ENTRY QUALIFICATIONS AND STUDENTS' ACADEMIC PERFORMANCES IN MATHEMATICS AND SCIENCE: A CASE STUDY OF THE COLLEGE OF ADVANCED STUDIES, ZARIA, NIGERIA

BY

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BY

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DECLARATION

I, Mr. Emmanuel Ijenkeli O'kwu, hereby declare that this Thesis is written by me and only me and that it was not copied from any past research work.

Also, I declare that both published and unpublished articles directly used in the Thesis are appropriately acknowledged.

CERTIFICATION

This thesis has been read and approved as meeting the requirements of the Department of Education, Faculty of Education, Ahmadu Bello University, Zaria.

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DEDICATION

This research report is dedicated to my beloved children:

Joy Enehi O'kwu

and Oche O'kwu

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ABSTRACT

This study was aimed at finding the relationship between entry qualifications and students' academic performance in various science subjects offered' for the I.J.M.B. examinations by students. The study used the year I sessional and year II (I.J.M.B.) examination results of the 1983/814. science intake of the College of Advanced Studies, Zaria. The subjects covered by the study included: Biology, Chemistry, Geography, Mathematics and Physics. In each subject there were two groups of students, (i) those with '0' level credits in the subject and (ii) those without '0' level credits in the subject. The academic performance of these two groups of students were compared for each subject in the sessional and I.J.M.B. examinations. The proportion of students in each of the two groups, who passed the examinations in the subject were also compared.

To investigate the effect of 'O' level mathematics achievement on students' academic performance, a comparison was also made between the academic performance of students with and without '0' level mathematics credits. The subjects covered in this part of the study included Biology, Chemistry, Geography and Physics. In the final part of the study, the correlation between the sessional and I.J.M.B. results in each subject was investigated.

Findings from the study.showed that in the year I sessional examinations, the students with '0' level credits in their subjects performed significantly better than

the others, in all the subjects except Chemistry, In Chemistry no significant difference was observed. In the I.J.M.B. examinations there was no significant difference between the performance of the two groups. In the sessional examinations, significantly greater proportion of students with '0' level credits, passed in each subject except Chemistry, In Chemistry no significant difference was observed between the proportion of students with or without '0' level credits who succeeded in the Chemistry examinations. In the I.J.M.B. examinations no significant difference was observed between the proportion of the two groups of students who passed in Chemistry, Mathematics and Physics. In Biology and Geography, significantly greater proportions of those with '0' level credits in their subjects passed in the I.J.M.B. examinations.

For Biology, Chemistry and Geography, no significant difference was observed between the academic performance of those with or without '0' level mathematics credits, in the sessional examinations. In Physics those with '0' level mathematics credits performed significantly better than the others. In the I.J.M.B. examinations, there was no significant difference between the academic performance of those with or without '0' level athematics credits, for all the four subjects. Significant positive correlations were found between the sessional and I.J.M.B. results in all the subjects except Geography.

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DEFINITION OF TERMS

For the purpose of this study it is necessary to define certain important terms to ensure clarity and similarity in meaning. The following terms and abbreviations are therefore defined in the context of their specific use in this study:

School:

A cluster of departments make up a school. In C.A.S., there are two schools, (1) the School of Science and (2) the School of Humanities. Each school has a number of academic departments (or sections) under it.

Entry Qualifications:

This refers to the qualifications the candidate had at the time of admission to the college. This is mainly the G.C.E. 'O' level of the West African Examinations Council (W.A.E.C.) in which the passes are graded as (i) credit (or higher level pass, which includes A1, A2, A3 C4, C5 and C6), (ii) Pass (this includes P7 and P8) and (iii) Fail (F9), for each subject a candidate offers. For the purpose of this study a credit or higher level pass is simply referred to as credit.

Academic Performance:

This refers to the quality of work produced by the students as is reflected in their examination results.

Northern States:

The states created out of the former Northern Region of Nigeria, namely: Benue, Bauchi, Borno, Gongola, Plateau,

Niger, Kwara, Kaduna, Kano and Sokoto States.

Science:

This includes the following subjects: Physics, Chemistry, Biology, Geography, Geology and Mathematics offered in the college.

I.J.M.B.:

Interim Joint Matriculation Board. The Board is an arm of the Ahmadu Bello University (A.B.U.), Zaria. The board conducts pre-degree (equivalent to 'A' level G.C.E.) examinations for about twelve colleges and schools of Basic Studies.

S.B.S. - School of Basic Studies.

G.C.E. - 'O' level: General Certificate of Education ordinary level.

W.A.S.C. - West African School Certificate (sometimes referred to as School Certificate).

C.A.S. - College of Advanced Studies.

CHAPTER I

INTRODUCTION

1.1 Preamble

The College of Advanced Studies (C.A.S.), Zaria (established in 1973 as the Kaduna State College of Arts, Science and Technology), prepares students for direct university admissions. After a two year course the students sit for the Interim Joint Matriculation Board (I.J.M.B.) examinations of the Ahmadu Bello University, Zaria. The college functions in the same way as the other schools of Basic Studies established in other states of the country.

The college has two schools: (1) the school of Humanities and (2) the school of Science. The school of Humanities comprises of the Departments of Arts, Social Sciences and Languages. The school of Science comprises of only the Department of Science which has Mathematics, Physics, Chemistry, Biology and Geology sections. Of the average annual intake of about 1,000 students into the college, only about 30 per cent of the students register for science courses each year. Mainly because of this imbalance between enrolments into the Humanities and the Sciences and because of the emphasis placed on science and technology by both the federal and state governments in the country, the college authorities had to modify the admission requirements for candidates who applied for science courses. Since 1981 candidates

who have a total of at least three credits (or higher level passes) in their West African School Certificate (W.A.S.C.) examinations with one or more credits in science subjects, have been offered admission to read science courses for their I.J.M.B. examinations.

Students' performances at the sessional examinations in the college have fallen below expectations in recent years. This reached a staggering stage during the 1983/84 session. The students' academic performance in both the school of Humanities and the school of Science were so poor that a committee had to be set up by the college Academic Board to investigate the causes of the students' poor performance. Table 1.1 shows the overall picture for the school of Science.

When the students' academic performance falls below expectation, attention is focused on the students' entry qualifications. Because of the problem of low students' enrollment in the School of Science it is necessary to have a deeper knowledge of the relationship between entry qualifications and the students' academic performance. Without such knowledge it would be difficult to draw conclusions regarding students' academic performance in the college.

Table 1.1

1983/84 Year 1 Sessional Results
for the School of Science

Result	Number of Students	Percentage (%)
Pass	189	55.3
Repeat	50	14.7
Withdraw	102	30.0
Total	341	100.0

The present study is aimed at having a deeper understanding of the students' poor academic performance. Specifically, this study seeks a thorough understanding of the relationship between students' entry qualifications and their academic performance in the sessional examinations as well as the I.J.M.B. examinations in the school of Science. The modified entry qualifications for the school of Science is at least three credits in W.A.S.C. (or the General Certificate of Education (G.C.E.) ordinary level), one of which must be in a science subject. On entry into the college, candidates are normally registered for subjects where they have credits at 'O' level. However, because of the concession granted to science applicants, candidates with only one credit in a science subject are allowed to register for three science subjects. It is therefore not surprising that in each subject in the school of Science there are two categories of students: (1) those with credits in the subject at 'O' level and (2) those without credits in the subject at 'O' level. All science students without credits in Mathematics are compulsorily made to offer Remedial Mathematics to enable them secure a credit in mathematics before they leave the college. Such students offer the Remedial Mathematics both in year I and year II (if they fail to secure a credit in G.C.E. Mathematics at the end of year 1). Students without credits in Mathematics register for Basic Mathematics as one of their I.J.M.B. subjects in year II.

The emphasis placed on mathematics is because of university entry requirements. All students wishing to read science courses in the universities are required to have at least a credit pass in their 'O' level Mathematics.

Remedial courses in other science subjects may be available for the students if there are adequate staff. As a rule, each subject area makes efforts to assist their students to secure 'O' level credits in the subject. This is also aimed at helping them in making up for their deficiencies in such subjects. Despite these remedial efforts, a pertinent question is that of the relationship between students' entry qualifications and their academic performance in the college. What effects would the students' qualifications prior to entering the college have on their academic performance? Again, has 'O' level (G.C.E.) performance in Mathematics any effects on the academic performance of students in science subjects (other than Mathematics) at the I.J.M.B. level?

1.2 Statement of the Problem

This study focuses attention on the academic performance of students in Mathematics, Physics, Chemistry, Biology and Geography according to the following groupings based on their 'O' level results:

1) Those with 'O' level credits in each subject,
2) Those without 'O' level credits in each subject,

3) Those with 'O' level credits in Mathematics,
4) Those without 'O' level credits in Mathematics.
Groups (1) and (2) apply to all the subjects while groups (3) and (4) are only applicable to Biology, Chemistry, Geography and Physics. For administrative purposes, Geography is under the school of Humanities. It has been included in this study because it is one of the major subjects offered by science students.

