in all things, but be realistic as well (Diana, 2013).

Terms like reframing 'idea repairs' are all used to refer to cognitive restructuring. It is a therapy that was popularized by Albert Ellis. Ellis argued that the primary causes of human distress are not unconscious impulses as opined by psychoanalysis, but that certain irrational beliefs are the causes of such behavior problems. Ogechiesere (2002) Ellis did not however claim to have initiated the CBT as he declared as follows; *I was not the first therapist to use what becomes known as Cognitive Behavior Therapy (CBT) since a few practitioners such as Herzberg (1945) and Salter (1949) had employed aspects of it previously. But I seem to have been the main*

Therapist to create Systematic Cognitive restructuring which I called disputing Irrational Beliefs. (Jane & Steven. 2003).

Beck (1979), explains how a cognitive therapist can help a client to think and act more realistically and adaptively about his problems and thus reduce the symptoms of the behavior that deserves to be changed. Beck emphasized that cognitive techniques aim at delineating and testing the client's specific misconceptions and maladaptive assumptions. This approach consists of specific learning experiences designed to change the clients' unwanted behavior.

Therefore cognitive Restructuring is one of the most suitable approaches to treat Bullying behavior because one of the major causes of bullying behavior is negative thinking. Cognitive restructuring involve four basic steps which identify by Hope, Burns, Hyes, Herbert and Warner (2010) identified four steps involved in cognitive restructuring and six types of automatic thoughts. The four steps include:

1. Identification of problematic cognitions known as "automatic thoughts" which are dysfunctional or negative views of the self, world, or future.
2. Identification of the cognitive distortions in the automatic thoughts.
3. Rational disputation of automatic thoughts with the Socratic dialogue.
4. Development of a rational rebuttal to the automatic thoughts.

The six types of automatic thoughts are:

- a) Self-evaluated thoughts.
- b) Thoughts about the evaluations of others.
- c) Evaluative thoughts about the other person with whom they are interacting.
- d) Thoughts about coping strategies and behavioral plans.
- e) Thoughts of avoidance.

f) Any other thoughts that were not categorized.

2.2.4 Process of Cognitive Restructuring Counselling Technique

Cognitive restructuring refers to the process of replacing cognitive distortions with the thought that are more accurate and useful. Cognitive restructuring has two basic steps as enumerated in (Burns, 1980)

- (1) Identifying the thoughts or beliefs that are influencing the disturbing emotion;
- (2) Evaluating them for their accuracy and usefulness using logic and evidence, and if warranted, modifying or replacing the thoughts with ones that are more accurate and useful.

2.2.8 Low-Achieving Cases Of Secondary School Students in Science Subjects

Despite the several efforts by the parents, teachers, and researchers to improve academic performance of science students by providing enable environment for learning, the effort does not give any positive outcome .Akparanta (2010) stated that West Africa Senior School Certificate Examination (WASSCE) result released by (WAEC) from 2005-2009 it represented poor performance in science subject.

The downward of students' performance in external examination in four science subject has become a source of worry to all. The school Certificate examination result for Science subjects from of three states Kano, Katsina and Jigawa of North 2005 to 2009 is showed that the students' performance is worrisome.

BIOLOGY

Year	Total candidate	Pass at A1-C6	%	Total D7-F9	%
2005	1051557	368045	35	683512	65
2006	1082556	385498	35.61	697058	64.39
2007	1072602	382524	35.57	691078	64.43
2008	1285048	436145	33.94	848903	66.13
2009	1903552	644733	33.87	1258818	66.13

CHEMISTRY

Year	Total candidate	Pass at A1-C6	%	D7-F9	%
2005	349936	178257	50.94	171678	49.06
2006	352452	172913	49.06	179539	50.94
2007	432230	198652	45.96	233578	54.04
2008	428533	190440	44.44	238093	55.56
2009	442091	203229	45.97	220862	54.03

PHYSIC

Year	Total candidate	Pass at A1-C6	%	D7-F9	%
2005	344411	142930	41.50	201481	58.50
2006	345235	148451	43.84	196884	56.16
2007	427398	248104	58.05	149294	41.95
2008	424393	204812	48.26	219581	51.74
2009	429174	186948	43.56	242226	56.44

Source(WAEC 2010) as cited in Akparanta 2010

2.2.9 Correlate of Academic Achievement.

2.2.9.1 Socio-Economic Status and Academic Achievement.

Socio-economic status is a definite background variable that represents a feature of the social structure of it family. It is imagining that parental socio-economic background can have possible effects on the students' academic background can have possible effect on the students' academic performance. Parents of different occupation classes often have different styles of child rearing, different ways of disciplining their children and different ways of reacting to their children (Rotheistin, 2004). There is still ongoing debate among the scholars, researchers about the effect of parental socio-economic status on students' academic achievement. Suleiman, Hussain, Ullahkahn, and Un-Nisa(2012)found that those children whose socio-economic status was strong show better academic performance and those with poor socio-economic status shaved poor and unsatisfactory academic performance.

Kariuki, Kibet, Mungiria, and Reche (2012)noted that most parents who do not have education beyond secondary school education. They may not be good role models for their children in academic matters, they also noted that low parental income is associated with diminished resources in studying science subjects, hence, it contributes to lower academic performance, Desarrollo (2007). Noted that the extent to which parents or other family members are actively engaged in a student's education had positive influence on the students' academic performance, Eamon (2005). Believed that low socio-economic status negatively affects the academic performance of students because due to low socio-economic status their needs and demand remain unfulfilled and that is why they do not show better academic performance.

Rouse and Barrow (2006), Krashen(2005)believed that parents of higher socio-economic status are more engaged in their children's education as compared to the parent of lower socio-

economic status and that greater parental participation and involvement promotes more positive attitudes towards school, improves homework habits, reduces absenteeism and dropping out, enhances academic performance and score higher on standardized tests as compared to those whose parents were low socioeconomic status. However, researcher argued that parental socioeconomic status does not affect the students' academic performance, but also makes it possible for children from low background to compete with their counterparts from high socioeconomic background under the same academic environment. Silverius (2014) showed that counseling may take part in improve academic performance of the students in respect of their socioeconomic status.

2.2.9.2 Gender and Academic Achievement

Gender difference in academic performance have been among the contemporary issues in the current academic debates all over the world, Abdul-Raheem, (2012). One specific issue which has generated much debates in educational circles over the year is a question of whether a statistically significant difference in performance exists or not between male and female students in a defined learning task. A definite answer to the question seems to be a complex one. The complexity arises because empirical and theoretical literatures have produced diverse and contradictory, result Oluwatyo,(2011). Despite of this complexity, the study aims to test the effect of Cognitive Restructuring counselling techniques on improving academic achievement of gender difference. Some of the available empirical that indicate gender difference on academic performance. Nevertheless, the studies conducted by Awofala (2011), (Doris, O'Neill and Sweetman (2012), Udida, Ukwaiyi and Ogod (2012) and Uluwagbohunmi (2014) disclosed that male students rather performed better than female and the results were also statistically significant,(KyeiApam and Nokoe 2011) .Conducted a research on gender difference in

performance in senior high school Mathematics examination in mixed high school in the upper east region of Ghana. The investigation showed that there is a gender differences with male performing better than females, Mensah and Nasir (2011) also indicated that parents prefer educating their male child as compared to their female and because of the notion that males usually perform better than females.

However, Cubb, Fergusson and Horwood(2008) Farooq, Chaudry, Shafiq and Berhanu (2011) and Voyer and Voyer (2014) all revealed that female performed better than their male counterparts and were statistically significant. On the other hand, Abubakar and Adegboyega (2012), Abdulraheem(2012), Mlambo (2011), Josiah and Adejoke (2014) and many others, have shown that no statistical significant difference in academic performance between male and female students, Fabunmi (2004)discovered that gender composition has a significant relationship with students' academic performance and that gender composition has a significant influence on secondary school students' academic performance.

2.3 Theoretical framework

(Cognitive Behavior Therapy, Aaron T. Beck, 1960)

The cognitive behavior therapy (CBT) was pioneered by Aaron T. Beck in the 1960s, while he was a psychiatrist at the University of Pennsylvania. Cognitive behavior therapy is based on the idea that how we think affects our behavior and we can monitor. The behavioral change may be affected through mental reasoning, Dobson cited in (McLeod, 2009). It focuses on changing unhelpful or unhealthy thoughts and behaviors. It is a combination of two therapies: *cognitive therapy*' and *behavior therapy*'. The belief of both techniques is that healthy thoughts lead to healthy feelings and behaviors. Cognitive behavior therapy is based on a cognitive theory of psychopathology. The cognitive model describes how people's perceptions of, or spontaneous thoughts about, situations influence their emotional, behavioral and often physiological reactions. Individuals 'perceptions are often distorted and dysfunctional when they are distressed. They can learn to identify and evaluate their —automatic thoughts| (spontaneously occurring verbal or imaginable cognitions), and to correct their thinking so that it is more closely resembles reality (Beck, 2017).

CBT was primarily developed through an integration of behavior therapy with cognitive psychology therapy. Many works conducted by Donald and several other authors with the label of cognitive behavior modification in the late 1970s. This tradition thereafter merged with earlier work of a few clinicians, labeled as cognitive therapy (CT), developed by Aaron Beck, Cognitive Restructuring, and Ration Emotive Therapy (RET) developed by Albert Ellis. While rooted in rather different theories, these two traditions have been characterized by a constant reference to experimental research to test hypotheses, both at clinical and basic level. Common features of CBT procedures are the focus on the "here and now", a directive or guidance role of the

therapist, a structuring of the psychotherapy sessions and path, and on alleviating both symptoms and patients' vulnerability (Martin, 2007).

In the 1960s, Aaron T. Beck, a psychiatrist, observed that during his analytical sessions, his patients tended to have an **internal dialogue** going on in their minds, almost as if they were talking to themselves. But they would only report a fraction of this kind of thinking to him. Beck realized that the link between thoughts and feelings was very important. He invented the term **automatic thoughts** to describe emotion-filled thoughts that might pop up in the mind (Martin, 2007).

Beck called it cognitive therapy because of the importance it places on thinking. It is now known as cognitive-behavioral therapy (CBT) because the therapy employs behavioral techniques as well. The balance between the cognitive and the behavioral elements varies among the different therapies of this type, but all come under the umbrella term cognitive behavior therapy. CBT has since undergone successful scientific trials in many places by different teams, and has been applied to a wide variety of problems, Martin (2007). Cognitive therapy makes the assumption that thoughts precede moods and that false self-beliefs lead to negative emotions. Cognitive therapy aims to help the patient recognize and reassess his patterns of negative thoughts and replace them with positive thoughts that are more closely reflecting reality (Rupke, David and Marjorie, 2006).

As a result of his findings, Beck began to look for other ways of conceptualizing depression. He found that depressed patients experienced streams of negative thoughts that seemed to arise spontaneously. He called these cognitions-automatic thoughts. He found that the patients' automatic thoughts fell into three categories. The patients had negative ideas about themselves, the world and/or the future. Therefore he began helping patients identify and evaluate these

automatic thoughts. He found that by doing so, patients were able to think more realistically. As a result, they felt better emotionally and were able to behave more functionally. When patients changed their underlying beliefs about themselves, their world and other people, therapy resulted in long-lasting change. Beck called this approach **cognitive therapy**. It has also become known as **cognitive behavior therapy** (Martin, 2007).

2.3.1 Basic Principles of Cognitive Behavior Therapy

There are several approaches to CBT. These include Rational Emotive Therapy, Rational Behavior Therapy, Rational Living Therapy, Cognitive Restructuring Therapy, Social Skills Training and Dialectic Behavior Therapy. In general, most of these approaches follow the principles listed below (Grohol, 2015: & Beck, 2011):

- a. Cognitive behavior therapy is based on an ever-evolving formulation of patients' problems and an individual conceptualization of each patient in cognitive terms.
- b. Cognitive behavior therapy requires a sound therapeutic alliance.
- c. Cognitive behavior therapy emphasizes collaboration and active participation.
- d. Cognitive behavior therapy is goal oriented and problem focused.
- e. Cognitive behavior therapy initially emphasizes on the present.
- f. Cognitive behavior therapy is educative, aims to teach the patient to be her own therapist, and emphasizes relapse prevention.
- g. Thoughts cause us to feel or behave in certain ways, not external things like people, situations, and events. This is the foundation of CBT. The benefit of this fact is that healthier thinking can lead to feeling better and reacting better even if people, situations, or events around us do not change.