The major problem of this study may be stated thus: What relationship exists between the students' entry qualifications and their academic performance in the college? Further, what relationship exists between the students' academic performance in the college and their performance in the external I.J.M.B. examinations? In particular, the study would endeavour to answer the following research questions:

1. For each science subject, is there any difference between the academic performance of students with 'O' level credits in the subject and the academic performance of students without 'O' level credits in the subject in (i) the sessional examinations and (ii) the I.J.M.B. examinations?
2. What proportion of students (i) with 'O' level credits in the subject, (ii) without 'O' level credits in the subject succeed in the sessional and I.J.M.B. examinations in each subject?

3. How do the students (i) with 'O' level credits, (ii) without 'O' level credits in Mathematics compare in their academic performance in subjects other than mathematics?

4. Is there any correlation between the students' performance in the sessional examinations and their performance in the I.J.M.B. examinations in each of the science subjects under investigation?

1.3 Purpose of the Study

The major objective of this study is to determine the relationship that might exist between students' entry qualifications and their academic performance in C.A.S., Zaria. This is aimed at establishing which entry qualifications are more predictive of higher academic achievement in the college. An attempt would be made to use the results of this study:

a) to establish the relative predictive validity of the entry qualifications into the C.A.S. school of Science,

b) to determine the level of correlation between the performance of students in the sessional examinations and their performance in the I.J.M.B. examinations.

c) to evaluate the success of the modifications in the admission requirements in the school of Science.

1.4 Null Hypotheses

The following null hypotheses (H_o) were developed for each of the science subjects (Biology, Chemistry, Geography, Mathematics and Physics):

1. There is no difference between the academic performance of students with 'O' level credits in the subject and the academic performance of students without 'O' level credits in the subject, in (i) the sessional examinations and (ii) the I.J.M.B. examinations in the subject.

2. There is no difference in the proportion of students (i) with 'O' level credits and (ii) without 'O' level credits in the subject who succeed in (a) the sessional examinations and (b) the I.J.M.B. examinations.

3. There is no difference between the academic performance of students with 'O' level credits in Mathematics and the academic performance of students without 'O' level credits in Mathematics in subjects other than Mathematics in (a) the sessional examinations and (b) the I.J.M.B. examinations.

4. There is no positive correlation between the students' performance in the sessional examinations and their performance in the I.J.M.B. examinations in each subject.

1.5 Assumptions of the Study

This study is based on the following assumptions:

1. All students in the school of Science have undertaken the G.C.E. ordinary level course in each of the science subjects they are offering in the college.
2. Lecturers in the school of Science are well qualified and are aware of their basic responsibilities towards the success of their students.
3. The variations in the teaching abilities of various lecturers (teacher-effect) would not bear any significant effect on the academic achievement of the students.
4. The assessment of the lecturers bear a true reflection of the students' academic achievement.
5. That a student's choice of a science course is voluntary and based on his inherent confidence in his ability to succeed in such courses.
6. That students with 'O' level credits in a subject possess adequate knowledge of the subject to offer it at the I.J.M.B. level.

1.6 Scope and Delimitations of the Study

The year 1 students in the school of Science for the 1983/84 academic session will be used for the study. Their academic performance in the 1983/84 sessional

examinations and their performance in the I.J.M.B. examinations at the end of the 1984/85 session will form the basis for this study. The modifications in the entry qualifications for science students started with the 1981/82 year I intake. Because of the initial problems encountered in implementing the modified entry requirements, only a limited number of candidates benefited from it during the first two years. The modifications did not make much impact on the students' intake into the school of Science until the 1983/84 session when the science intake rose from about 180 to 341. This is why the science intakes for the 1981/82 and 1982/83 sessions have not been included in the study. The study covers the analysis of the academic performance of the 1983/84 intake in the 1984 sessional examinations and the 1985 I.J.M.B. examinations in Biology, Chemistry, Geography, Mathematics and Physics. Geology is not included in the study because it is not offered as one of the subjects in most secondary schools.

The relationship between teachers' qualifications and students' a hievement would not be investigated in this study. This is because the minimum qualification to become a lecturer in the college is a university degree in the appropriate discipline. Besides, a good number of the lecturers in the school of Science posess higher degrees, so the lecturers are all well qualified.

The relationship between class sizes and student achievement would not be investigated also because lecturers in most subject areas in the school of Science teach various subject components on rotational basis. For example, one lecturer may teach Electricity to all the groups of Physics students while other lecturers may teach the same groups of students in other areas of Physics. The study could have covered other schools of Basic Studies offering science courses but for the economic and other constraints.

1.7 The Significance of the Study

A situation where a candidate with only one 'O' level credit in a science subject is allowed to read three science subjects at the I.J.M.B. level can only be regarded as an experiment. After a few years, such an experiment needs an appraisal to see how far the objectives are being met. Now that the failure rate during the year 1 sessional examinations have become so alarming that the college authorities would want to know why, it is only proper that a study is made of the various factors that might have contributed to such a state of affairs. Entry qualifications are used as yardsticks in determining the choice of candidates for various courses. Entry qualifications therefore play a major role when the academic achievement of the college intakes are being called to question. This study is an attempt to determine

the relationship between entry qualifications and students academic performance in the college.

It is hoped that this study would provide enough information that would aid the college admission officers, lecturers, and the entire college authorities both in the selection of candidates for science courses and in the counselling of students regarding their course combinations when they enter the college. There is need to give students such guidance to avoid wastage in manpower resources of the state and the country in general. Since the emphasis on science and technology is still gathering momentum in the country, there is need to have data on the type of experiment the school of Science has been undertaking, especially since 1981, as regards students' intake and registration for courses. The dearth of indigenous science and mathematics teachers in the country makes it imperative for us to encourage the younger generation to take to science. This will enable the country to have not only enough applied scientists like doctors, engineers, pharmacists and technologists but also enough science teachers. This study will therefore be valuable not only for other colleges offering I.J.M.B. courses but also for other higher institutions offering science and technical courses in general. It is hoped that this study would open the way to a number of such research studies aimed at helping the country to meet its

manpower needs in the fields of science and technology.

Studies have shown that a high correlation exists between achievements involving science and technology on one hand and mathematics on the other hand. Mathematics has been called the queen and servant of the sciences (Bell, 1959). It is in realization of this important fact that mathematics has been made a compulsory subject in the secondary schools and the teacher training colleges in Nigeria. This study also seeks to investigate the relationship between mathematics and academic achievement of science students in subjects other than mathematics.

1.8 Summary

In this chapter the background and general introduction to this study has been discussed. The section on the statement of the problem raised a number of empirical research questions which the study hopes to answer. Suitable hypotheses were also derived from the research questions for testing in the chapter on the analysis of data. It is envisaged that the answers to such questions would clearly bring out the relationship between the students' academic performance and their entry qualifications. There is need for this type of study as it would contribute to finding solutions to the manpower problems in the fields of science and technology in the country.

In the following chapter, a review is made of literature relevant to this study. In subsequent chapters, the methodology and analysis of data are presented before conclusions and recommendations based on the findings of the study are made in the last chapter.

CHAPTER 2

REVIEW OF RELATED LITERATURE

2.1 Introduction

In chapter one the historical background, the purpose, problems and significance of the study were examined. In this chapter a review is made of the works of other researchers who carried out some studies on the effects of entry qualifications on students' academic performance. This chapter also includes a brief review of the effects of other variables (such as attitudes, self-concept, interest and motivation) on students' academic performance. The first part of the chapter focuses attention on the relationship between entry qualifications and students' academic performance, while the second part treats the effects of other variables on students' academic performance. A brief summary forms the last part of this chapter.

2.2 Entry Qualifications and Students' Academic Performance

One of the basic assumptions of this study is that entry qualifications have some predictive values on students' academic performance. Screening and selection of students for most higher institutions in Nigeria and other parts of the world is based on this fundamental assumption. A study was conducted by Bakare and Majason (1974) titled "Predictive Validity of Ibadan University

Entry Qualifications". In the study a random sample of 1,000 students admitted to the university between 1962 and 1969 was taken out of a total of 2,147 students. In analysing the data, the mean scores of each student in (i) the entry qualification examinations and (ii) the examinations taken over the years in the university were taken and subjected to correlational analysis. Findings from the study showed that there was a significant positive correlation between students' performances in various entry qualification examinations and the relevant university examinations. It was also found that G.C.E. 'A' level and the Higher School Certificate (H.S.C.) examinations were more predictive of degree performance than the preliminary year examinations in the university.

Nisbet and Welsh (1966) concluded from their own studies in Britain that a number of preliminary analyses of this kind have failed to give promising results. They contend that substantial part of the variation in a student's performance in the university is basically unpredictable from evidence available at the time of entry to the university. They therefore suggest that a good prediction of final performance could be got from the performance in the initial stages of a period of training or study. Fafunwa (1967) in his own study at the university of Nigeria Nsukka found that in degree examinations direct entry (those with G.C.E. 'A' level or H.S.C.) students performed better than preliminary year students in Liberal

Arts courses while the latter group performed better in Science and Technical courses.

Ajagbe (1976) in his own study on possible effects of previous knowledge of Mathematics on students' academic performance in Economics (Department of Commerce) at the College of Administrative and Business Studies (C.A.B.S.) of Kaduna Polytechnic, found that there was a close relationship between students' academic performance in Economics and the students' performance in Elementary Mathematics in their W.A.S.C. examinations. Those students who had passed mathematics at credit level (or above) in their W.A.S.C. performed better than the other students. Pryor and Gordon (1974) worked on a statistical model for the examination of the validity of pre-requisites. Their model utilized information concerning exposure to pre-requisite courses. The findings of the study revealed that a student's record of academic success is a better predictor of performance than the sequence of specific courses to which he has been exposed previously. It was therefore suggested from the findings of this research that students with high grade point averages could be exempted from some or all of the preliminary requirements of a course.

Osha (1973) in his own study of the effects of dual entry qualifications (W.A.S.C. and London City and Guilds) on students' performances in Engineering and Technician's course at the Kaduna Polytechnic found that

there was no significant difference in the performances of the two groups at their final year examinations. Awesu (1974) in a similar study on the effects of dual entry qualifications (W.A.S.C. and Teachers' Grade II) on academic achievement of Zaria Advanced Teachers' College students also found that there was no significant difference between the two groups of students in their academic performance. Ukwanyi (1976) concluded from his own study of the effects of entry qualifications on students' academic achievement in executive grade final examinations at the Kaduna Polytechnic that entry qualifications did not exert much influence on students' academic achievement. His own study was also based on different types of entry qualifications (W.A.S.C. and other equivalent qualifications).

Ohuche (1974) undertook a study of the academic achievement of Nigerian undergraduates in the United States of America (U.S.A.) as a function of previous educational experiences. In the study, the researcher used multiple regression analysis to predict the probability of success of the candidates in terms of performance prior to their enrolling in the universities in the U.S.A. He developed a simple regression equation using performance in entry qualification examination as the predictors and the university variables as the measure. He then went on to use the analysis of covariance to investigate if there was any significant difference in academic achievement between

undergraduates who completed the equivalent of Sixth form (H.S.C.) and those who went to the U.S.A. after completing the equivalent of secondary school (W.A.S.C.) in Nigeria. He used the pre-university predictor variable as the covariate and the cumulative grade point average as the measure. His findings were that: (1) previous educational experience as measured by the grade point in the school certificate examination (W.A.S.C.) could not be used to predict satisfactorily the academic achievement of such students as measured by their cumulative grade point averages in the university, (2) a satisfactory predictor of academic achievement for the Nigerian undergraduate was his own grade point average at the end of his first term in a higher educational institution in the U.S.A. Furthermore his cumulative grade point average one year later was a better predictor variable than this, (3) Nigerian undergraduates who completed the equivalent of sixth form programme performed better than the others.

Simon and Ward (1983) undertook a study titled: "Correlates of Performan : in a Postgraduate Certificate in Education (P.G.C.E.) course". Findings from the study showed that prior academic achievement was particularly positively correlated with performance in the Theory of Education. Significant positive correlations were also found between performance in the Theory of Education and Practice of Education on one hand and the selection

interview grades on the other hand. Significant positive correlation between previous performance in degree examinations and grades in the Theory of Education was also observed.

From the results of these research studies one can conclude that: (1) Different but equivalent entry qualifications do not have any significant effects on students' academic performance, (2) Direct entry candidates (H.S.C. or 'A' level equivalents) perform better than preliminary students in the sciences, (3) Assessment of students at the end of their first year of training in an institution is a better predictor of their academic performance than entry qualifications, (4) The relationship between students' entry qualifications and their academic achievement is not yet conclusive. Before final conclusions are drawn regarding the relationship between entry qualifications and students' academic performance there is need to examine the nature and purpose of the various research works that were carried out. Most researchers have focused attention on the types of entry qualifications and their effects on students' academic performance. The relationship between the quality of entry qualifications and students' academic performance has not been given adequate attention by many researchers. Selection of candidates for institutions of higher learning, based on some pre-requisite qualifications without an entrance

examination, is based on the fact that entry qualifications do have predictive values on students' academic performance. This is why minimum entry qualifications are set for such purposes. Because of the vital role being played by entry requirements in admission processes for most institutions, further and more intensive studies need to be undertaken to bring out clearly the effects of entry qualifications on students' academic performance.

Past studies have been conducted mostly on students with the minimum entry requirements for their courses. Studies involving both students with the minimum entry qualifications and those without the minimum entry qualifications are likely to throw more light on the relationship between entry qualifications and students' academic performance. Again previous studies have been rather broad based since entry qualifications in component parts of courses were not examined in relation to the students' academic performance in such areas. The present study attempts to do this by looking at students' entry qualifications and their performances in individual subjects in their science courses. For each science subject there are two groups of students: (i) those who have the minimum entry qualification (credit or higher level pass) and (ii) those without this minimum entry qualification. This is a situation where students without the minimum entry requirement for a particular subject are

allowed to offer the subject. This practice is a departure from the normal rigid entry qualifications adhered to by most other institutions of higher learning. According to Mayer (1966), high schools in the U.S.A. are often held back by inflexible admission requirements on the part of colleges. To encourage flexibility of entry requirements, the Progressive Education Association sponsored an eight year study (1932-1940) of thirty secondary schools. These schools were not obliged to stress the usual college entry requirements. Results of the study showed that graduates of these schools were as successful in colleges as the graduates of more orthodox high schools.

Most of the studies under review have focused attention on university students. The present study focuses its attention on pre-university students. Again a situation where a student who has only one 'O' level credit in a science subject is allowed to offer three science subjects should be of interest to researchers who would want to foster the study of science in a developing country like Nigeria. As mentioned by Mayer (1966), results of research in colleges in the U.S.A. with such liberal admission policies indicate that the students of such colleges were as successful as those of other colleges in their academic career. Such a study as the present one in Nigeria is long overdue. The rigidity of admission

requirements (entry qualifications) to our institutions of higher learning has largely been responsible for the exodus of students to institutions of higher learning in other countries (especially where such courses are available locally).

2.3 Effects of Other Variables on Students' Academic Performance

According to Shertzer and Stone (1976), educational attainment is affected by factors such as geographic location, family background and social status. More than 95% of the students in the present study come from Kaduna State. Evidence from their personal files also indicate that majority of them have similar family and social backgrounds. The influence of such factors would therefore be very minimal on the findings of this study. Blair et al (1968) emphasised that the kinds of attitude which a child has affects school work and learning. Daily attendance of students are taken in this college to encourage regular attendance at classes and a monthly test is also conducted for each subject, to ensure a continuous seriousness about school work on the part of students. Such monthly tests are used in compiling their continuous assessment at the end of the session. Ikiejiofor (1979) contends that the cause of poor academic performance lies mostly with the students. He gave such reasons as lack of adequate preparation for examinations, the hope of cheating and leakages, wastage of study time at social parties and

sometimes drug addiction as some of the possible causes. Blair et al (1968) also emphasise that the way a child perceives himself in relation to his goals, the kind of person he believes himself to be and the kind of fears and aspirations he has will be the major factors in delineating the things for which he strives. They therefore assert that motivation is another key factor in the success of students in their academic work.

The science students in the college are all assigned to various lecturers for guidance and counselling. Students who are found wanting are normally referred to the guidance and counselling committee if their personal counsellors cannot resolve the issues at stake. This is aimed at ensuring a suitable attitude to work and minimising the effects of personal factors detrimental to the students' school work. The students of C.A.S. are also adequately motivated. As mentioned in the previous paragraph, majority of them come from Kaduna State where no stone is left unturned in encouraging the students. The students' allowances are paid regularly and promptly. The students' counsellors also give them career guidance in addition to counselling them on their problems in the college. The proximity of the college to the Ahmadu Bello University is also a strong motivational factor since they all aspire to go there after a successful stay at C.A.S. The college is also manned by well qualified

and dedicated staff. The state government takes very good care of the college, so that adequate facilities are provided for both staff and students. The influence of factors such as motivation and teacher-qualification is therefore of little or no significance in this study. The two groups of students (those with credits and those without credits in each subject) under consideration in this study, are subjected to the same environmental conditions in the college.

2.4 Summary

Considerable research has been done in Nigeria and other countries to determine the relationship between entry qualifications and students' academic performance. Most of these studies show that there is a positive correlation between students' entry qualifications and their academic performance. This area is still subject to further investigations as there is no conclusive evidence regarding the relationship between entry qualifications and students' academic performance. Such previous studies have centred their findings on samples involving students wi.. the minimum entry qualifications for their courses. Students without such minimum entry qualifications were not given the opportunity of being compared with qualified students in various courses. The present study attempts to do this by comparing the academic performance of students with the minimum entry requirements with that of students

without the minimum entry qualification in each science subject under investigation.

Some of the research works reviewed showed that students with higher level entry qualifications (G.C.E. 'A' level or equivalent) performed better than those who registered for university courses with lower qualifications (W.A.S.C. or equivalent) in their final degree examinations. Factors such as self concept, motivation and attitude of students that could affect the students' academic performance were also examined. The influence of such other factors on students' academic performance is, however, reduced to an insignificant level where both teachers and students are adequately motivated and facilities for students optimum output are provided as is the case in C.A.S. Both groups of students under consideration in each subject are subjected to the same classroom and other environmental conditions. The influence of such factors on the present study is therefore minimal. Research findings also show that the academic performance of students in their first year of training serves as a good predictor of their success in subsequent years of training in an institution.

In the next chapter, the statistical methods adopted for the collection and analysis of data are discussed.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter deals with the various procedures used in collecting data as well as the statistical methods adopted for the analysis of the data. The background of the students used for the study is discussed in the first section. The procedures used for obtaining samples as well as the methods used in obtaining the scores are also presented. The methods of presentation of the findings are also discussed before the chapter is concluded with a brief summary.