- h. CBT works best when the therapist or coach teaching the principles has a positive relationship with the client.
- i. CBT is based on an educational model. The goal is to help clients unlearn their unwanted reactions and to learn a new way of reacting to people, situations, or events.
- j. Homework is important in CBT. Instructors who use a CBT model will frequently assign homework to their clients. The purpose of homework is to practice healthy ways of thinking and reacting to people, situations, or events.

Conclusively cognitive behavioral therapy is a form of psychotherapy that help the client to change on how he think (cognition) and what he do (behavior), these changes can help him to feel better and improve his mental wellbeing as well as breaking various negative thinking, feelings and behavior .

The relevance of CBT to this study is that behaviors are changed and modified when you identify and challenge the maladaptive thought as well as encourage the client to change disruptive pattern of behavior. This means that behaviors are likely to be change when you teach the client on how to identify distorted cognition through the process of re-evaluation, and those who are not identified and challenged them are likely to be repeated.(Dattilio and Freeman 1992), (Beck and Weishaar 2000) as cited in Core (2007). Examine systematic error in reasoning that lead to faulty assumption and misconceptions. As

- (a). Arbitrary inferences ; refer to making conclusion without supporting and relevant evidence. This include catastrophizing or thinking from absolute worst scenario and outcomes for most situation.
- (b). Selective abstraction; consists of forming conclusion based on an isolated detail of an event. In this process other information is ignored and the significance of the context is

missed. The assumption is that the event that matter are those dealing with failure and deprivation.

(c). Overgeneralization; as process of holding extreme belief on the basic of a single incident and apply them inappropriately and dissimilar events or setting.

(d). Magnification and minimization. Consist of perceiving a case or situation in a greater or lesser than it truly deserve.

(e). Personalization; is a tendency for individuals to relate external events to themselves, even when there is no basic for making the connection.

(f). Labeling and mislabeling; involves portraying ones identity on the basic of imperfection and mistakes made in the past and allowing them to define ones true identity.

(g).Polarized thinking; involves thinking and interpreting in all or nothing terms or categorizing experiences in either or extreme. With such dichotomous thinking events are labeled in black or white terms.

2.3.2.1: Cognitive Restructuring.

As the organizing aspect of thinking which seems to monitor and direct the choice of thought which implies executive and processor which holds the blueprints of thinking that determine when to continue, interrupt or change thinking.(Corey 2007). However Meichenbaum (1977). As cited in Corey (2007). He propose behavior change process which occurs through a sequence of mediating processes involving the interaction of inner speech , Cognitive Restructuring, and behavior and their resulting outcomes. He describes a three phases process of change in which those three aspect are interwoven. Such as follows.

1. Phase 1 self- observation. The beginning step in the change process consists of clients learning how to observe their own behavior. When they begin counseling their internal

dialogue is characterized by negative self statement and imagery. A crucial factor is their willingness and ability to listen to themselves. This process involves an increased sensitivity to their thoughts, feelings, actions, psychological reactions, and ways of reacting to others.

2. Phase 2 starting new internal dialogue. As a result of the early clients- counselor contacts, clients learn to notice their maladaptive behavior, and they begin to see opportunities for adaptive behavior alternatives. If clients hope to change, what they say to themselves must initiate a new behavior chain, one that is incompatible with their maladaptive behaviors. Clients learn to change their internal dialogue through counseling. Their new internal dialogue serves as a guide to new behavior.
3. Phase 3 learning new skills. This consists of teaching clients more effective coping skills, which are practiced in real- life situations. (for example, a client who can't cope with failure may avoid appealing activities for fear of not succeeding at them.)

Cognitive Restructuring is a core technique in Cognitive Behavior Therapy. It's a therapeutic process used to identify and confront negative thought patterns and help people understand that these thoughts are ineffective or disruptive, with the goal to ultimately change negative behaviors. It teaches clients how to think differently by replacing adverse and illogical thoughts ("faulty thinking") with more rational and positive types of thinking. Cognitive restructuring is commonly used in treatment of substance abuse and eating disorders, and distorted academic achievement. Counsellors will aid the clients in attempting to replace irrational thoughts with realistic ones. The steps in cognitive restructuring are:

- 1) Identifying irrational thoughts,
- 2) Challenging/disputing them, and

3) Replacing them with more realistic, rational, and positive thoughts. An example would be a client who was having repeated panic attacks because of their academic classes. The Counsellor would first help them identify the disruptive thoughts that are contributing to the panic attacks ("I am going to fail. I am stupid. The teacher hates me. I am way out of my league"). Then the clients would need to dispute these negative thoughts with more positive statements ("I got here because of my good grades. I have passed classes in the past. Everyone else is struggling too right now"). Eventually the clients would replace the negative thoughts with realistic thoughts ("I need to study more. We need to form a study group. This is a rough patch that will be over soon. I can handle this").

2.4 Review of Empirical Studies

Several empirical studies were conducted in relation to dependent, and independent variables of this study within or outside Nigerian context.

The study conducted by, Akujieze and Nwadinobi (2015), to investigate the effect of counselling (cognitive behavioural therapy) strategy in geometry among low-achieving secondary school students in Ibadan. The study adopted quasi-experimental design, with pre-test, post-test control group. The population was five local government areas of Ibadan metropolis; simple random techniques were used to select two local governments, and also the same techniques were employed to select four schools and an intact class from each school. Two instruments were used, students selection Test ($r = 0.70$) and achievement test in geometry ($r = 0.81$). Two hypotheses were tested. Data were analyzed using descriptive statistics and analysis of covariance. The study conclude that, the use of counselling strategy improved students achievement in geometry, also there was no significant main effects of gender on geometry achievement.

Another empirical was conducted by, Olubusayo A..Asikhus.(2014). To examined the effect of Cognitive Restructuring on the reduction of mathematics anxiety among senior secondary school students in Ogun state. Nigeria. All high mathematic anxious ss2 students of public secondary school in Ado-Odo Ota and Ifo local Government area of Ogun state. 19 secondary schools in the two L.G.A. 120 students were selected using stratified random sampling technique to select the sample size. Anxiety in mathematics rating scale and study habit inventory were used to collect the data. Data were analyzed using Analysis of Covariance (ANCOVA). To tested the two hypotheses. The result showed that it has been able to provide meaningful insight to the used of Cognitive Restructuring training as a strategy for reducing anxiety in mathematics among secondary school students. It also discovered that Anxiety in mathematics is gender sensitive. Another study conducted by Adeyemi O. Adetola and Oladunmoye E.O (2017). Cognitive Restructuring therapy on reduction of mathematic anxiety among senior secondary school students in two local Government area of oyo state, Nigeria. The population of the study consisted poor performance in mathematic in two local Government area of Oyo state, purposive sampling was used to selected one urban public secondary school from each of the local Government area. A simple random sampling was used to select forty students from the two selected secondary schools after established the fact that they had consisted record of low score in the mathematic. Mathematic Anxiety scale was used to assess students mathematic Anxiety level. The data collected were analysed using Analysis of Covariance (ANCOVA). The finding showed that Cognitive Restructuring therapy was effective in reduction of mathematic Anxiety.

Another study conducted by Grace NnennaEzechi and BibianAdekwuChinyere (2018) on the influence of gender and school location on senior secondary school students Achievement in

biology Inagbani education zone of Enugu state, Nigeria. 326 students were sampled 164 male and 164 female from four co-education schools and four intact ss3 classes both from rural and urban schools, multistage sampled technique was used. Ex-post facto design was used. Biology achievement test was used to collect the data, mean and simple percentage were used to answer the research questions. The research hypotheses were tested using Z-test at 0.05 level of significant. The finding revealed that there was a significant difference in the mean achievement score between male and female. Which showed that male students achieved higher than their female counterparts in biology achievement, also the finding showed that there was significant difference in the achievement mean score of students in rural and urban located areas? The urban students achieved higher than rural students. Okoria U. Eugene and Ezech D.N. (2016). Influence of gender and location on students achievement in chemical bonding. The population consisted of 5966 senior secondary class one students studying chemistry in Nsuka Enugu zone during 2012/2013 academic session. Purposive sampling technique was used to select 311 ss one students from nine senior secondary school in Nsuka education zone of Enugu state Nigeria, five schools located in the urban center formed urban group while the rural group consisted of four schools located in rural area of the zone. Two instrument were used to collect the data namely students interest scale in chemical bonding and chemical bonding achievement test. Quasi-experimental pretest, posttest, control group was used. Mean and standard deviation were used to answer research questions. The hypotheses were tested using Analysis of Covariance (ANCOVA). At 0.05 level of significant. The result showed that gender has no significant effect on students achievement in chemical bonding and location has significant effect on students achievement in chemical bonding. This implies that rural students achieved more than their urban counterparts.

Study conducted by Olowatosiri Victor Ajayi and Josiah Ogbeba (2017). On effect of gender on senior secondary chemistry achievement in stoichemistry using hands-on activities. the population consisted of 8381 ss two students from zone c Benue state. Purposive sampling technique were used to select 292 students from eight senior secondary schools quasi-experimental design was used. Stoichemistry achievement test was used to collect the data. Research question was answer using mean and standard deviation and Analysis of Covariance (ANCOVA) were used to tested the hypotheses at 0,05 level of significant. The finding revealed that there is no significant difference in the mean achievement score between male and female taught stoichemistry using hands-on activities, and the study recommended that science hands-on activities is not gender sensitive.

2.5 Summary and Uniqueness of the Study

Major concepts related to the variables of the study were reviewed in this chapter some of the concepts are academic achievement, academic achievement in relation to science subjects, gender and academic achievement and many other concepts. Also concept of Cognitive Restructuring and its process were reviewed.

The reviewed also considered some of the empirical studies above which investigate the effect of Cognitive Restructuring on students achievement in science subjects and effect on gender, location on low achieving science secondary school students. Among others are Olabusayo (2014). Investigate the effect of Cognitive Restructuring on the reduction of mathematic Anxiety among senior secondary school students in Ogun state, Nigeria. The study found that Cognitive Restructuring has able to provide meaningful insight as a strategy for reducing Anxiety in mathematic among secondary school students. Akiejioze and Nwodinobi (2015) investigate the effect of counseling Cognitive Behavior therapy strategy in geometry

among low achieving secondary school students in Ibadan. The study revealed that Cognitive Behavior counseling strategy improved student's achievement in geometry and is not gender sensitive. The studies also consider the work of Adeyimi and Oladunmaye (2017). Investigate Cognitive Restructuring therapy on reducing of mathematic Anxiety among senior secondary school students in two local Government areas of Oyo State, the finding showed that Cognitive Restructuring therapy is effective in the reduction of mathematic Anxiety among senior secondary school students.

Gender and location are variables under this study , the study reviewed some of empirical related to these variables, it consider the work of Okeria and Ezeh (2016). To investigate the influence of gender and location on students achievement in chemical bonding. The finding showed that gender has no significant effect on students achievement in chemical bonding and also showed that location has significant effect on student achievement in chemical bonding, this implies that rural students more than urban students in chemical bonding. Grace and Bibian (2018). Examined the influence of gender and school location on senior secondary school student's achievement in biology Inagboni education zone of Enugu state, Nigeria. The finding showed revealed that there was significant difference in the means score between male and female. Male students achieved higher than the female in biology achievement test, also revealed that there was significant difference in the achievement between rural and urban areas, the urban students achieved higher than rural students. Olowatosini and Josiah (2017). Investigated the effect of gender on senior secondary chemistry students achievement in stoichemistry using hands on activities. The finding showed that there is no significant difference in the means achievement score between male and female students taught stoichemistry using hands on activities.

This study is unique in term location, most of the reviewed empirical were focus in Oyo, Enugu, Ibadan and Ogun, but this study covered Dala education zone in kano which consist Gwale and Dala local government. The study is unique in term of variables under investigation the study covered low achieving in biology, mathematic, physic and chemistry, the reviewed empirical focus on either a subject or concepts from science subjects. The data collection instrument using in this study is teacher made test knows as science achievement test in pre test and post test. The study employed pre test post test quasi experimental with no control group the revealed empirical employed pre- test post- test control group. The study was guide by three hypotheses. T-test dependent sample and independent sample were used to test the hypotheses.

In view of the above the study is attempt to bridge the gap in providing empirical data which explained the effect of Cognitive Restructuring counseling technique on low achieving science based secondary school students in Dala education zone Kano state, Nigeria.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

The chapter presents research design, population, sample, sample technique, instrumentation, treatment procedure and the data analysis procedure

3.2 Research Design

The study adopted quasi-experimental research design pre test, post test form. Quasi experimental design is a design that does not provide full control of subject and does not include random assignment of subjects. .As design involves periodic measurement on one group before and after treatment. (Aknezuilo 2013). Widely used in the behavioral research primarily for the purpose of measuring change from experimental treatment or comparing groups.