3.2 Background of the Students

The study is based on the academic performance of the science intake for the 1983/84 academic session. Their academic performance for two successive sessions was used for the study. The study started with 341 students for the 1983/84 session and ended with 185 of them during the 1984/85 session. The reason for this huge difference is given later in this chapter. The students were of average ability as judged by their academic achievement in the G.C.E. examinations. Most of them had a total of three credits in their G.C.E. results. Under more strict admission conditions, as is operated in many other similar institutions of higher learning,

most of these students would not have gained admission. As mentioned in chapter 1, admission conditions had to be relaxed in this way in order to increase the science intake into the college. The students were encouraged to offer science courses not only by the offer of automatic scholarships for science students of Kaduna state origin, but also by the prospects of job opportunities available to them on completion of their university education. About 95% of these students come from Kaduna state which is considered to be one of the educationally less priviledged states of the country. Most of them came to the college immediately after completing their secondary school education. Only a few of them had had some form of working experience by the time they were admitted to the college, as evidenced by information contained in their personal files. Parental influence on course choice was minimal as most of them came from parents who did not have any western education. Their ages ranged from about 16 to 23 years. Only about 20% of them were females.

Each student in the school of Science offers three subjects for the I.J.M.B. examinations. In addition to these three subjects, all students without 'O' level credits in Mathematics compulsorily offer Remedial Mathematics. In other science subjects remedial classes may or may not be organized for the students. Such an

arrangement is dependent on the staff strength of the subject section. The students are however advised to retake the G.C.E. examinations in those subjects they are offering in which they failed to secure a credit pass at 'O' level. To promote the interest of these students in science, a Science Society exists in the School of Science. Most of the science students belong to this society. A good number of lecturers in the school of science participate in the activities of the Science Society. The society organizes public lectures, film shows and excursions to various establishments that are considered of interest to the promotion of science. Trips to the Ahmadu Bello University Computer Centre and various other departments (especially the applied sciences) in the university, the Nigerian National Petroleum Corporation (N.N.P.C.) at Kaduna, the Nigerian Breweries Limited also at Kaduna, and the Nigerian Tobacco Company (N.T.C.) in Zaria are among the numerous excursions undertaken by the Science Society.

The attrition rate in both the school of humanities and the school of science is quite high, unfortunately. The reasons are not yet very clear. Of the 341 year I students in the school of science during the 1983/84 session only 185 of them were able to proceed to year II for the 1984/85 session. To proceed to year two a candidate must have scored a total of at least 120 marks

out of 300 marks. Such a candidate must have also scored at least 40% (the minimum pass mark) in not less than two out of his three major subjects, provided he scored more than 35% in the third subject. From Table 1.1 (Chapter 1) it can be seen that 189 students succeeded in the year I sessional examinations. Of this number, 4 students left the college voluntarily for other higher institutions, so that only 185 of the 341 students were left in year II for the 1984/85 session. As can be seen from the conditions for promotion from year I to year II of the I.J.M.B. course, the 152 students who were unsuccessful in the sessional examinations, were the academically weak ones. The attrition number would therefore not have any significant effect on the findings of this study, since the attrition affects both parties of each comparison.

3.3 Sampling Procedures

The total number of students in year I in the school of science for the 1983/84 session was 341. The study covered the academic performance of these students during the 1984 sessional examinations as well as the academic performance of the 185 of them who sat for the 1985 I.J.M.B. examinations at the end of their second year.

To compare the academic performance of students in each subject, the method of stratified sampling was used. The whole population of science students for each of the two sessions, 1983/84 and 1984/85 was divided into five strata: (1) Biology, (2) Chemistry, (3) Geography, (4) Mathematics and (5) Physics. Each of these strata was further subdivided into two groups, (a) those with 'O' level credits in the subject and (b) those without 'O' level credits in the subject (see Table 3.1.). The

Table 3.1

Distribution of Science, Students by Subjects, by Year and by 'O' Level Results.

Year	Result*	Biology	Chemistry	Geography	Maths	Physics
	C	120	135	88	91	97
1983/84						
	WC	89	85	35	48	65
Total		209	220	123	139	162
	C	85	82	57	54	62
1984/85						
	WC	43	50	16	19	22
Total		128	132	73	73	84

* C = with 'O' level credits

WC = without 'O' level credits

results of all the students in each of these two groups were used for the comparison in each subject. The comparison was done for both the 1984 sessional examinations and the 1985 I.J.M.B. examinations.

To investigate the effect of 'O' level mathematics achievement of students on their academic performance in other subjects, four out of the above five strata were used, namely (1) Biology, (2) Chemistry, (3) Geography and (4) Physics. Each stratum was again subdivided into two groups, (c) those with 'O' level credits in Mathematics and (d) those without 'O' level credits in Mathematics (see Table 3.2). For this comparison a random sample of 50 students was selected from each of the two groups. This was done by numbering the students in each group serially, then using a table of random numbers to select the 50 students from the group. Where the number of students in a group was not up to 50, all the students were automatically selected for the comparison. The comparison of the academic performance of the students in the two groups was done for each of the above four subjects in both the sessional and I.J.M.B. examinations.

For the correlational studies, a random sample of 50 students was chosen from the students offering each subject during the 1984/85 session. The students who had failed to proceed to year II of their I.J.M.B. courses were not used for this part of the study. To select this random sample of 50 students, the students offering each subject were assigned serial numbers and a table of random numbers was again used.

Table 3.2

Distribution of Science Students by Subject, by Year and by '0' Level Mathematics Results

Year	Result*	Biology	Chemistry	Geography	Physics
	MC	58	86	25	78
1983/84	WMC	151	134	98	84
Total		209	220	123	162
	MC	37	53	14	46
1984/85					
	WMC	91	79	59	38
Total		128	132	73	84

* MC = with '0' level Mathematics credits

WMC = without '0' level Mathematics credits

3.4 Data Collection

The sessional examination results list of year I science students for the 1983/84 session was obtained from the Science Office in the college. The sessional results list contained their subject combinations, college numbers and their sessional results, including the marks obtained in each subject. All the registration forms (see appendix A) on which the students filled their entry qualifications during their registration at the beginning of their year I were also secured from the Science Office. The available subject combinations for each subject (see appendix B) were listed and the registration forms of students offering each subject were sorted out. The registration forms for each subject were then grouped into two: (a) those with 'O' level credits in the subject, and (b) those without 'O' level credits in the subject. These registration forms together with the sessional results list were used in compiling the students' list for each subject. College numbers of students who were absent from the sessional examinations were omitted from the lists. Finally, the 1985 I.J.M.B. examination results list was obtained from the Academic Office in the college.

Each subject list (see appendix C, for a sample) comprised of two parts, A and B. Part A contained information about students with 'O' level credits in the subject, while part B contained information about those

students without 'O' level credits in the subject. The grades obtained in G.C.E. in the subject and mathematics were entered in the lists with the aid of the registration forms. The grades obtained in both the sessional and I.J.M.B. examinations in the subject were also entered in the appropriate columns with the help of the sessional results list and the I.J.M.B. results list. Further information about the students' age and parental background were obtained from the students' personal files in the Academic Office.

3.5 Methods of Data Analysis

3.5.1 The Scores

The I.J.M.B. results for the June 1985 examinations were given in grades (A, B, C, D, E and F) while the sessional results were in percentages. For the purpose of data analysis grade points (as used by the Joint Admissions and Matriculation Board (J.A.M.B.) and the universities for admission of students) were used. The grades and their equivalent points and range of marks are as follows:

Range of Marks (%)	Grade	Grade Points
70 - 100	A	5
60 - 69	B	4
50 - 59	C	3
45 - 49	D	2
40 - 44	E	1
0 - 39	F	0

The sessional results and I.J.M.B. results were both converted to grade points using the above table. For the comparison of academic performance and computation of correlation coefficients all the students' scores were therefore in grade points.

3.5.2 Statistical Design for Data Analysis

A. Comparison of Academic Performance

To compare the academic performance of students, the mean score, the standard deviation and the number of students in each sample were used for the following groups of students in each of the subjects, Biology, Chemistry, Geography, Mathematics and Physics:

a) Students with 'O' level credits in the subject,
b) Students without 'O' level credits in the subject,
c) Students with 'O' level credits in Mathematics and (d) Students without 'O' level credits in Mathematics.

For Mathematics, calculations were only made for groups (a) and (b). For the comparison of groups (a) and (b) the total number of students in each group were used for each subject. The mean scores of the two groups $\bar{X}_c$ and $\bar{X}_{wc}$ for groups (a) and (b) respectively, were compared using the differ ce of means. Since the number of students in each group was fairly large (see Table 3.1), the scores were assumed to be normally distributed. Most statistical authors (for example Erricker (1975)) consider samples of size greater than 30 to be large samples. Hence the statistic used to test the hypotheses was the standard normal variate z. The level of significance adopted

to test the hypotheses was 0.05. Theoretically, one would expect those with 'O' level credits in each subject to perform better than those without 'O' level credits in the subject, this was why 0.05 level of significance was chosen for the hypotheses testing.