3.3 Population and Sample

3.3.1 Population of the Study

Population of this study comprises all low-achieving science based secondary school students of senior class one (S.S one) of three secondary schools in Dala education zone, teacher made test (TMT) were used to identified students with low achieving performance in biology, chemistry, physic and mathematic. One hundred and seventeen (117). Students were the population of this study drawn from three secondary schools.

Table 3.3.1 showing the population

s/n	School	Local govt	Gender	No of students	Low-achieving
1	AKCCC	Gwale	Female	79	31
2	AKCCC	Gwale	Male	78	29
3	GSS Dala	Dala	Male	76	25
4	GGSS Dala	Dala	Female	80	32

3.3.2 Sample Size

Three sample schools were selected from population. Aminu Kano Community Commercial College (A.K.C.C) will selected as sample school because it co- educational school, GSS Dala and G.G.S.S. Dala, Sixty(60) students from three sampled schools, thirty from Aminu Kano Community Commerce College as fifteen male and fifteen female and fifteen from Government Secondary School Dala and fifteen from G.G.S.S Dala. Below is the table of sample size

S/N	SCHOOL	GENDER	LOW ACHIEVING STUDENTS	SAMPLE SIZE
1	A..K.C.C.C	MALE	31	15
	A.K.C.C.C	FEMALE	29	15
2	G.S.S DALA	MALE	25	15
3	G.G.S.S DALA (G.G.C DALA)	FEMALE	32	15
		Total	117	60

Table of sample size

3.3.3 Sampling Technique

Purposive sampling technique was used in drawing up sample size sixty(60) low achieving students from the population were the sample size. After sat for teacher made test. Those failed to obtained average of 40% in four science subjects or score less than 40 marks in mathematic, biology chemistry and physic. purposive sampling technique as technique which involves the researcher deciding to choose or use certain objects or person as research participant, due to his experience in relation the research nature (Richird 2013).

3.4 Data Collection Instrument

To collect data for this study in the selected schools researcher developed, science achievement test (SAT) was used to identify the students with low- achieving in science subjects in pre-test.in four science subjects as biology, chemistry, physic and mathematics. Another researcher developed science achievement test was used in posttests with equivalent in difficulty level, the test comprise of two sections, section A 20 items (objectives) to answer all and section B 5 items (essay) to answer only three for each subjects one hour is allocated for the test. The instrument was vetted, validated by head of subject in Kano educational resource department.

3.4.1 Scoring Procedure

Marking scheme was designed, after collected the answer sheets. The researcher exchanges the answer scripts for marking between the sciences teachers of selected three schools. Two marks were allocated for each objective $2*20= 40$, and twenty marks were allocated for essay $3*20=60$ marks. The score was transform in to z score for standardization and selected the student with low- achieving In pretest

3.5 Validation of Data Collection Instrument.

3.5.1 Validity of Instrument

The science achievement test was validated through face validity by the head of science subjects to make sure that the domain of measurement interest was well defined and covered the syllabus in the specific period. The items were able to cover every aspect of the variable under investigation and the number of items was enough to cover the scope or characteristic of domain, the items were goodness in structure.

3.5.2 Reliability of Instrument

The reliability of the instrument was established through a pilot study conducted in some schools different from the sampled schools. In the pilot study test and re-test was used its way of determining external reliability and stability of measurement scale interval of two weeks to establish the reliability using Pearson Moment Correlation Coefficient (PPMCC), to compute the degree of association between the two sets of scores, the reliability index was established at $r = 0.76$ co-efficient using 40 sample from pilot test school.

3.6 Procedure for Data Collection

A letter of introduction was collected from the department of education Bayero University Kano to Kano State Senior Secondary School Management Board to seek permission to conduct research in the sampled schools. Upon permission granted the researcher went to Dala education zone directorate for further permission to enter the sampled schools, upon permission granted the researcher went the sample schools with introduction letter and principal informed consent form. The researcher requests the assistance of school counsellors for controlling and organizing the students for conducting pre- test intervention and post- test. Science teachers of the sampled schools were informed and ask to draft the items with two section, section A (objectives) consists

of twenty (20) items while section B (essay) five (5) items. The draft items was taken to H.O.S of each biology, chemistry, physics, mathematics of Kano Education Resource Department (K.E.R.D) for vetting, correction, and validation and design standard item.

The procedure that was used for intervention was divided in to pre-test, treatment and post-test phase.

3.6.1. Pre-Test Phase.

In the fifth week of the term the researcher request the science teachers to design and administer a test, after marking the test the result was collected and selected students with below 40% as subjects of treatment , 303 students was exposed to pre- test and 112 students was identified as low achieving science based students and 60 students was exposed to treatment from three schools sat for pre-test in G.S.S Dala, while 70 students (male) were sat for pre-test in A.K.C.C.C. and 80 students (female) also in A.K.C.C.C sat for pre-test and 60 from G.G.S.S Dala(G.G.C) sat for pre-test.

3.6.2. Treatment Phase.

This involves use of counselling intervention using researcher developed counselling treatment package focusing on Cognitive Restructuring counselling techniques on the treatment subjects. The treatment lasted for 15-20 minutes in each session and it was conducted twice in a week and for the period of five weeks. The subjects were expected to attended ten counselling session.

3.6.3. Post Test Phase.

After treatment the respondents were sat for test in science subjects, the results were collected analyze and compared for differences. The extent of differences in the performance means score determined the significant effect of the treatment.

3.7 Data Analyses Procedure

The statistical tools used in this study are t-test dependent and independent sample to test three null hypothesis and standard deviation.

T-test dependent sample was used to test the null hypothesis number one while null hypotheses two and three t- test independent sample was used. Means and .Standard deviation was used to answer three research questions in this study, because the standard deviation would indicate the extent to which values are dispersed from the distribution means. The higher the mean the more dispersed the distribution.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.1 Introduction

The chapter presents, the analysis of data collected from the study, research questions were answered using descriptive statistics/mean and standard deviation. The t-test dependent sample was used for hypothesis one, while t-test independent sample was used for hypotheses two and three. The basis for accepting or rejecting the hypothesis is at 0.05 level of significance. The chapter also presents summary of findings and discussions

4.2. 1 Summary of Data

Below is the summary of demographic data of the respondent.

Table 4.1: Demographic Data of respondent base of gender, school, and local govt.

School	Gender	LG	Frequency	Percentage
GSS Dala	Male	Dala	15	25%
GGSS Dala	Female	Dala	15	25%
AKCC	Male	Gwale	15	25%
AKCCC	Female	Gwale	15	25%

Table 4.1 shows that three schools were used for the experiments, G.S.S, Dala as male students 15 students were used which represents 25%, while GGSS Dala as female students 15 students were used, which represents 25%, and AKCCC as co-education school 30 students were used, as 15 male and 15 female which represents 50%. This shows that there is equal gender and local government representation for better judgment.

4.3 Data Analysis

4.3.1 Answers to Research Questions

The three (3) research questions raised in chapter one were answered below using mean and standard deviation.

Question One: What is the effect of Cognitive Restructuring counselling technique on low achieving science based secondary school students in Dala Education Zone, Kano State?. This research question was answered using descriptive statistics of means and standard deviation.

The result of the analysis is presented in Table 4.2

Table 4.2 means & standard deviation of low achieving science based students in the pretest and posttest.

Group	N	Mean	SD
Pretest	60	28.72	4.14
Post test	60	49.30	7.38

Table 4.2 shows pre-test and post-test mean score achievement of low-achieving science secondary students. The pre-test mean score was (28.72), and SD was 4.14 while the post-test mean score was 49.30. and SD was 7.58. This indicates that there is significant improvement in the post-test mean score. This therefore demonstrated that, cognitive restructuring counselling technique was effective in improving academic the achievement of low- achieving science secondary school students in Dala education zone Kano state.

Research Question Two: What is the difference in the posttest mean scores between male and female low-achieving science based secondary school students in Dala Education Zone?. This research question was answered using descriptive statistic of means and standard deviation.

Table 4.3 mean & standard deviation of low achieving science students posttest of male and female

Treatment	N	Mean	SD
Posttest male	30	48.20	6.54
Post test female	30	50.40	8.09

Table 4.3 shows the post-test mean score of male and female low-achieving science senior secondary school students of Dala Education Zone, Kano State exposed to cognitive restructuring counselling technique, the academic achievement mean score of male students was (48.20) and SD was 6.54 while that of female was (50.40) and SD 8.09. This means that the effect of cognitive restructuring counselling techniques was not significantly different between male and female under achieving science based secondary school students in Dala education zone Kano state, Nigeria.

Research Question Three: What is the difference in the posttest mean scores of low-achieving science based secondary students between Dala and Gwale local government students of Dala Education Zone?. This research question was answered using descriptive statistics of means and standard deviation.

Table 4.4. means & standard deviation of low achieving science based students post test in Dala and Gwale

Treatment	N	Mean	SD
Post test Dala	30	49.70	6.20
Post test Gwale	30	48.90	8.50

Table 4.4 shows that post-test academic achievement means score of Dala and Gwale local government low-achieving science based secondary school students exposed to cognitive restructuring counselling technique. The academic achievement mean score of low-achieving science students exposed to cognitive restructuring counselling technique of Dala Local Government is (49.70) and SD was 6.20 while that of Gwale Local Government mean score was (48.90) and SD was 8.50. This means that cognitive restructuring counseling techniques with the only mean difference of (0.8). Therefore, this shows that the cognitive restructuring counselling technique was not significantly different between Dala and Gwale local government low achieving science based secondary school students

4.3.2 Hypotheses Testing

Three null hypotheses were formulated and tested at $p= 0.05$ level of significance using inferential statistic of dependent and independent samples t-test to determine the effect on Cognitive Restructuring counselling technique on low-achieving science secondary school students of Dala Education Zone, Kano State.

Null Hypothesis One: There is no significant difference in the effect of Cognitive Restructuring counselling techniques on low-achieving science based secondary school students in Dala Education Zone, Kano State. This null hypothesis was tested using dependent samples t-test.

The result of the analysis is presented in Table 4.5

Table 4.5 Pre-test and post-test academic achievement mean score of low achieving science students

Group	No	Mean	SD	t-value	Df	p-value 2-tailed
Pretest	60	28.72	4.14	53.61	58	
Post test	60	49.30	7.38			0.000

p-value =0.000 < 0.05 level of significance

Table 4.5 above shows t-test analysis for pre-test and post test academic achievement mean scores of low-achieving science based secondary school students in Dala Education Zone, Kano State exposed to cognitive restructuring counselling techniques. It shows that t-value is (53.61) at 0.05 level of significance, 58 degree of freedom and p-value of (0.000). Therefore, the null hypothesis which states that there is no significant effect of cognitive restructuring counseling technique on low-achieving science senior secondary school students in Dala Education Zone, Kano State is rejected. Therefore, this reveals that there is significant effect of Cognitive Restructuring counselling technique on low achieving science based secondary school students in Dala education zone Kano state.

Hypothesis Two: There is no significant difference in the posttest mean scores between male and female low-achieving science based secondary school students in Dala Education Zone, Kano State.

Table 4.6: Post test Comparison between male and female

Treatment	Gender	N	Mean	SD	t-value	Df	p-value
Post test	Male	30	48.20	6.54	-1.15	58	.252
	Female	30	50.40	8.09			

P – Value= 0.252 > 0.05 level of significance= no significant difference

The table 4.6 above shows the post-test result of cognitive restructuring counselling technique between male and female low-achieving science based secondary school students in Dala Education Zone, Kano State. P-value 0.252 as tested at 0.05 level of significant of 58 degree of freedom. Therefore, the null hypothesis that states “there is no significant gender difference in the effect of cognitive restructuring counselling techniques on low-achieving science secondary students in Dala Education Zone, Kano State is retained meaning no significant differences was observed between male and female in the effect of cognitive restructuring counselling technique on low-achieving based science secondary school students, this implies cognitive restructuring counselling technique is not gender sensitive.