For the comparison of the academic performance of students with 'O' level credits in mathematics (group (c)) and those without 'O' level credits in mathematics (group (d)), in Biology, Chemistry, Geography and Physics, random samples of 50 students were used. This was because of the size of the samples (see Table 3.2). Comparison of the mean scores $\bar{X}_{cm}$ and $\bar{X}_{wcm}$ for groups (c) and (d) respectively, were made for each subject using the difference of means. The statistic used for the comparison here was the student's 't' value. The level of significance adopted for testing the hypotheses here was again 0.05, because, theoretically, one would expect group (c) to perform better than group (d).

The above two sets of comparisons were made separately for (i) the 1984 sessional examinations and (ii) the 1985 I.J.M.B. examinations. To compare the number of successful students in groups (a) and (b) the difference in their proportions was used. For this comparison the proportion of successful students in group (a), P_c and the proportion of successful students in group (b), P_{wc} were computed. The difference in their

proportions P_c and P_{wc} was used for the comparison in each subject. Because of the large number of students in each group, the distribution was assumed to be normal. The standard normal variate Z was again used to test the hypotheses. Theoretically one would expect a greater proportion of students with 'O' level credits in a subject to succeed in the examinations in the subject compared to proportion of successful students in the group without 'O' level credits in the subject. For this reason the level of significance chosen for the testing of hypotheses was 0.05.

B. Correlation Between Sessional and I.J.M.B. Examinations

To investigate the correlation between the year 1 sessional examination results and the I.J.M.B. results the grade points of randomly selected 50 students from each subject were used. The scores in the sessional examination were designated X and the I.J.M.B. scores were designated Y. The product moment coefficient of correlation (r) was calculated for each subject. The correlated test was used to test for significant difference between the measures of the pairs oi variables. The statistic used here was the student's 't' value at .05 level of significance.

3.5.3 Methodological Assumptions and Limitations of the Study

The use of the product moment coefficient of correlation to study the relationship between the students'

scores in the year 1 sessional examinations (X) and their scores in the I.J.M.B. examinations (Y), pre-supposes that the data being used form a normal distribution. Another assumption is that the variables X and Y could be linearly related, taking Y as the dependent variable and X as the independent variable. For the correlated test, the scores were assumed to be symmetrical so that the 't' statistic was used even though the sample sizes were rather large (N = 50). The use of correlation here does not in any way imply a cause and effect relationship.

The scores of students with and without 'O' level credits in each subject were assumed to be normally distributed so that the standard normal variate was used to test the appropriate hypotheses. It must be pointed out that the internal validity of the data here could also have been affected by some external factors.

3.6 Summary

The methods used for obtaining samples for data collection were (i) simple random samplin- and (ii) stratified random sampling. For the analysis of data, the standard normal variate z was used for the comparison of mean scores and proportion of successful students with 'O' level credits and students without 'O' level credits in each of the science subjects used for the study. The

student's 't' value was used for the comparison of academic performance of students with 'O' level credits in mathematics and students without 'O' level credits in mathematics in subjects other than mathematics.

The correlated test between the sessional scores and I.J.M.B. scores also used the students 't' value to test for significance. The level of significance adopted to test all the hypotheses in the study was 0.05. This was in order to minimize the probability (β) of accepting H_o when it is false (Type II error). In the next chapter a detailed presentation as well as the analysis of data are made.

CHAPTER 4

PRESENTATION AND ANALYSIS OF DATA

4.1 Introduction

In this chapter a summary of the data collected as well as the analysis of the data and findings based on the analysis are presented. The first part of the analysis deals with the comparison of the academic performance of students who had credits with students who had no credits in each of the following subjects: (1) Biology, (2) Chemistry, (3) Geography, (4) Mathematics and (5) Physics. The second part of the analysis deals with the comparison of academic performance of students who had credits with students who had no credits in Mathematics. This analysis was made for Biology, Chemistry, Geography and Physics. The last part of the analysis deals with correlation between the sessional and I.J.M.B. examinations. A summary of the results and findings marks the end of the chapter.

4.2 Comparative Analysis of Academic Performance

For this analysis the data collected were the students' grade points (see Section 3.5.1) in the 1984 sessional examinations and the 1985 I.J.M.B. examinations. The analysis was done separately for each of the subjects and for each of the examinations. For each subject three sets of analysis were made:

1. Comparison of academic performance of students who had credits with students who had no credits, in each subject.
2. Comparison of the proportion of passes of students who had credits with students who had no credits in each subject.
3. Comparison of academic performance (in each science subject other than mathematics) of students who had 'O' level mathematics credits with those who had no mathematics credits.

4.2.1 Comparison of Academic Performance of Students who had credits with students who had no credits in each subject

For this comparison the mean grade points and the standard deviation of students who had credits and students who had no credits in each subject were computed separately. Since academic ability is normally distributed for a large sample size ($N > 50$), the standard normal variate, z, was used for this comparison. The standard deviation of each group, the number of students in the group and the difference between the mean grade points of the two groups were used to obtain the calculted value of z for each subject. The investigation here is centred on whether those with 'O' level credits would perform better than students without 'O' level credits in each subject. Hence a one-tailed test was used to test the

appropriate hypotheses. The level of significance used for each test was 0.05.

(a) Biology

The hypothesis tested here was:

H_o: There is no significant difference between the academic performance of students who had 'O' level credits in Biology with students who hadn't.

H_1: The academic performance of students with 'O' level credits in Biology is significantly higher than the academic performance of students without 'O' level credits in Biology.

Symbolically:

H_o: $\mu_{BC} - \mu_{BWC} = 0$

H_1: $\mu_{BC} > \mu_{BWC}$

where H_o = null hypothesis

H_1 = alternative hypothesis

μ_{BC} = mean score of students with 'O' level credits in Biology

μ_{BWC} = mean score of students without 'O' level credits in Biology.

This analysis was done for both the 1984 sessional examinations and the 1985 I.J.M.B. examinations in Biology. Table 4.1 gives a summary of the results obtained.

Findings:

i) Sessional Examinations:

The calculated value of z is 4.22. This is greater than 1.645 which is the upper limit of acceptable values of

Table 4.1

Means and Standard Deviations of Scores of Students who had Credits and Students who had no Credits in Biology

Exam.	Group**	Number of Students (N)	Mean Score* ($\bar{X}$)	Standard Deviation (σ)	Calculated z
Sessional	C	120	1.78	1.19	4.22
	WC	89	1.11	1.09	
I.J.M.B.	C	85	1.93	1.20	1.39
	WC	43	1.62	1.19	

* The range of mean scores was between 0 and 5.

** C = with 'O' level credits in Biology

WC = without 'O' level credits in Biology,

$\bar{z}$ at 0.05 level of significance. At 0.05 level of significance the null hypothesis is therefore rejected. From the table the mean score of those with 'O' level credits is 1.78 compared to 1.11 for those without credits. The alternative hypothesis is therefore accepted. The conclusion on the basis of this finding is that the academic performance of students with 'O' level credits in Biology is significantly higher than the academic performance of students without 'O' level credits in Biology.

ii) I.J.M.B. Examinations:

The calculated value of $\bar{z}$ is 1.39 which is less than 1.645 the critical value of $\bar{z}$ at 0.05 level of significance. The null hypothesis is therefore retained at 0.05 level of significance. On the basis of this finding the conclusion is that there is no significant difference between the academic performance of students who had credits and students who had no credits in Biology in the I.J.M.B. examinations in Biology. The spread of scores of the two groups are also very similar as shown by their standard deviations in Table 4.1.

This difference in the results in Biology can be expected if note is taken of the fact that the year 1 students during the 1983/84 session spent only two terms in the college. Probably the remedial assistance for the students without credits in Biology did not take off before the end of their first year. The finding from the

I.J.M.B. examination is an indication that by the end of their year II differences in academic performance between those with and those without 'O' level credits in Biology seem to have disappeared. This may be attributed to the effect of remedial assistance combined with effective teaching in their second year.

(b) Chemistry:

The null hypothesis tested here was:

H_o: There is no significant difference between the academic performance of students who had 'O' level credits in Chemistry and students without 'O' level credits.

H_1: The academic performance of students with 'O' level credits in Chemistry is significantly higher than the academic performance of students without 'O' level credits in Chemistry.

Symbolically:

H_o: $\mu_{CC} - \mu_{CWC} = 0$

H_1: $\mu_{CC} > \mu_{CWC}$

where H_o, H_1 are the null and alternative hypothesis respectively and:

μ_{CC} = mean score of students with 'O' level credits in Chemistry.

μ_{CWC} = mean score of students without 'O' level credits in Chemistry.

This analysis was done for both the sessional and I.J.M.B. examinations and a summary of the results is presented in table 4.2.

Table 4.2

Means and Standard Deviations of Scores of Students who had Credits and Students who had no Credits in Chemistry

Exam.	Group**	Number of Students (N)	Mean Score* ($\bar{X}$)	Standard Deviation (σ)	Calculated $\bar{z}$
	C	135	0.96	1.17	
Sessional					1.58
	WC	85	0.74	0.89	
	C	82	2.06	1.31	
I.J.M.B.					1.42
	WC	50	1.74	1.22	

* The range of mean scores was between 0 and 5.

** C = with 'O' level credits in Chemistry

WC = without 'O' level credits in Chemistry

Findings:

i) Sessional Examinations:

The calculated value of $\bar{z}$ is 1.58 which is less than 1.645 the critical value of $\bar{z}$ at 0.05 level of significance. The null hypothesis is therefore retained at 0.05 level of significance. The conclusion is that there is no significant difference between the academic performance of students who had credits and students who had no credits in Chemistry, in the sessional examinations in Chemistry. However, from Table 4.2 the mean score of each of the two groups was a failure. The performance of the students was generally poor in the sessional examinations.

ii) I.J.M.B. Examinations:

The calculated value of $\bar{z}$ is 1.42 which is also less than 1.645, the critical value of $\bar{z}$ at 0.05 level of significance. The null hypothesis is therefore retained at 0.05 level of significance. The conclusion is that there is no significant difference between the academic performance of students who had credits and students who had no credits in Chemistry, in the I.J.M.B. examinations in Chemistry. From Table 4.2 each group recorded a mucher higher performance in the I.J.M.B. examinations.

The agreement between the findings for the sessional and I.J.M.B. examinations is quite striking. Under normal circumstances one would expect those with 'O' level credits in Chemistry to perform better than the students without 'O' level credits in Chemistry. That this has not been the

case might be due to the effect of remedial assistance given to the students without 'O' level credits in Chemistry. Effective teaching could also account for this, in part.

c) Geography:

The hypothesis tested here was:

H_o: There is no significant difference between the academic performance of students with 'O' level credits and students without 'O' level credits in Geography.

H_1: The academic performance of students with 'O' level credits in Geography is significantly higher than the academic performance of students without 'O' level credits in Geography.

Symbolically:

$H_o: \mu_{GC} - \mu_{GWC} = 0$

$H_1: \mu_{GC} > \mu_{GWC}$

where H_o, H_1 are the null and alternative hypothesis respectively, and:

μ_{GC} = mean score of students with 'O' level credits in Geography.

μ_{GWC} = mean score of students without 'O' level credits in Geography.

The analysis here was done for both the sessional and I.J.M.B. examinations. Table 4.3 gives a summary of the results.

Table 4.3

Means and Standard Deviations of Scores of Students who had credits and Students who had no credits in Geography

Exam.	Group**	Number of Students(N)	Mean Score* ($\bar{X}$)	Standard Deviation (σ)	Calculated z
	C	88	0.97	0.89	
Sessional					1.94
	WC	35	0.66	0.76	
	C	57	1.35	1.11	
I.J.M.B.					0.81
	WC	16	1.07	1.03	

* The range of mean scores was between 0 and 5.

** C = with '0' level credits in Geography

WC = without '0' level credits in Geography

Findings:

i) Sessional Examinations

The calculated value of $\bar{z}$ is 1.94. This is higher than 1.645 the upper limit of acceptable values of $\bar{z}$ at 0.05 level of significance. The null hypothesis is therefore rejected at 0.05 level of significance. The mean score of students with credits was 0.97 while that of students without credits was 0.66. On the basis of this the alternative hypothesis is accepted. The conclusion is that the academic performance of students with 'O' level credits in Geography is significantly higher than the academic performance of students without 'O' level credits in Geography. It should however be noted from Table 4.3 that the mean performance of each group was a failure. Thus the sessional results were poor.

ii) I.J.M.B. Examinations

The calculated value of $\bar{z}$ here is 0.81 which is less than 1.645, the critical value of $\bar{z}$ at 0.05 level of significance. The null hypothesis is therefore retained at 0.05 level of significance. The conclusion is that there is no significant difference between the academic performance of students who had credits and students who had no credits in Geography. Here again there was a marked improvement in the performance of the two groups in the I.J.M.B. examinations.

The difference between the findings for the sessional and I.J.M.B. examinations could be attributed to the failure of the students to adjust properly to academic conditions in the college during their first year or due to lack of remedial assistance in the first year for those without 'O' level credits in Geography.

(d) Mathematics

The hypothesis tested here was:

H_o: There is no significant difference between the academic performance of students who had credits and students who had no credits in Mathematics.

H_1: The academic performance of students with 'O' level credits in Mathematics is significantly higher than the academic performance of students without 'O' level credits in Mathematics.

Symbolically:

H_o: $\mu_{MC} - \mu_{MWC} = 0$

H_1: $\mu_{MC} > \mu_{MWC}$

where H_o, H_1 ar the null and alternative hypothesis respectively and:

μ_{MC} = mean score of students with 'O' level credits in Mathematics,

μ_{MWC} = mean score of students without 'O' level credits in Mathematics.

Table 4.4 gives a summary of the results for the analysis for both the sessional and I.J.M.B. examinations.

Findings:

i) Sessional Examinations

The computed value of z here is 2.18. This is greater than 1.645 the upper limit of acceptable values of z at 0.05 level of significance. The null hypothesis is thus rejected at 0.05 level of significance. From Table 4.4 the mean score of those with 'O' level credits was 1.11 while that of students without credits was 0.67 (a failure). The alternative hypothesis is therefore accepted. The conclusion is that for the sessional examinations in Mathematics, the academic performance of students with 'O' level credits in Mathematics is significantly higher than the academic performance of students without 'O' level credits in Mathematics.

ii) I.J.M.B. Examinations

The calculated value of z here is -0.24 which is less than 1.645, the critical value of z at 0.05 level of significance. The null hypothesis is therefore retained at 0.05 level of significance. The conclusion on the basis of this result is that there is no significant difference between the academic performance of students who had credits and students who had no credits in Mathematics. Here also, there is a marked improvement in the performance of those without credits (mean score = 1.32).

Table 4.4

Means and Standard Deviations of Scores of students who had Credits and Students who had no Credits in Mathematics

Exam.	Group**	Number of Students(N)	Mean Score* ($\bar{X}$)	Standard Deviation (σ)	Calculated z
	C	91	1.11	1.25	
Sessional					2.18
	WC	48	0.67	1.06	
	C	54	1.24	1.21	
I.J.M.B.					-0.24
	WC	19	1.32	1.25	

* The range of mean scores was between 0 and 5.

** C = with '0' level credits in Mathematics

WC = without '0' level credits in Mathematics

The difference between the findings for the sessional and I.J.M.B. examinations could be due to the effect of Remedial Mathematics given to students without 'O' level credits in Mathematics in both their first and second years in the college. Because of the duration of the year I course for the 1983/84 session (two terms), the students seemed not to have benefited from such remedial assistance during their first year.

e) Physics:

The hypothesis tested here was:

H_o: There is no significant difference between the academic performance of students who had credits and students who had no credits in Physics.

H_1: The academic performance of students with 'O' level credits in Physics is significantly higher than the academic performance of students without 'O' level credits in Physics.

Symbolically:

H_o: $\mu_{PC} - \mu_{PWC} = 0$

H_1 $\mu_{PC} > \mu_{PWC}$

where H_o, and H_1 are the null and alternative hypothesis respectively and:

μ_{PC} = mean score of students with 'O' level credits in Physics,

μ_{PWC} = mean score of students without 'O' level credits in Physics.

Table 4.5 gives a summary of the results for the analysis for both the sessional and I.J.M.B. examinations.

Findings:

i) Sessional Examinations

The computed value of $\bar{z}$ here is 3.71 which is higher than 1.645 the upper limit of acceptable values of $\bar{z}$ at 0.05 level of significance. The null hypothesis is therefore rejected at 0.05 level of significance. From Table 4.5 the mean score of those with credits was 1.26 compared to 0.63 for those without credits. The alternative hypothesis is thus accepted. The conclusion is that the academic performance of students with 'O' level credits in Physics is significantly higher than the academic performance of students without 'O' level credits in Physics. It should be noted that the mean score of those without credits was a failure.

ii) I.J.M.B. Examinations

The calculated value of $\bar{z}$ is 1.07 which is smaller than 1.645 the critical value of $\bar{z}$ at 0.05 level of significance. The null hypothesis is therefore retained at 0.05 level of significance. The conclusion is that there is no significant difference between the academic performance of students who had credits and students who had no credits in Physics.

Here again the findings for the sessional and I.J.M.B. examinations seem to be at variance. If no remedial assistance had been offered to the students without 'O' level credits in Physics one would have expected the

Table 4.5

Means and Standard Deviations of Scores of Students who had Credits and Students who had no credits in Physics.

Exam.	Group**	Number of Students(N)	Mean Score* ($\bar{X}$)	Standard Deviation (σ)	Calculated z
	C	97	1.26	1.32	
Sessional					3.71
	WC	65	0.63	0.84	
	C	62	1.82	1.35	
I.J.M.B.					1.07
	WC	22	1.48	1.25	

* The range of mean scores was between 0 and 5.

** C = with 'O' level credits in Physics

WC = without 'O' credits in Physics

findings for the sessional and I.J.M.B. examinations to be in agreement. Differences between the two groups of students must have disappeared at the end of their year II due to the effect of remedial assistance given to the students without 'O' level credits in Physics.

4.2.2 Comparison of Proportion of Passes of Students who had credits with Students who no credits in each subject

This part of the study is a follow up from the first part of the analysis. The comparison of mean scores of students with and without 'O' level credits in each subject only provided information about the qualitative aspect of students' academic performance. This part of the study seeks to provide information regarding the distribution of passes within each of the two groups. To realize this objective, the proportion of passes of students who had credits and students who had no credits in each subject were compared for the sessional and I.J.M.B. examinations. Since academic ability is normally distributed, for a large sample size, the distribution was assumed to be normal. The standard normal variate Z was again used to test the appropriate hypotheses. For this comparison, the proportion of successful students and the number of students who had credits and students who had no credits in each subject were used to obtain the calculated value of the Z statistic. The 0.05 level of significance was used to test for significant difference between the proportion of successful

students. This is because theoretical consideration is in favour of a greater proportion of successful students among those with 'O' level credits in their subjects. As in the previous comparison, the emphasis here is on whether the proportion of students with 'O' level credits in each subject who succeeded in the examinations in the subject would be greater than that of students without 'O' level credits in the subject. For this reason a one-tailed test was used for the hypothesis testing.