Hypothesis Three: There is no significant difference in the posttest mean scores between Dala and Gwale Local Government of low-achieving science based secondary school students in Dala Education Zone, Kano State

Table 4.7 post-test Comparison between Dala local government and Gwale local government

Local Government	N	Mean	Std	t-value	Df	P value
Post test Dala L.G	30	49.70	6.19	0.417	58	0.678
Post test Gwale L.G	30	48.90	8.49			

p- Value 0,678 > 0.05 level of significant = no significant difference

The table 4.7 above shows the post test result of Cognitive Restructuring counselling technique on academic achievement between Dala Local Government and Gwale Local Government low-achieving science based secondary school students’ value 0.678 as tested at 0.05 level of significant and 58 degree of freedom. Therefore the null hypotheses which states that “there is no significant difference in the effect of cognitive restructuring techniques on academic achievement between Dala Local Government and Gwale Local Government low-achieving

science based secondary school students is retained Meaning that no significant difference was observed between Dala and Gwale low-achieving science secondary school students

4.4 Summary of Findings

Below were the summary of the findings:

1. A significant effect of cognitive restructuring counselling technique was found on the academic achievement of low-achieving of science based secondary school students in Dala Education Zone, Kano State. .Because post-test mean score is greater than pre-test mean score.
2. That no significant difference was found in the posttest mean scores between male and female low achieving science based secondary school students in Dala education zone Kano state.
3. That no significant difference was found in the posttest mean scores between Dala and Gwale local government low achieving science secondary school students in Dala education zone kano state.

4.5 Discussions

The result discovered that the cognitive restructuring counselling technique is effective on academic achievement of low-achieving science based secondary schools in Dala Education Zone, Kano State. The mean score of pre test was 28.72 and standard deviation 4.14. the mean score of post test was 49.30 and standard deviation 7.38. the t-test analysis also shows a significant difference .The result in line with finding of Mary and Vera (2015) which indicate that there is significant main effect of counselling (CBT) strategy on student achievement geometry, and also line with the finding of Edarho (2019) who contended that cognitive

restructuring was very effective in enhancing students achievement in science, and also supported by the finding of Wess and Peloto (2007) which reviewed that counselling technique (CBT) strategy as effective in improving the low-achieving science students. The result reviewed that counselling is very much necessary for students in both academic and persona-socio which in term enhance the academic achievement of the students.

Another findings of the study shows that the Cognitive Restructuring counselling technique has no difference in the effective on academic achievement between male and female low-achieving science secondary school students. The mean score of post test result was 48.20 and standard deviation 6.54 of male, mean score of post test result was 50.40 and standard deviation 8.09 of female. The t-test analysis also show that no significant difference between male and female, this also in line with Sink (2005). Who of the opinion that cognitive restructuring is a process of changing ones thought, ego, and feeling via self-talk verbalization leading to achievable goals irrespective of sex. Means that is not gender sensitive. The result is supported by psychology of use which asserted that individual have the capacity to interpret, influence and created action, which we are born with is not much important as what we chose to do with abilities and limitation we possesses it also in line of the finding of Asikhia (2010), Nwokgi (2012) which reviewed that gender is not much important on academic achievement than other factors such include teachers-students relationship, poor achievement motivation, lack of basic cognitive skills. Also the finding is in line of Akinsola and Tella (2007), they reviewed that science is not gender dominated subjects as people assumed it to be, but for both sexes provided that both sexes are subjected to the same learning condition and receiving the same counselling techniques, and also the finding in line with the finding of Abiam and Odok (2006) which found that there is no significant relationship between gender and achievement in number

and numeration, statistics, algebra, but a weak relationship between gender and achievement in geometry and trigonometry. The findings of Amelink (2009) note that male students performed better in geometry and measurement than female students. Therefore this indicates that the effect of gender on students' achievement is still point of debate among researchers.

The last finding shows that Cognitive Restructuring counselling technique had no differential effect on academic achievement between Dala and Gwale Local Government low-achieving science based secondary school students, since the p-value $0.678 < 0.05$ level of significant, this is to retained the null hypothesis, which is in line with finding of Olatunji Gabriel, and Festus (2012). The study revealed that there is no significant difference in the academic achievement between Akure South and Ifedore Local Government Senior Secondary Schools in Ondo State. The study disagreed with the work of Philius and Wanjobi (2011) who reiterated that the location and type of school has effect on academic achievement. The effect of location on academic achievement is still point of debate among the scholars.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS.

5.1 Introduction

This chapter presents an overview of the entire study by presenting the summary of the entire research work, conclusion drawn from the study, recommendation based on the findings and suggestion for further studies.

5.2 Summary

The study investigated the effect of Cognitive Restructuring counselling technique on low-achieving science secondary school students' of Dala Education Zone. The entire research work was made into five chapters with headings and subheadings under each chapter. Chapter one of the research is an introductory part of the study. The background of the study in chapter was articulated and the problem under investigation has been stated and explained, the nature of the problems and how the problem affect dependent variables, and the needs for the intervention of independent variables, the gap in the previous studies was also explained. The researcher stated three objectives, and research questions which were corresponding with objectives. Three research null hypotheses were formulated in line with objectives and research questions, the hypotheses were tested at 0.05 level of significance, the core beneficiaries of the study were explain, which include students, teachers, school counsellors, parents and policymakers, the chapter finally presents the scope and delimitation of the study.

While the relevant literature reviewed, includes the concepts of academic achievement factors affecting academic achievement, the low achievement case of students in science subjects, the correlate of science academic achievement, socio-economic status and gender, theoretical framework of the study was also discussed. The research cover the Cognitive

Restructuring counselling technique, the basic concept of Cognitive Restructuring counselling techniques and counselling process of Cognitive Restructuring was explained. Empirical studies relevant to dependent or independent variable to the study were also reviewed, and summary and uniqueness of the studies.

However, methodology described the design used which was a quasi-experimental design in form of pre-test, posttest design. It also consists of the population, sample, sampling techniques, data collection instrument, data collection procedure and data analysis procedure. The population covered all SS one low-achieving science secondary school students in Dala Education Zone, three schools were selected as sampled and 60 students were selected from the population, thirty from 2 schools of Dala Local Government as G.S.S Dala and GGSS Dala. While thirty from AKCCC of Gwale Local Government. Also in chapter four focuses on data presentation and analysis, to analyses the data obtained from the study which involves data presentation, answer to research questions, hypotheses testing, summary of finding and discussion on the finding.

5.3 Conclusions

In view of statistical analysis and the result of findings from the study, the following conclusions were drawn.

Cognitive restructuring counselling technique was effective in enhancing the academic achievement of low-achieving science secondary school students, the conclusion was actualized based on the available evidences from the finding of the study, which supported from the post-test result where significant difference was observed between the mean score, in which p-value 0.000 at 0.05 level of significant whereby the null hypotheses was rejected and retained alternative hypotheses.

It was also concluded that the treatment using cognitive restructuring counseling technique has no difference in the effect on academic achievement between male and female low-achieving science secondary school students. This shows that the cognitive restructuring counselling techniques is not gender sensitive based on the available evidence from the finding in which no significant difference was observed whereby p-value 0.252 at 0.05 level of significant, whereby the null hypotheses was returned. Finally it was concluded that the treatment using cognitive restructuring counselling technique has no difference in its effect between Gwale and Dala local government low-achieving science based secondary schools students, this show that the technique is not sensitive on location, the evidence was observed that p-value 0.678 at 0.05 level of significant, this shows that the null hypotheses was retained.

5.4 Recommendations

5.4.1 Recommendations from the Study

The following are the recommendations of the study:

1. Since the finding of the work discovered the effectiveness of cognitive restructuring counselling technique on academic achievement of low-achieving science secondary school students. The school counselor should use the techniques effective in helping secondary school students on academic achievement. Also the parent and science teachers should use the techniques in helping their children/students on their academic achievement in science subjects.
2. Since the finding revealed that there is no significant difference in the effect of cognitive restructuring counselling technique between male and female low-achieving science secondary school. The study recommend that school counsellor should use the techniques to

all students in respect of their gender, and also the study recommend that parent should provide all necessary learning material to their children in respect of their gender.

3. Also since there is no significance difference in the effect of cognitive restructuring counselling techniques between Dala and Gwale Local Government low-achieving science secondary school students the study recommends that, government should always provide learning facilities in all schools in respect of gender and location to give equal opportunities to all learners.

5.4.2 Recommendation for Further Studies

In light of the finding and conclusion, and due to the limitation and scope of this research work, the recommendations for further studies are as follows:

1. A similar study should be replicated to cover private schools, since the scope of this study was public and community schools.
2. A similar study should be replicated to schools in Science and Technical Schools Board of Kano State.
3. A similar study should also replicate in others 14 education zones in Kano state using the same procedure and techniques.
4. It recommended that a similar study should be carried out using the same counselling techniques on academic performance of low-achieving, commerce, humanity subjects and entrepreneurship subjects in secondary school students.
5. A similar study should be conducted on other secondary school students not covered in this study using the same counselling techniques and procedure.

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- (a) Irritability (b) Sensitivity (c) Excretion (d) Growth
- All these organisms pass backbone except;
 - (a) Annelida (b) Amphibians (c) Reptiles (d) Aves
- Plants kingdom include all these except;
 - (a) Bryophyta (b) Echinodermata (c) Thallophyta (d) Pteridophyta
- Organism that are capable of living freely on their own are called _____
 - (a) Independence organism (b) Colony organisms (d) Filaments (d) Volvox
- Which of these organelles is responsible for protein synthesis?
 - (a) Vacuole (b) Ribosomes (c) Lysosomes (d) Chromosomes
- In plants, respiration occurs in _____
 - (a) Mesophyll cells only (b) The root only (c) Stomata and tentacles only
 - (d) All living cells
- Sense organs include all of these except;
 - (a) Skin (b) Tongue (c) Eyes (d) Leg
- The process by which molecules or ions move from a region of high to low concentration is called.
 - (a) Osmosis (b) Diffusion (c) Plasmolysis (d) Hemolysis
- The flow of water molecules from a region of weak solution to a region of concentration solution is called _____
 - (a) Osmosis (b) Diffusion (c) Plasmolysis (d) hemolysis
- Which of the following stimuli's are not perceived through the skin of mammals?
 - (a) Heat (b) Pressure (c) Pain (d) Light
- The study of living things is called _____
 - (a) Biology (b) Movement (c) Death (d) Ecology

SECTION B: ESSAY

- (a) What is biology?
- (b) List five (5) usefulness of biology to man.
- (c) Write the characteristics of living things and explain any one.
- (a) Define the following
 - Tissue

- Organs
- System

(b) State five (5) differences between plants and animals.

(c) State the differences between vertebrates and invertebrates.

- (a) What is cell?
- (b) List the forms in which the cell exists
- (c) State the function of the following organelles:
 - (i) Ribosome
 - (ii) Chromosomes
 - (iii) Nucleus
 - (iv) Cell wall
- (a) Differentiate between Osmosis and Diffusion.
- (b) What is hypotonic solution?
- (c) Define plasmolysis
- (a) Differentiate between plants and animal cells.
- (b) Draw and label the animal cell.

MARKING SCHEME (BIOLOGY)

SECTION A

- C
- B
- B
- C
- D
- B
- A
- B
- B
- C
- A

- B
- BONUS
- B
- C
- D
- B
- A
- D
- A

Each attracts 2 marks = 40 marks

SECTION B

- (a) What is biology?

Biology is the study of living things or the study of life. *(5 marks)*

- (b) (i) In medicine

- (ii) Used in manufacturing industries

- (iii) Used in construction

- (iv) Used in agriculture

- (v) Used in transportation. *(7½ marks)*

- (c) (i) Nutrition (ii) Respiration (iii) Excretion

- (I) Nutrition: This is also called feeding. A living organism need for energy and building the body. *(7½ marks)*

- (i) Tissue: Some organisms are at tissue level at organization e.g. Hydra. A tissue is a group of cell performing the same function e.g. blood, epidemic, phloem, xylem e.t.c.
- (ii) Organs: is A group of tissues performing specific function e.g. hearts, kidney, stomach, eyes e.tc.
- (iii) System: This is a group of organs performing complementary function e.g. digestive, respiratory, excretory, circulatory and reproductive systems.

(6marks)

(b)

Plants	Animals
<ul style="list-style-type: none">• Plants do not have organs at movement.• Plants have slow response to external stimuli.• Gaseous exchange is through the entire body.• Plant cells have large vacuoles containing cell sap.• They possess no special excretory systems.	<ul style="list-style-type: none">• Animals have organs of movement.• Animals have fast response to external stimuli.• Gaseous exchange is through special organs.• Animal cells do not contain large vacuoles.• Animals possess well-developed excretory system.

(10 marks)

(c)

Vertebrates	Invertebrates
<ul style="list-style-type: none">• They are animals with backbone.• They possess scale as in fish.• Their body structure is not cylindrical.• They are divided into five classes.	<ul style="list-style-type: none">• Animals without backbone.• Absence of scale• Their body structure is cylindrical as in earthworm.• They are divided into six phylum.