(a) Biology

The hypothesis tested here was:

H_o: There is no significant difference between the proportion of passes of students who had credits and students who had no credits in Biology.

H_i: The proportion of students with 'O' level credits in Biology who succeeded in Biology examinations is significantly greater than that of students without 'O' level credits in Biology.

Symbolically:

H_o: $P_{BC} - P_{BWC} = 0$

H_1: $P_{BC} > P_{BWC}$

where H_o = Null hypothesis

H_1 = Alternative hypothesis

P_{BC} = Proportion of students without 'O' level credits in Biology who succeeded in Biology examination.

$$\left(\text{i.e. } P_{BC} = \frac{\text{number of passes of students with Biology credits}}{\text{Total number of students with Biology credits}} \right)$$

P_{BWC} = proportion of students without 'O' level credits in Biology who succeeded in Biology examination.

$$\left\{ \text{i.e. } P_{BWC} = \frac{\text{number of passes of students without Biology credits}}{\text{Total number of students without Biology credits}} \right\}$$

Table 4.6 gives a summary of the results for the analysis for both the sessional and I.J.M.B. examinations in Biology.

Findings:

i) Sessional Examinations

The calculated value of $\bar{z}$ is 3.26, which is greater than 1.645, the critical value of $\bar{z}$ at 0.05 level of significance. The null hypothesis is therefore rejected. From Table 4.6 the proportion of passes for students with credits was 0.83 while that of students without credits was 0.63. On the basis of this, the alternative hypothesis is accepted. The conclusion is that the proportion of students with 'O' level credits in Biology who succeeded in Biology examinations is significantly greater than that of students without 'O' level credits in Biology.

ii) I.J.M.B. Examinations

The calculated value of $\bar{z}$ is 2.58 which is greater than 1.645, the upper limit of acceptable values of $\bar{z}$ at 0.05 level

Table 4.6

Proportion of Passes of Students who had Credits and Students who had no Credits in Biology

Exam.	Group**	Number of Students(N)	Number of Passes (n)	Proportion of Passes (P)	Calculated z
	C	120	99	.83	
Sessional					3.26
	WC	89	56	.63	
	C	85	72	.85	
I.J.M.B.					2.58
	WC	43	28	.65	

** C = with 'O' level credits in Biology.

WC = without 'O' level credits in Biology.

of significance. Again the null hypothesis is rejected. The proportion of passes of students with 'O' level credits was 0.85 compared to 0.65 for students without 'O' level credits. The alternative hypothesis is therefore accepted. The conclusion is that the proportion of students with 'O' level credits in Biology who succeeded in Biology examinations is significantly greater than that of students without 'O' level credits in Biology.

Findings from both the sessional and I.J.M.B. examinations are in agreement with theoretical expectation. This implies that the probability of success of a student with 'O' level credit in Biology is much higher than that of a student without 'O' level credit in Biology for both the sessional and I.J.M.B. examinations in Biology.

(b) Chemistry

The hypothesis tested here was:

H_o There is no significant difference between the proportion of passes of students who had credits and students who had no credits in Chemistry.

H_1: The proportion of students with 'O' level credits in Chemistry who succeeded in the examinations in Chemistry is significantly greater than that of students without 'O' level credits in Chemistry.

Symbolically:

H_o: $P_{CC} - P_{CWC} = 0$

H_1: $P_{CC} > P_{CWC}$

where H_o = null hypothesis

H_1 = alternative hypothesis

P_{CC} = proportion of students with 'O' level credits in Chemistry who succeeded in Chemistry examination.

$$\left\{ \text{i.e. } P_{CC} = \frac{\text{number of passes of students with credits in Chemistry}}{\text{total number of students with credits in Chemistry}} \right\}$$

P_{CWC} = proportion of students without 'O' level credits in Chemistry who succeeded in Chemistry examination.

$$\left\{ \text{i.e. } P_{CWC} = \frac{\text{number of passes of students without credits in Chemistry}}{\text{total number of students without credits in Chemistry}} \right\}$$

Table 4.7 gives a summary of the results for the analysis for both the sessional and I.J.M.B. examinations.

Findings:

i) Sessional Examinations

The calculated value of $\bar{z}$ is 0.14 which is less than 1.645, the upper limit of $\bar{z}$ at 0.05 level of significance.

Table 4.7

Proportion of Passes of Students who had Credits and Students who had no Credits in Chemistry

Exam.	Group**	Number of Students (N)	Number of Passes (n)	Proportion of Passes (P)	Calculated z
	C	135	71	.53	
Sessional					0.14
	WC	85	44	.52	
	C	82	68	.83	
I.J.M.B.					0.98
	WC	50	38	.76	

** C = with 'O' level credits in Chemistry

WC = without 'O' level credits in Chemistry

The null hypothesis is therefore retained. From Table 4.7 the proportion of passes for those with credits was 0.53 compared to 0.52 for those without credits. The conclusion is that there is no significant difference between the proportion of passes of students who had credits and students who had no credits in Chemistry.

ii) I.J.M.B. Examinations

The calculated value of $\bar{z}$ is 0.98 which is less than 1.645, the critical value of $\bar{z}$ at 0.05 level of significance. The null hypothesis is therefore retained at this level of significance. The conclusion is that there is no significant difference between the proportion of passes of students who had credits and students who had no credits in Chemistry.

The findings for both the Sessional and I.J.M.B. examinations inspite of their agreement are contrary to theoretical expectations. Theoretically, the proportion of students with 'O' level credits in Chemistry who succeeded in the Chemistry examinations is expected to be greater. That this has not been the case can only be attributed to the effect of some remedial assistance given to the students without 'O' level credits in Chemistry. Effective teaching could also have contributed to this result.

(c) Geography

The hypothesis tested for Geography was:

H_o: There is no significant difference between the proportion of passes of students who had credits and students who had no credits in Geography.

H_i: The proportion of students with 'O' level credits in Geography who succeeded in the examinations in Geography is significantly greater than that of students without 'O' level credits in Geography.

Symbolically:

H_o: $P_{GC} - P_{GWC} = 0$

H_1: $P_{GC} > P_{GWC}$

where H_o = null hypothesis

H_1 = alternative hypothesis

P_{GC} = proportion of students with 'O' level credits in Geography who succeeded in Geography examinations

(i.e. P_{GC} = number of passes of students with Geography credits / total number of students with Geography credits.)

P_{GWC} = proportion of students without 'O' level credits in Geography who succeeded in Geography examinations

(i.e. P_{GWC} = number of passes of students without Geography credits. / total number of students without Geography credits)

Table 4.8 gives a summary of the results for the analysis for both the sessional and I.J.M.B. examinations

Table 4.8

Proportion of Passes of Students who had Credits and Students who had no credits in Geography

Exam.	Group**	Number of Students (N)	Number of Passes (n)	Proportion of Passes (P)	Calculated z
	C	88	61	.69	
Sessional					1.88
	WC	35	18	.51	
	C	57	42	.74	
I.J.M.B.					1.83
	WC	16	8	.50	

** C = with '0' level credits in Geography

WC = without '0' level credits in Geography

Findings:

i) Sessional Examinations

The calculated value of $\bar{z}$ here is 1.88 which is greater than 1.645, the upper limit of acceptable values of $\bar{z}$ at 0.05 level of significance. Hence the null hypothesis is rejected. From Table 4.8 the proportion of passes for the students with 'O' level credits in Geography was 0.69 compared to 0.51 for those without 'O' level credits. On the basis of this evidence, the alternative hypothesis is accepted. The conclusion is that the proportion of students with 'O' level credits in Geography who succeeded in the examinations in Geography is significantly greater than that of students without 'O' level credits in Geography.

ii) I.J.M.B. Examinations

The calculated value of $\bar{z}$ here is 1.83. This is again greater than 1.645, the critical value of $\bar{z}$ at 0.05 level of significance. The null hypothesis is therefore rejected at this level of significance. From Table 4.8 the proportion of passes for the students with credits was 0.74 compared to 0.50 for those without credits. On the basis of this evidence the alternative hypothesis is accepted. The conclusion is that the proportion of students with credits in Geography who succeeded in the examinations in Geography is significantly greater than that of students without 'O' level credits in Geography.

The findings for both the Sessional and I.J.M.B. examinations are in agreement with theoretical expectation. That a significantly greater proportion of students with 'O' level credits in Geography succeeded in the Geography examinations implies that the probability of success of a student with 'O' level credit in Geography is much higher than that of a student without 'O' level credit in Geography.

(d) Mathematics

The hypothesis tested for Mathematics was:

H_o: There is no significant difference between the proportion of passes of students who had credits and students who had no credits in Mathematics.

H_i: The proportion of students with 'O' level credits in Mathematics who succeeded in the examinations in Mathematics is significantly greater than that of students without 'O' level credits in Mathematics.