(4 marks)

- (a) Cell is defined as the structural and functional unit of a living organism in other words. The cell is the simplest, the smallest and basic unit of life. (5 marks)

(b) i. As independent a single and free-living organisms

ii. As a colony

iii. As a filament

iv. Cell as part of a living organism.

(7½ marks)

(c) Function of the following parts:

i. Ribosome: They are responsible for protein synthesis.

- ii. Chromosomes: It contains the DNA which store genetic traits.
- iii. Nucleus: It controls most life activities at the cell.
- iv. Cell wall: It provides protection, shape and mechanical support for the cell.

• (a)

Osmosis	Diffusion
<ul style="list-style-type: none"> • Osmosis occurs in liquid medium only. • Differentially permeable membrane is required. • It occurs naturally in living organism. 	<ul style="list-style-type: none"> Diffusion occurs in gases and liquids. Differentially permeable membrane is not required. It occurs in living and non-living organisms.

(10 marks)

(b) Hypertonic solution: When the cell is surrounded by a stronger solution, water will be lost by the cell. The shrinking of the cell is as a result of the surrounding solution being hypertonic. (5 marks).

(c) Plasmolysis: is defined as the outward movement or flow of water from living cells when they are placed in a hypertonic solution.

(5 marks)

• (a)

Plant Cell	Animal Cell
<ul style="list-style-type: none"> • Cellulose, cell wall are present • Definite shape • Chlorophyll is present • Large vacuoles present • Larger than animal cell 	<ul style="list-style-type: none"> • Cellulose, cell wall is absent • No definable shape • Chlorophyll is absent • small vacuole present • Smaller than plant cell.

(10 marks)

(b) A large and well label diagram of animal cell of about 8 – 10 cm.

(10 marks)

(IDENTIFICATION AND PRETEST)

SCIENCE ACHIEVEMENT TEST

(CHEMISTRY)

SECTION A: OBJECTIVE (40 marks)

Instruction: Answer all questions (each question carries 2 marks)

- The focus of chemistry is probably on the chemical reaction.
True or False
- The study of chemistry helps us acquire knowledge about matter.
True or False
- Burning of substance, for example wood is a _____ change.
(a) Chemical change (b) Physical change (c) None of the above
- Salt + water salt solution is an example of _____ change.
(a) Physical change (b) Chemical change (c) None of the above
- $\text{Zn(s)} + 2\text{HCl(aq)} \rightarrow \text{ZnCl}_2\text{(s)} + \text{H}_2\text{(g)}$ is an example of _____ change.
(a) Chemical change (b) Physical change (c) None of the above
- We have _____ types of changes.
(a) 2 (b) 3 (c) 4
- Matter is anything that has mass and occupies space.
True or False
- Matter exists in three physical states.
True or False
- All basic raw materials are mined from earth crust except _____
(a) Air (b) Petroleum (c) Metallic ores
- We have _____ division of chemical industries.
(a) 12 (b) 13 (c) 14
- We have _____ types of separation techniques.
(a) 12 (b) 13 (c) 14
- The symbols of an element represent an atom of the element.
True or False
- The chemical symbol for vanadium is written as _____
(a) V (b) Vn (c) Vd

- The chemical symbol of silicon is written as _____
(a) Si (b) S (c) Sc
- The chemical symbol for antimony (Stibium) is written as _____
(a) Sb (b) An (c) At
- The formulae for a compound copper (ii) oxide, is written as _____
(a) CuO (b) Cu₂O₂ (c) CuO₂
- An organic compound on analysis yielded 2.0kg carbon, 0.34kg hydrogen and 2.73g oxygen. Calculate the empirical formula.
(a) CH₂O (b) C₂H₄O₂ (c) C₂H₆O₂
- The natural raw materials is also called _____ raw material.
(a) basic (b) simple (c) complex
- The law of conservation of matter states that during ordinary chemical reaction, matter can neither be created nor destroyed.
True or False
- The chemical symbols for tin (stannum) is written as _____
(a) Sn (b) Tn (c) Tp

SECTION B: ESSAY (20 marks)

- What is chemistry?
- What are chemical industries?
- What is a raw material?
- List five (5) types of separation techniques.
- Differentiate between chemical and physical change.
-

MARKING SCHEME (CHEMISTRY)

SECTION A

- True
- True
- Chemical change
- Physical change

- Chemical change
- 2
- True
- True
- Air
- 12
- 12
- True
- V
- Si
- Sb
- CuO
- CH₂O
- Basic
- True
- Sn

SECTION B

- **What is chemistry?**

Chemistry is defined as the science that is concerned with the composition and the structure of matter, and with the forces that hold the structures together.

(20 marks)

- **What are chemical industries?**

Chemical industries are industries that uses chemistry to make chemicals from other chemical substances (raw material).

(20 marks)

- **What is a raw material?**

Raw materials are the starting materials usually in an unrefined (less useful) state which need to go through an industrial process, in order to be upgraded to their more useful form.

(20 marks)

• **List five (5) types of separation techniques**

- Filtration (4 marks each)
- Distillation
- Crystallization
- Fractional distillation
- Precipitation

• **Differentiate between chemical and physical change**

Chemical Change	Physical Change
<ul style="list-style-type: none">• It is not easily reversible• New substances are formed.• It is permanent change.	<ul style="list-style-type: none">It is easily reversible.It produces no new substances.It is temporary change.

(3 marks each)

(IDENTIFICATION AND PRE-TEST)
SCIENCE ACHIEVEMENT TEST
(PHYSICS)

SECTION A: OBJECTIVE (40 marks)

Instruction: Answer all questions (each question carries 2 marks)

- Which of the following are fundamental units?
(a) kg (b) kg/m^3 (c) m^3 (d) N/m^2
- Which of the following instruments has a reading accuracy of 0.5mm?
(a) Vernier calipers (b) Micrometer screw gauge
(c) Meter rule (d) Spring balance
- One of the following is a scalar quantity.
(a) Mass (b) Time (c) Electric current (d) Volume
- A car travels at an average speed of 100km/h, what distance does it cover in 5 minutes?
(a) 18.3km (b) 83km (c) 83.3km (d) 833km
- _____ is defined as the velocity at any instant of time.
(a) Acceleration (b) Instantaneous velocity (c) Uniform acceleration
(d) All of the above
- A swinging pendulum has a motion which is _____.
(a) Translational (b) Oscillatory (c) Rotational (d) Random
- A car covers a distance of 60km in half an hour. What is the average speed of the car?
(a) 60km/h (b) 30km/h (c) 120km/h (d) 20km/h
- Which of the following is not a vector quantity?
(a) Speed (b) Velocity (c) Force (d) Acceleration
- Which of the following is not a scalar quantity?
(a) Density (b) Weight (c) Speed (d) Temperature
- The volume of a sphere is given by
(a) $\frac{4}{3}r^3$ (b) $4r^2$ (c) $4r^3/3$ (d) $4/3r^2$
- A car starting from rest is uniformly accelerated, so that its velocity in 5s is 36km/h. Find its acceleration.
(a) 2m/s^2 (b) 3m/s^2 (c) 3.5m/s^2 (d) 25m/s^2

- What is the velocity of a car that covers a distance of 200m in a specified direction in 10 seconds?
 (a) 16m/s (b) 0.2m/s (c) 20m/s (d) 2.0m/s
- A car from a point A to point B which is 400m away with a velocity of 25m/s. How long has it taken?
 (a) 16s (b) 1.6s (c) 61s (d) 61.3s
- One of the following is not instruments used for measuring mass.
 (a) A lever balance (b) Chemical change
 (c) A direct reading balance (d) Micrometer screw gouge
- In the laboratory time is measured with a _____
 (a) Stopwatch (b) Pendulum (c) Clocks
 (d) All of the above
- A mass of 10kg is moving in a circular path of radius 2m with uniform speed of 50m/s. Find its centripetal acceleration.
 (a) 12500m/s^2 (b) 250m/s^2 (c) 1250m/s^2 (d) 25m/s^2
- A stone whirled at the end of the rope 30cm long makes 10 complete revolution in 2 seconds find its angular velocity in radian per second.
 (a) 30.1 rad/sec (b) 34.3 rad/sec (c) 33.1 rad/sec (d) 31.4 rad/sec
- One of the following is not a method for reducing friction.
 - use of lubricant oil, grease, air, graphite
 - use of ball or roller bearings
 - the streamlining of body shapes of moving object
 - none of the above
- Which of the following correctly gives the relationship between linear speed and angular speed ω of a body moving uniformly in a circle of radius r ?
 (a) $v = \omega r$ (b) $v = \omega^2 r$ (c) $v = \omega r^2$ (d) $v^2 = \omega r$
- The cause of every motion _____
 (a) Force (b) Pressure (c) Work (d) Energy

SECTION B: ESSAY (60 marks)

Instruction: Answer three questions. Each question carries 20 marks.

- (a) Define the following terms:
 - Speed
 - Velocity
 - Acceleration
- (b) What is the velocity of a car that covers a distance of 250m in a specified direction in 15 seconds?
- (a) List two types of friction.
- (b) List two advantages and two disadvantages of friction.
- (c) A block of wood weighing 10N is placed in a horizontal table. It is then pulled by means of a spring balance attached to one end. The block just begins to move when the spring balance records a horizontal force of 2.5N.
- (a) Differentiate between scalar and vector quantities with examples.
- (b) Give the three (3) types of motion.
- (c) A mass of 15kg is moving in a circular path of radius 2m with uniform speed of 50m/s. Find the centripetal acceleration and the corresponding centripetal force.
- (a) Define position.
- (b) Differentiate between distance and displacement.
- (a) Briefly explain the term distance and displacement.
- (b) List four (4) examples of a derived quantity.
- (c) If the speed of a car is 30km/h. find the distance covered in 30 seconds.

SECTION A

- A
- B
- B.
- .C
- A
- B
- B

- A
- B
- .A
- A
- C
- A
- D
- A
- .C
- .B
- D
- A
- A

Each attracts 2 marks = 40marks

SECTION B

- (a) i. Speed: is change of a distance with time

S = 5marks

- ii. Velocity: Velocity is the rate of change of displacement with time.

i.e. V = 5marks

- iii. Acceleration: is the change of velocity with time.

i.e. Acceleration = 5marks

- (b) V = =16.7m/s 5marks

- (a) i. Static or limiting friction 2marks

- ii. Dynamic friction 2marks

- (b) 2 advantages of friction

1- Friction helps us in working and walking with our feet or shoes 2marks.

2- Friction helps in automobile brake i.e. between the tyres and the road.2marks

2 disadvantages of friction

i. Friction causes much loss of energy in machine.2marks

ii. it reduces efficiency of machines.2marks

Spring balance

Pulled

(c) Frictional HN C – 2.5 N

Horizontal table 8marks

- Differentiate between scalar and vector quantities.

Scalar Quantities	Vector Quantities
Scalar quantities are quantities that has no magnitude and direction. Example of scalar quantities: weight, mass, density, temperature.	Vector quantities are quantities that have both magnitude and direction. Example are: speed, velocity, acceleration. Momentum

Each point attract 2 ½ and good table 1marks

(b) Three types of motion:

- Random motion 3marks
 - Oscillatory motion 3marks
 - Rotational motion 3marks
- (a) Position: is a frame of reference or point of reference which we call the origin. 5marks
 - (b) Differences between distance and displacement.
 - Distance: is define as the moving of an object from point (A) to another point (B).is the length between two point 7 ½ marks
 - Displacement: is the distance travelled in a specified direction. 7 ½
 - (a) Derive quantity: are those quantities that are obtained by simple combination of fundamental quantities and units.
 - (b) Example of derived quantities: area, volume (m³), density kgm⁻³, velocity (m/s), acceleration (ms⁻²), frequency (hz), force (N).Each 2 ½

(c) S =

$$d = 30 \times 30$$

$$d = 900 \text{ 5marks}$$

$$S =$$

$$D = \quad =$$

$$D = 8.33M$$

Speed =

$$\begin{aligned} D &= \text{speed} \times \text{time} \\ &= 8.33 \times 0.5 \\ &= 125.1 \text{m/s} \end{aligned}$$

(IDENTIFICATION AND PRE-TEST)

SCIENCE ACHIEVEMENT TEST

(MATHEMATIC)

SECTION A: OBJECTIVE (40 marks)

Instruction: Answer all questions. Each question carries 2 marks)

- Convert 25 to base six.
(a) 41_6 (b) 14_6 (c) 44_6
- Convert 11.1_2 to base ten
(a) 3.5_{10} (b) 0.35_{10} (c) 35_{10}
- Express the product of 0.06 and 0.09 in standard form.
(a) 5.4×10 (b) 5.4×10^{-3} (c) 5.4×10^2
- Any number raised to the power of zero is:
(a) 0 (b) 1 (c) 2
- If $3x = 27$ then x equal to
(a) $3x$ (b) 2 (c) 3
- Evaluate $3524/0.05$ correct to 3 significance figures.
(a) 700 (b) 0.480 (c) 705
- Express 80000 in standard form:
(a) 8×10^4 (b) 8×10^2 (c) 8×10^2
- Express 3.16×10^2 in ordinary form.
(a) 3160 (b) 31600 (c) 316
- Find the characteristics of logarithm of 603.
(a) 1 (b) 2 (c) 3
- Let $A = \{a, b, c, d\}$ and $B = \{c, d, e, f, g\}$
(a) $\{a, b, c\}$ (b) $\{c, d\}$ (c) $\{e, f, g\}$
- Simplify $2 \times 3 \pmod{5}$
(a) 5 (b) 0 (c) 1
- Find the difference between 18 and 6 (mod 7)
(a) $12 \pmod{7}$ (b) $2 \pmod{7}$ (c) $22 \pmod{7}$
- Simplify

- (a) 3^{-2x} (b) 9^{-2x} (c) 0

- $a + b = c$ make a the subject of the equation.
(a) $a = b + c$ (b) $a = b - c$ (c) $a = c - b$
- $\log_4 \frac{1}{2}$ is equal to
(a) -1 (b) $-\frac{1}{2}$ (c) $\frac{1}{2}$
- $P = \{3, 9, 11, 13\}$ and $Q = \{3, 7, 9, 15\}$ are subset of the universal set Find PQ
(a) $\{3, 9\}$ (b) $\{5, 7, 15\}$ (c) $\{1, 11\}$
- Simplify 5^{-2}
(a) 25 (b) $\frac{1}{25}$ (c) $\frac{1}{10}$

Use the following numbers below to answer (18 – 20)

4, 4, 5, 6, 1

- Find mean
(a) 4 (b) 3 (c) 5
- Find mode
(a) 6 (b) 4 (c) 3
- Find the median
(a) 4 (b) 5 (c) 6

SECTION B: ESSAY (60 marks)

Instruction: Answer any 3 questions. Each question carries 20 marks.

- (a) Convert to base two
(b) Convert 124_{ten} to a number in base eight.
- (a)
(b) $2a^2 \times 4a^3$
- Use the Venn diagram to illustrate the information below:
 $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
 $P = \{2, 4, 5, 7\}$
 $Q = \{1, 2, 5, 6, 8\}$
 $R = \{1, 2, 4, 6, 9\}$

- $22n^7 2n^3$
- (a) Evaluate 34.83×5.427
- (b) Evaluate $4562 \div 98.76$

**MARKING SCHEME
(MATHEMATICS)**

SECTION A

- A
- A
- A
- B
- C
- C
- A
- C
- B
- B
- C
- A
- B
- B
- C
- A
- B
- A
- B
- A

2 marks each

SECTION B

- Convert to base two

= 1½ mark

1½ mark

1½ mark

$$1 \times 2^{-1} + 1 \times 2^{-2} + 1 \times 2^{-3} + 1 \times 2^{-5} + 1 \times 2^{-6} \quad 1\frac{1}{2} \text{ mark}$$

$$1 \times 2^{-1} + 1 \times 2^{-2} + 1 \times 2^{-3} + 0 \times 2^{-4} + 1 \times 2^{-5} + 1 \times 2^{-6} \quad 1\frac{1}{2} \text{ mark}$$

111011_{two} 1½ mark

1½ mark

(b)

8	124
8	15R4 2marks
8	1R7 2marks
	0R1 2marks

- (a)

Solution

2marks

2marks

2marks

2marks

2marks

2marks

2marks

2marks

2marks

- (a) Use the Venn diagram to illustrate the information below

$$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$$

$$P = \{2, 4, 5, 7\}$$

$$Q = \{1, 2, 5, 6, 8\}$$

$$R = \{1, 2, 4, 6, 9\}$$

$$\begin{array}{r}
 P \qquad Q \\
 7 \qquad 5 \quad 8 \\
 4 \quad 2 \\
 9 \quad 3 \\
 R \quad 10
 \end{array}$$

Solution

20marks

- $22n^7 2n^3$

Solution

10 marks

$11n^4$ 10 marks

- (a) Evaluate $34.83 \cdot 5.427$

Solution

No	Log
34.83	1.5420 2mrks
54.27	0.7346 2mrks
189.1	2.2766 2mrks

$= 34.83 \cdot 5.427$ 2marks

$= 189.1$ 2marks

(b) Evaluate $4567 \cdot 98.76$

No	Log
4567	3.6592 2mrks
98.76	1.9946 2mrks
46.19	1.6646 2mrks

$= 4562 \cdot 9876$ 2mrks

$= 46.19$ 2mrks

APPENDIX II
SCIENCE ACHIEVEMENT TEST (POSTTEST)
(BIOLOGY)

SECTION A: OBJECTIVE (40 marks)

Instruction: Answer all questions. Each question carries 2 marks

- Biology is the study of
(A) Matter and energy (b) Plants and animals (c) Composition of matter
- All the following are characteristics of living things except
(a) Competition (b) Decomposition (c) Respiration
- Which one of the following control most activities of the cell?
(a) Mitochondria (b) Nucleus (c) Cytoplasm
- All the following are unicellular organisms except
(a) Amoeba (b) Hydra (c) Paramecium
- Most of the energy in the cell is produced in the
(a) Nucleus (b) Mitochondria (c) Chloroplast
- Which of the following organisms does not exist as a single free living cell?
(a) Euglena (b) Volvox (c) Amoeba
- Animal cells possess the following except
(a) Vacuole (b) Cellulose cell wall (c) Nucleus
- At what level of organization is amoeba?
(a) Tissue (b) Cellular (c) Organ
- The process by which green plants manufacture their own food is called
(a) Distillation (b) Photosynthesis (c) Fractional distillation
- Which one of the following is raw material for photosynthesis?
(a) Oxygen (b) Carbon dioxide (c) Starch
- Chemical used to test for starch is
(a) Benedict solution (b) Iodine solution (c) Million's reagent
- Blue-black colour shows presence of
(a) Protein (b) Starch (c) Fat and oil

- Movement of molecular (gas) from the region of higher concentration to the region of lower concentration is called _____
 (a) Diffusion (b) Osmosis (c) Plasmolysis
- Movement of molecule (liquid) from the region of lower concentration to the region of higher concentration is called _____
 (a) Osmosis (b) Diffusion (c) Plasmolysis
- During test for starch in a leaf. Leaf was boiled in water first in order to
 (a) kill the cell of a leaf (b) decolourized the leaf (c) removed the colour
- Student's diagram is 10cm. Specimen's size is also 10cm. What is the magnification of the diagram?
 (a) x1 (b) x1cm (c) x0cm
- The one element which is responsible for chlorophyll formation in plants is
 (a) magnesium (b) sulphur (c) potassium
- Which one is a semi-permeable membrane.
 (a) Yam (b) Pig's bladder (c) All the above
- All the following are kingdom except
 (a) Animalia (b) Plantae (c) Thallophyta
- Chemical used to preserve fresh specimen in the school laboratory is
 (a) Alcohol (b) Formalin (c) All the above

SECTION B: ESSAY (60 marks)

Instruction: Answer only 3 questions. Each question carries 20 marks.

- (a) What is biology?
 (b) Mention five characteristics of living things/
 (c) Write five differences between living things and non-living things.
- Define the following:
 - Cell
 - Tissue
 - Organ
 - System
- In tabular form give five differences between plant cell and animal cell.

- (a) Define diffusion.
- (b) Write 2 differences between diffusion and osmosis.
- (c) Demonstrate osmosis.
- (a) What is skeletal system?
- (b) Mention five functions of skeleton.

MARKING SCHEME
BIOLOGY

SECTION A

- B
- B
- B
- B
- B
- B
- B
- B
- B
- B
- B
- B
- A
- A
- A
- A
- A
- C
- C
- C

Each attracts 2 marks

SECTION B

- (a) Biology is the study of living things. It has been divided into two branches botany and zoology. Botany is the study of plants whereby zoology is the study of animals.

2marks

- (b) 1. Movement 2. Respiration 3. Nutrition 4. Irritability 5. Growth

Each attracts 1½ mark

(c) DIFFERENCES BETWEEN LIVING THING AND NON-LIVING THINGS

LIVING THING	NON-LIVING THING
<ul style="list-style-type: none">• Has a cell• Response to stimuli• Can grow• Can reproduce• Can die	<ul style="list-style-type: none">• Has no cell• Cannot response to stimuli• Cannot grow• Cannot reproduce• Cannot die

Each attracts 1 mark

- (i) Cell: is the basic unit of life.
- (ii) Tissue: is the similar cells specialized to carry out particular function.
- (iii) Organ: is a body part composed of many types of tissue to be able to carry out a specialized function.
- (iv) System: is the composing of functionally related organ.

Good meaning attracts 5 marks

- DIFFERENCES BETWEEN PLANT CELL AND ANIMAL CELL

PLANT CELL	ANIMAL CELL
<ul style="list-style-type: none">• Chloroplast is present• Large vacuole• Stored carbohydrate in form of starch	<ul style="list-style-type: none">• Chloroplast is absent.• Small vacuole• Stored carbohydrate in form of glycogen.

Each attracts 2 marks

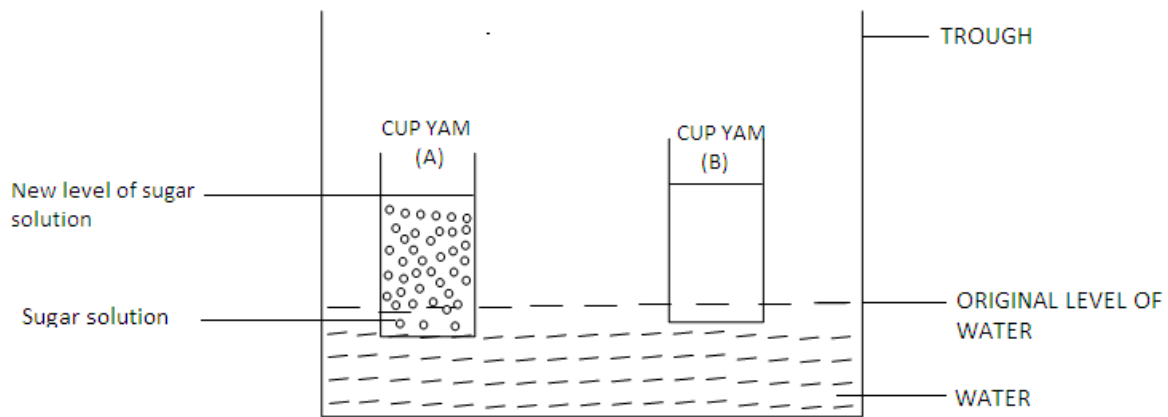
- (a) Diffusion is the movement of molecules (gas, liquid and solid) from the region of higher concentration to the region of lower concentration.

(b) DIFFERENCES BETWEEN OSMOSIS AND DIFFUSION

OSMOSIS	DIFFUSION
<ul style="list-style-type: none">• Permeable membrane is present.• It occur or it deals with liquid only.	<ul style="list-style-type: none">• Permeable membrane is absent• It deals with gas, liquid and solid.

Table 1 mark

(c)



DEMONSTRATION OF OSMOSIS USING LIVING TISSUE (YAM TUBER)

Good diagram 4 marks and leveling 6 marks

- (a) Skeletal system is the bony framework of the body. 5marks
- (b) i. It protects delicate organ e.g. brain, bone marrow.
- ii. It gives shape to the body.
- iii. It gives support to the body.
- iv. It give attaches to the muscle.

Each function attracts 3 marks.

SCIENCE ACHIEVEMENT TEST(POSTTEST)
(CHEMISTRY)

SECTION A: OBJECTIVE (20 marks)

Instruction: Answer all questions. Each question carries 2 marks.

- Carbon occurs as graphite and
(a) Coal (b) Diamond (c) None of the above (d) All of the above
- The study of vast number of stable carbon compounds with the exception of the very simplest one forms a branch of chemistry known as:
(a) Organic chemistry (b) Inorganic chemistry (c) Physical chemistry
(d) None of the above
- Diamond and graphite form _____
(a) crystalline carbon (b) none crystalline carbon (c) all of the above
(d) none of the above
- The existence of the same physical state of two or more structural forms of the same element is known as _____
(a) Isotopy (b) Allotropy (c) None of the above (d) All of the above
- There are _____ types of coal.
(a) 2 (b) 4 (c) 6 (d) 3
- An oxide is a compound that contain only _____ element.
(a) 1 (b) 2 (c) 3 (d) 4
- Hydrocarbons are compounds of hydrogen and _____
(a) Nitrogen (b) Carbon (c) Oxygen (d) Sulphur
- Hydrocarbons are classified into _____ main classes.
(a) 1 (b) 2 (c) 3 (d) 4
- Carbon can exist in _____ different allotropic forms.
(a) 2 (b) 3 (c) 4 (d) 5
- Trioxocarbonate (IV) may be regarded as
(a) Salt (b) Sugar (c) None of the above (d) All of the above

SECTION B: FILL IN THE BLANK SPACES (20 marks)

Instruction: Answer all questions. Each question carries 2 marks.

- The property of carbon to form bonds with other carbon in which other element attached is called _____
- Coal is a black organic rock formed from the vegetation of the _____ period.
- Coke is the non-volatile residue left behind after destructive distillation of _____
- The aliphatic may be cyclic and _____
- Carbon (IV) oxide was first observed by _____
- Carbon (II) oxide is a poisonous, colourless and _____ gas.
- Crude oil (petroleum) is the principal source of _____
- Aromatic hydrocarbons are called _____
- The simplest aromatic hydrocarbon is _____
- Diamond is the hardest known substance. True/False

SECTION C: ESSAY (60 marks)

Instruction: Answer three questions. Each question carries 20 marks

- What do you understand by the term “Carbon”?
- What are the allotropes of carbon?
- List three properties of diamond.
- (a) Draw the structure of graphite
(b) List three properties of graphite.
- What are the main classes of hydrocarbon?
-

MARKING SCHEME
(CHEMISTRY)

SECTION A

- B
- B
- A
- B
- B
- B
- B
- B
- A
- A

2 x 10 = 20 marks

SECTION B

- Catenation
- Carboniferous
- Coal
- Acyclic
- Van Helmont
- Odourless, tasteless
- Minerals Hydrocarbon
- Unsaturated hydrocarbon
- Benzene
- True.

2 x 10 = 20marks

SECTION C

- “Carbon” occurs naturally as diamond, and graphite, it occurs in an impure forms as coal and in the combined state as co₂ natural gas, petroleum and wood.

- Allotropes of carbon are crystalline and amorphous, in crystalline are diamond and graphite in Amorphous are coal, coke, charcoal.

20 marks

- Properties of diamond
 - It is the hardest substance known.
 - Has high melting point.
 - Non conductor of heat and electricity because there are no free valence electron in the diamond crystal.

Each property attracts 6mark

- (a) Structure of graphite

(b) Properties

- good conductor of electricity
- excellent lubricant
- used as electrode

20 marks

- Aliphatic and aromatic hydrocarbon.

10 marks 10 marks

SCIENCE ACHIEVEMENT TEST(POSTTEST)
(PHYSICS)

SECTION A: OBJECTIVE (40 marks)

Instruction: Answer all questions. Each question carries 2 marks

- Which of the following statements is not true?
 - Matter is made up of molecules
 - The molecules of matter are in constant motion
 - Brownian motion is an evidence of particles nature of matter
 - Atoms combine to form molecule
- A force of 0.8N stretches by elastic spring by 2cm. Find the elastic constant of the spring.
(a) 4Nm⁻¹ (b) 0.33Nm⁻¹ (c) 39.5Nm⁻¹ (d) 42Nm⁻¹
- _____ is the ability of a substance to regain its original shape and size after being distorted by an external forces.
(a) Molecules (b) Elasticity (c) Elastic material (d) Elastic limit
- An iron rod of $\alpha = 12 \times 10^{-6} \text{ K}^{-1}$ and $L_1 = 60\text{m}$, expands when heated through 100K. Calculate its increase in length.
(a) 0.07m (b) 0.72m (c) 72.0m (d) 0.702m
- The heat of the sun mainly reaches the earth by the process of
(a) conduction (b) radiation (c) convection (d) reflection
- The ration of force per unit area is known as _____
(a) tensile stress (b) tensile strain (c) young modulus (d) all of the above
- A spring is stretched 40mm by a force of 15N. what is the work done by the force?
(a) 0.27J (b) 0.33J (c) 0.37J (d) 3.0J
- A spiral spring is compressed by 0.02m. Calculate energy stored in the spring if the force constant is 400Nm⁻¹.
(a) 0.07 joules (b) 0.70 joules (c) 0.8 joules (d) 0.08 joules
- The SI unit of linear expansivity is _____
(a) K (b) S (c) K⁻¹ (d) m
- Which of the following is the absorber of radiant energy?
(a) white (b) black (c) red (d) yellow

- The meniscus of water in a capillary tube is _____
 (a) convex (b) concave (c) straight
 (d) dependent on the bore of the tube
- The rise and fall of liquid in a narrow tube is due to _____
 (a) The friction between the walls of the tube and the liquid
 (b) The viscosity of the liquid (d) The osmotic pressure of the liquid
 (d) The surface tension of the liquid
- A spring of force constant 1500Nm^{-1} is acted upon by a constant force of 70N . Calculate the potential energy stored in the spring.
 (a) 1.9J (b) 3.2J (c) 3.8J (d) 5.0J
- A force of 2N is stretched on elastic material by 30mm . What additional force will stretch the material 35mm ? Assume that the elastic limit is not exceeded.
 (a) 0.33N (b) 0.3N (c) 3.3N (d) 33N
- A drop of oil of volume 10^{-10}m^3 spread out on water to make circular film of radius 10^{-1}m . What is the thickness of the film?
 (a) $32 \times 10^{-9}\text{m}$ (b) $3.2 \times 10^{-8}\text{m}$ (c) 1.6×10^{-10} (d) $3.12 \times 10^{-9}\text{m}$
- The thickness of film is given by
 (a) $4v/d^2\text{cm}$ (b) $4v/3d^2\text{cm}$ (c) $4v/d^2\text{cm}$ (d) $4/d^2\text{cm}$
- A brass of length 100m increases to 100.5m when heated from 500C to 1000C . Calculate the linear expansivity.
 (a) $12 \times 10^{-5}\text{K}^{-1}$ (b) 10^{-4}K^{-1} (c) 0.53K^{-1} (d) 0.610^{-1}K^{-1}
- _____ is the process through which heat energy is transferred in a fluid (liquid or gas) by the actual movement of the heated particles.
 (a) convection (b) conduction (c) radiation (d) all of the above
- _____ is the rapid, constant and irregular motion of tiny particles.
 (a) Molecules (b) Diffusion (c) Brownian motion (d) Crystal
- The internal friction between layers of a liquid or gas in motion is called _____
 (a) Capillary (b) Osmosis (c) Viscosity (d) Surface tension

SECTION B: ESSAY (60 marks)

Instruction: Answer 3 questions. Each question carries 20 marks

- (a) State Hooke's law
- (b) A force of 0.9N stretches an elastic spring by 2cm. Find the elastic constant of the spring.
- (a) Define the following term
 - Capillary
 - Surface tension
 - Viscosity
- (b) A stone of mass 20g is released from a catapult whose rubber has been stretched through 4cm. If the force constant of the rubber is 200Nm^{-1} . Calculate the velocity with which the stone leaves the catapult.
- (a) Define Young's Modulus
- (b) A spiral spring is compressed by 0.02m. Calculate the energy stored in the spring, if the force constant is 400Nm^{-1} .
- (a) Define linear expansivity.
- (b) A brass of length 100m increases to 100.5m when heated from 500C to 1000C . Calculate the linear expansivity.
- (a) List four evidences of particles nature of matter.
- (b) Differentiate between the crystalline and the amorphous substances.
- (c) Give two similarities and two differences between viscosity and friction.

MARKING SCHEME
(PHYSICS)

SECTION A

-
- B
- C
- B
- B
- B
- A
- C
- D
- C
- B
- B
- D
- B
- 2.3
- B
- B
- C
- A
- B
- C

SECTION B

- (a) Hooke's law stated that the force exerted on a string is directly proportional to its extension.

$$F \propto e$$

(b) $F = 0.9\text{N}$

$$e = 2\text{cm} = \frac{2}{100} = 0.02\text{m}, k = ?$$

$$F = ke, K = \frac{F}{e} = 43\text{N/m}$$

- (a) i. Capillary: Ability of water to rise in a tube/ability of liquid to flow in narrow space.
 - ii. Surface tension: This is the cohesive forces between two molecules.
 - iii. Viscosity: This is the quantity that describe a fluid resistance to follow.
- (b) $M = 20\text{g} = 0.02\text{kg}$
 - $D = 4\text{cm} = 0.04\text{m}$
 - $K = 200\text{Nm}^{-1}$
- (a) Young modulus =
- (b) $e = 0.02\text{m}$, $k = 400\text{Nm}^{-1}$
 - $E = \frac{1}{2} ke^2 = \frac{1}{2} 400 0.02 0.02$
 - $= 0.08\text{J}$
- Linear expansivity =

**SCIENCE ACHIEVEMENT TEST(POSTTEST)
(MATHEMATICS)**

SECTION A: OBJECTIVE (40 marks)

Instruction: Answer all questions. Each question carries 2 marks

- Express the following in standard form 263,000,000.
(a) 2.63×10^8 (b) 2.63×10^{-8} (c) 2.63×10^2 (d) 2.63×10^{-2}
- Convert the following to base ten 134_5 .
(a) 54_{10} (b) 34_{10} (c) 64_{10} (d) 44_{10}
- Multiply the following base two numerals $11_2 \ 11_2$
(a) 10001_2 (b) 1001_2 (c) 1001_2 (d) 1101_2
- Find the value in the Moduli written beside $2 \ 3 \pmod{4}$
(a) $1 \pmod{4}$ (b) $2 \pmod{4}$ (c) $3 \pmod{4}$ (d) $12 \pmod{4}$
- Simplify $10^3 \ 10^4$
(a) 10^9 (b) 10^{20} (c) 10^{12} (d) 10^{11}
- Evaluate $8^{1/3}$
(a) 3 (b) 2 (c) 1 (d) 0
- What is the integer of 5600?
(a) 4 (b) 5 (c) 3 (d) 2
- Given that $X = \{a, b, c, d, e\}$
 $Y = \{a, e, i, o, u\}$. Find XY
(a) $\{a, b\}$ (b) $\{a, e, i\}$ (c) $\{a, b, c, d, e, i, o, u\}$ (d) $\{0\}$
- If $A = \{a, b, c, d, e, f\}$ $B = \{b, d, e, g, h\}$. Find $B - A$
(a) $\{a, c\}$ (b) $\{d, e, f\}$ (c) $\{a, b, c\}$ (d) $\{g, h\}$
- Make x the subject of the formula from the equation. $x + a = b$
(a) $x = b - a$ (b) $x = b + a$ (c) $x = ba$ (d) $x = b + 2a$
- If a d and $a = 6$ when $d = 2$. Find the value of d when $a = 12$.
(a) 1 (b) 2 (c) 3 (d) 4
- Make r the subject of a formula $C = 2r$
(a) $r =$ (b) $r = 2c$ (c) $r = c$ (d) $r = 2c$
- Solve for x in the equation $2^x = 64$.
(a) 5 (b) 6 (c) 4 (d) 3

- Evaluate 4^{-3}
 (a) $1/16$ (b) $1/32$ (c) $1/64$ (d) $1/8$
- Simplify $(y^3)^2$
 (a) y^5 (b) y^6 (c) y^9 (d) y^2
- What is the value of n if $0.0000094 = 9.4 \cdot 10^n$
 (a) 6 (b) 5 (c) -6 (d) -5
- Add the following in base 2 $10_2 + 11_2 + 11_2$
 (a) 1000_2 (b) 1001_2 (c) 10011_2 (d) 1100_2
- Find the simplest positive form of $-2 \pmod{9}$
 (a) $6 \pmod{9}$ (b) $5 \pmod{9}$ (c) $4 \pmod{9}$ (d) $7 \pmod{9}$
- What is the integer of 1234?
 (a) 1 (b) 2 (c) 3 (d) 4
- Make x the subject of the formula from the equation
 (a) $x = \pm$ (b) $x = b$ (c) $x = 2b$ (d) $x = 10$

SECTION B: ESSAY (60 marks)

Instruction: Answer any 3 questions. Each question carries 20 marks.

- (a) Write out the numbers of the following sets
 i. $\{x: x \in \mathbb{N}, x \leq 10\}$ ii. $\{P: P \text{ is a factor of } 12\}$
- (b) If $A = \{a, b, c, d, e, f\}$ and $B = \{b, d, e, g, h\}$ then find
 i. $A - B$ ii. $B - A$
- Evaluate
 (a) (b)
- Solve for x in the equation
 (a) $5^{x+1} = 625$ (b) $4^{x+1} = 8^{x+2}$
- Simplify the following
 (a) $2^2 \cdot 2^4$ (b) $5y \cdot 4y^4$ (c) $a^3 \cdot a^9$ (d) $M^8 \cdot M^5$

- (a) Copy and complete the table for addition

	0	1	2	3	4
0					
1					
2					
3					
4					

- (b) Find the values of the following in the moduli stated against them.

(a) $8 \equiv 6 \pmod{5}$

(b) $12 \equiv 9 \pmod{4}$

MARKING SCHEME

(MATHEMATICS)

-
- A
- D
- C
- B
- A
- B
- C
- C
- D
- A
- D
- A
- B
- C
- B
- C
- A
- D
- C

- A

2 marks each = 40 marks

SECTION B

- (a) i. $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ 5marks
 ii. $\{2, 3, 4, 6, 12\}$ 5marks
 (b) i. $A - B = \{a, c\}$ 5marks
 ii. $B - A = \{g, h\}$ 5marks

•

- (a)

No	Log
467.5	2.6698
	2.6698 2
	1.3349

Anti-log = 21.62

= 21.62 (10marks)

- (b)

No	Log
26.21	1.4185
	1.4185 3

Anti-log = 2.970

= 2.970 (10marks)

- (a) $5^{x+1} = 625$

$$5^{x+1} = 5^4$$

$$x + 1 = 4$$

Collecting like terms

$$x = 4 - 1$$

$$x = 3 \text{ (10 marks)}$$

- (b) $4^{x+1} = 8^{x+2}$

$$2^{2(x+1)} = 2^{3(x+2)}$$

$$2(x+1) = 3(x+2)$$

$$2x + 2 = 3x + 6$$

$$-x = 4$$

$$x = 04 \text{ (10 marks)}$$

-
-

- (a) $2^2 2^4$

$$2^{2+4}$$

$$2^6 \quad (5 \text{ marks})$$

- (b) $5y 4y^4$

$$= 5 y^{1+4}$$

$$4 5 y^5$$

$$= 20y^5 \quad (5 \text{ marks})$$

- (c) $a^3 a^9$

$$= a^{3+9}$$

$$= a^{12} \quad (5 \text{ marks})$$

- (d) $M^8 M^5$

$$= M^{8+5}$$

$$= M^{13} \quad (5 \text{ marks})$$

- (a)

	0	1	2	3	4
0	0	1	2	3	4
1	1	2	3	4	0
2	2	3	4	0	1
3	3	4	0	1	2
4	4	0	1	2	3

(10 marks)

- (b)i. $8 \equiv 6 \pmod{5}$

$$8 = 14$$

$$= (2 \cdot 5 + 4)$$

$$= 4 \pmod{5}$$

(5 marks)

ii. $12 \cdot 9 = 21$

$$= 5 \cdot 4 + 1$$

$$= 1 \pmod{4}$$

(5 marks)

APPENDIX II

Treatment session (Cognitive Restructuring counseling technique)

WEEK	STAGE/PHASE	COUNSELLOR ACTIVITIES	CLIENTS ACTIVITIES	EXPECTED OUT COMES
1st	Establishing counseling relation	Personal introduction, creation of mutual respect with care love and affection, assurance of confidentiality.	Personal introduction, expression of likes and dislikes,	Engagement.
2nd	introduction	Explain the major goals of Cognitive Restructuring. Such as maladaptive behavior and action on learning science, irrational thought	Identification maladaptive behavior on learning science such as lack of interest, phobia	Identification of major goals of Cognitive Restructuring counseling technique.
3rd	Identification of irrational thought.	Explanation of low achieving behavior. Asking questions on school work and activities, asking questions on examination Anxiety and phobia , asking on interest in science subjects.	Responding toward interest, Anxiety and phobia.	Identification of clients interest, feeling, irrational thought, Anxiety and phobia.
4th	Challenging and disputing irrational thought.	Description of major causes of low-achievement as failure to attended class lesson, failure to do school work negative interest. Consequences of low- achievement in future life of studies. Home work Ask to identify causes of their low-achievement and how they feel, and thought expected consequences.	Responding toward the identification of causes of low-achieving and the consequences of it in their future life of study.	Identification the negative consequences of irrational thought and actions.
5th	Replacing them	Guide clients to	Accept change.	Developed

	with more realistic rational and positive thought.	understanding thinking styles. Views self as complete success or failure in every situation how to cope with criticism. Avoid using negative language.; " I cannot" "I would not". How to construct more realistic objectives, consider each lesson as opportunity to learn.	Engage in class work improve group work and assignment, full lesson participation. Change of friends.	realistic positive and rational thought.
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APPENDIX IV

GOVERNMENT SECONDARY SCHOOL DALA

MALE

PRE-TEST RESULT

S/N	STUDENTS CODE	MATHS	PHYSIC	CHEM	BIOLOGY	PRE-TEST TOTAL	AVERAGE
1	Omo1	35	08	25	33	101	25
2	Om02	22	12	37	28	99	25
3	Om03	32	23	29	19	103	26
4	Om04	31	20	33	13	95	24
5	Om05	24	30	21	25	100	25
6	Om06	34	37	39	11	121	30
7	Om07	21	18	33	33	105	26
8	Om08	34	03	21	30	88	22
9	Om09	27	37	34	37	135	34
10	Om10	31	33	24	33	119	30
11	Om11	32	31	30	21	114	29
12	Om12	35	33	30	26	124	31
13	Om13	20	25	28	22	95	24
14	Om14	36	11	30	21	98	25
15	Om15	25	25	39	35	114	29

AMINU KANO COMMUNITY COMMERCIAL COLLEGE

FEMALE

PRE-TEST RESULT

S/N	STUDENTS CODE	MATHS	PHYSIC	CHEMISTRY	BIOLOGY	PRE-TEST TOTAL	AVERAGE
1	OF01	25	29	25	30	109	27
2	OF02	35	38	34	38	145	35
3	OF03	15	39	37	31	122	30
4	OF04	35	20	29	23	107	26
5	OF05	27	28	38	36	129	32
6	OF06	33	31	34	30	128	32
7	OF07	16	25	30	26	102	25
8	OF08	35	28	39	31	133	33
9	OF09	17	20	21	30	89	21
10	OF10	38	36	39	37	150	37
11	OF11	13	20	20	25	78	19
12	OF12	20	29	25	27	101	25
13	OF13	30	20	30	23	103	25
14	OF14	22	28	31	29	110	27
15	OF15	20	24	30	35	109	27

GOVERNMENT GIRLS SECONCONDARY SCHOOL DALA (G.G.S.S. DALA)**FEMALE PRE-TEST RESULT**

S/N	STUDENTS CODE	MATHS	PHYSIC	CHEMISTRY	BIOLOGY	PRE-TEST TOTAL	AVERAGE
1	OF01	35	38	35	37	145	36
2	OF02	34	38	22	32	126	31
3	OF03	24	28	22	34	108	27
4	OF04	30	36	33	23	122	30
5	OF05	30	26	30	32	118	29
6	OF06	35	35	34	23	135	33
7	OF07	20	25	21	31	136	33
8	OF08	31	38	32	32	120	30
9	OF09	16	34	17	27	136	34
10	OF10	30	26	31	21	117	29
11	OF11	31	17	32	27	116	29
12	OF12	33	33	35	38	129	32
13	OF13	27	39	23	33	116	29
14	OF14	21	29	21	34	89	24
15	OF15	34	31	34	29	113	28

AMINU KANO COMMUNITY COMMERCIAL COLLEGE**MALE PRE-TEST RESULT**

S/N	STUDENTS CODE	MATHS	PHYSICS	CHEMISTRY	BIOLOGY	TOTAL	AVAREGE
1	OM01	12	37	26	31	106	27
2	OM02	39	34	30	26	126	32
3	OM03	19	34	35	11	99	25
4	OM04	26	22	37	34	119	30
5	OM05	35	39	38	39	151	38
6	OM06	31	28	36	23	119	30
7	OM07	28	36	20	25	98	24
8	OM08	20	28	38	31	117	29
9	OM09	35	37	30	27	129	32
10	OM10	20	28	28	21	97	24
11	OM11	34	33	36	35	138	34
12	OM12	26	27	25	19	97	24
13	OM13	35	35	36	27	133	33
14	OM14	18	20	20	41	97	24
15	OM15	36	28	20	22	106	27

**GOVERNMENT SECONDARY SCHOOL DALA
MALE POST-TEST RESULT**

S/N	STUDENT S CODE	MATHS	PHYSICS	CHEMISTRY	BIOLOGY	POST-TEST TOTAL	AVERAGE
1	Om01	56	39	35	69	199	50
2	Om02	38	53	57	44	192	48
3	Om03	50	49	49	58	206	52
4	Om04	60	59	73	47	229	57
5	Om05	49	60	56	58	199	50
6	Om06	50	64	39	51	204	51
7	Om07	51	67	43	59	220	55
8	Om08	64	49	25	57	195	49
9	Om09	49	30	24	46	149	37
10	Om10	60	56	50	29	195	49
11	Om11	67	41	60	51	219	55
12	Om12	54	20	58	44	176	44
13	Om13	60	50	30	61	201	50
14	Om14	54	49	49	33	185	46
15	Om15	49	60	40	60	209	52

**AMINU KANO COMMUNITY COMMERCIAL COLLEGE
FEMALE POST-TEST RESULT**

S/N	STUDENTS CODE	MATHS	PHYSICS	CHEMISTRY	BIOLOGY	POST-TEST TOTAL	AVAREGE
1	OF01	65	56	60	56	212	53
2	OF02	57	69	40	23	189	47
3	OF03	55	49	40	44	188	47
4	OF04	49	65	24	77	215	53
5	OF05	58	26	62	56	202	50
6	OF06	41	51	88	52	222	55
7	OF07	47	29	34	45	155	38
8	OF08	56	56	73	64	249	62
9	OF09	25	50	37	45	157	39
10	OF10	39	41	29	39	158	39
11	OF11	48	46	54	59	197	49
12	OF12	60	60	53	61	234	58
13	OF13	58	68	28	55	182	45
14	OF14	31	67	29	24	242	60
15	OF15	62	63	62	56	203	51

**GOVERNMENT GIRLS SENIOR SECONDARY SCHOOL
FEMALE POST-TEST RESULT**

S/N	STUDENTS CODE	MATHS	PHYSICS	CHEMISTRY	BIOLOGY	POST-TEST TOTAL	AVAREGE
1	OF01	46	49	40	38	173	43
2	OF02	64	60	64	58	246	61
3	OF03	62	59	42	41	204	51
4	OF04	48	65	32	43	188	47
5	OF05	33	47	43	35	158	39
6	OF06	59	60	59	60	238	59
7	OF07	49	61	46	24	180	45
8	OF08	51	55	63	72	241	60
9	OF09	39	24	49	40	152	38
10	OF10	59	59	59	67	244	61
11	OF11	35	45	35	54	169	42
12	OF12	32	62	52	40	186	47
13	OF13	60	70	70	58	258	64
14	OF14	57	54	37	54	202	50
15	OF15	56	59	50	62	237	59

AMINU KANO COMMUNITY COMMERCIAL COLLEGE

MALE POST-TEST RESULT

S/N	STUDENTS CODE	MATHS	PHYSICS	CHEMISTRY	BIOLOGY	TOTAL	AVAGEGE
1	OM01	53	54	20	60	187	47
2	OMO2	56	33	57	49	195	49
3	OM03	59	44	58	63	224	56
4	OM04	54	49	24	61	188	47
5	OM05	48	29	35	22	134	34
6	OM06	53	52	43	64	212	53
7	OM07	67	49	42	58	218	54
8	OM08	35	45	36	37	153	38
9	OM09	42	30	30	31	133	33
10	OM10	57	48	53	41	199	50
11	OM11	62	63	57	55	237	58
12	OM12	24	59	66	62	211	52
13	OM13	50	45	46	51s	192	48
14	OM04	33	40	50	40	163	40
15	OM15	26	50	38	55	169	42