Symbolically:

H_o: $P_{MC} - P_{MWC} = 0$

H_1: $P_{MC} > P_{MWC}$

where H_o = null hypothesis,

H_1 = alternative hypothesis,

P_{MC} = proportion of students with 'O' level credits in Mathematics who succeeded in Mathematics examination$.

i.e. P_{MC} = number of passes of students with Mathematics credits / total number of students with mathematics credits

P_{MWC} = proportion of students without '0' level credits in mathematics who succeeded in mathematics examinations.

i.e. P_{MWC} = number of passes of students without mathematics credits / total number of students without mathemactics credits.

A summary of the results for the analysis for both the sessional and I.J.M.B. examinations is presented in Table 4.9.

Findings:

i) Sessional Examinations

The calculated value of z here is 2.13. This is greater than 1.645, the critical value of z at 0.05 level of significance. The null hypothesis is therefore rejected. From Table 4.9 the proportion of passes for the students with '0' level credits in Mathematics was 0.57 compared to 0.38 for those without '0' level credits. On the basis of this evidence, the alternative hypothesis is accepted. The conclusion is that the proportion of students with '0' level credits in mathematics who succeeded in the sessional examinations in mathematics, is significantly greater than that of students without '0' level credits in Mathematics.

Table 4.9

Proportion of Passes of Students who had Credits and Students who had no credits in Mathematics

Exam.	Group**	Number of Students (N)	Number of Passes (n)	Proportion of Passes (P)	Calculated z
Sessional	C	91	52	.57	2.13
	WC	48	18	.38	
I.J.M.B.	C	54	34	.63	0.00
	WC	19	12	.63	

** C = with 'O' level credits in Mathematics.

WC = without 'O' level credits in Mathematics.

ii) I.J.M.B. Examinations

The calculated value of $\bar{z}$ is 0.00 which is within the range of acceptable values of $\bar{z}$ at 0.05 level of significance. The null hypothesis is therefore retained. From Table 4.9 the proportion of passes for each group was 0.63. The conclusion is that for the I.J.M.B. examinations in Mathematics, there is no significant difference in the proportion of passes of students who had credits and students who no credits in Mathematics.

The difference in the findings for the sessional and I.J.M.B. examinations might have been due to the effects of the Remedial Mathematics programme organized for students without 'O' level credits in Mathematics. Again the remedial assistance given to the students without 'O' level credits in Mathematics did not seem to have had any significant effect on the performance of the students during the year 1 sessional examinations.

(e) Physics

The hypothesis tested for physics was:

H_o: There is no significant difference between the proportion of passes of students who had credits and students who had no credits in Physics.

H_i The proportion of students with 'O' level credits in Physics who succeeded in the examinations in Physics is significantly greater than that of students without 'O' level credits in Physics.

Symbolically:

H_o: $P_{PC} - P_{PWC} = 0$

H_1: $P_{PC} > P_{PWC}$

where H_o, H_i are the null and alternative hypothesis respectively and:

P_{PC} = proportion of students with 'O' level credits in Physics who succeeded in Physics examination.

$$\left(\text{i.e. } P_{PC} = \frac{\text{number of passes of students with Physics credits}}{\text{total number of students with Physics credits}}\right)$$

P_{PWC} = proportion of students without 'O' level credits in Physics who succeeded in Physics examination.

$$\left(\text{i.e. } P_{PWC} = \frac{\text{number of passes of students without Physics credits}}{\text{total number of students without Physics credits}}\right)$$

Table 4.10 gives a summary of the results for the analysis for both the sessional and I.J.M.B. examinations in Physics.

Findings:

i) Sessional Examinations

The calculated value of $\bar{z}$ here is 2.25 which is higher than 1.645, the upper limit of $\bar{z}$ at 0.05 level of significance. Hence the null hypothesis is rejected. From Table 4.10 the proportion of passes for the students with 'O' level credits in Physics was 0.61 while the proportion of passes for the students without 'O' level credits was 0.43. On the basis of this evidence, the

Table 4.10

Proportion of Passes of Students who had Credits and Students who had no Credits in Physics

Exam.	Group**	Number of Students (N)	Number of Passes (n)	Proportion of Passes (P)	Calculated $\bar{z}$
	C	97	59	.61	
Sessional					2.25
	WC	65	28	.43	
	C	62	48	.77	
I.J.M.B.					0.38
	WC	22	16	.73	

** C = with 'O' level credits in Physics

WC = without 'O' level credits in Physics

alternative hypothesis is accepted. The conclusion is that for the sessional examinations, the proportion of students with 'O' level credits in Physics who succeeded in the examinations in Physics is significantly greater than that of students without 'O' level credits in Physics.

ii) I.J.M.B. Examinations

The calculated value of $\bar{z}$ here is 0.38 which is less than 1.645, the critical value of $\bar{z}$ at 0.05 level of significance. The null hypothesis is therefore retained at this level of significance. The conclusion is that there is no significant difference between the proportion of passes of students who had credits and students who had no credits in Physics for the I.J.M.B. examinations in Physics.

The difference between the findings for the sessional and I.J.M.B. examinations could be attributed to the effects of remedial assistance probably given to the students without 'O' level credits in Physics.

4.2.3 Comparison of Academic Performance of Students who had credits in Mathematics with Students who had no credits in Mathematics

To investigate the effect of 'O' level Mathematics achievement on the academic performance of students in Biology, Chemistry, Geography and Physics, a comparison was made between the academic performance of students who

had credits and students who had no credits in Mathematics for each of these science subjects. The mean grade points, the standard deviation and the number of students in each of the two groups being compared were used to obtain the calculated value of the student's 't' value which was used to test the appropriate hypothesis here. The choice of the 't' statistic here was because of the small size of most of the samples involved in this comparison. Where the number of students was more than 50, a random sample of 50 students was used to obtain the data for the analysis here. The 0.05 level of significance was used for the hypothesis testing because theoretically, the students with 'O' level credits in Mathematics are expected to perform better than those without 'O' level credits in Mathematics. The emphasis here was also on whether those with 'O' level credits in Mathematics would perform better. Hence a one-tailed test was used for the hypothesis testing.

(a) Biology

The hypothesis tested here was:

H_o: There is no significant difference between the academic performance of Biology students who had credits and Biology students who had no credits

in Mathematics.

H_1: The academic performance of Biology students with 'O' level credits in Mathematics is significantly higher than that of Biology students without 'O' level credits in Mathematics.

Symbolically:

$$H_o: \quad \mu_{BCM} - \mu_{BWCM} = 0$$

$$H_1: \quad \mu_{BCM} > \mu_{BWCM}$$

where H_o: = the null hypothesis

H_1 = the alternative hypothesis

μ_{BCM} = mean score of Biology students with 'O' level credits in Mathematics

μ_{BWCM} = mean score of Biology students without 'O' level credits in Mathematics.

Table 4.11 gives a summary of the results for the analysis for both the sessional and I.J.M.B. examinations in Biology.

Table 4.11

Means and Standard Deviations of Biology Students who had Credits and Biology Students who had no credits in Mathematics

Exam.	Group**	Number of Students (N)	Mean Score* ($\bar{X}$)	Standard Deviation (S)	Calculated 't'
	MC	50	1.70	1.20	
Sessional					-0.49
	WMC	50	1.82	1.27	
	MC	37	1.78	1.38	
I.J.M.B.					-0.97
	WMC	50	2.04	1.11	

* The range of mean scores was between 0 and 5.

** MC = with 'O' level Mathematics credits

WMC = without 'O' level Mathematics credits

Findings:

i) Sessional Examinations

The calculated value of the student's 't' is -0.49 which is less than 1.664, the tabulated value of 't' at 98 degrees of freedom and at 0.05 level of significance. The null hypothesis is retained at this level of significance. From Table 4.11 there is a close agreement between the mean scores and standard deviations of the two groups. The conclusion is that there is no significant difference between the academic performance of Biology students who had credits and Biology students who had no credits in Mathematics, for the sessional examinations in Biolgoy.

ii) The I.J.M.B. Examinations

The calculated value of the student's 't' is -0.97 which is less than 1.665, the tabulated value of 't' at 85 degrees of freedom and at 0.05 level of significance. The null hypothesis is therefore retained at this level of significance. The conclusion is that there is no significant difference between the academic performance of Biology students who had credits and Biology students who had no credits in Mathematics, for the I.J.M.B. examinations in Biology.

The agreement between the findings for both the sessional and I.J.M.B. examinamitions is quite striking. Theoretically, the students with 'O' level credits in

Mathematics are expected to perform better. That there is no difference between the academic performance of the two groups of students might be attributed to the effects of the compulsory Remedial Mathematics programme organised for all science students without 'O' level credits in Mathematics.

(b) Chemistry

The hypothesis tested here was:

H_o: There is no significant difference between the academic performance of Chemistry students who had credits and Chemistry students who had no credits in Mathematics.

H_1: The academic performance of Chemistry students with 'O' level credits in Mathematics is significantly higher than that of Chemistry students without 'O' level credits in Mathematics.

Symbolically:

$H_o: \mu_{CCM} - \mu_{CWCM} = 0$

$H_1: \mu_{CCM} > \mu_{CWCM}$

where H_o, H_1 are the null and alternative hypothesis respectively and:

μ_{CCM} = Mean score of Chemistry students with 'O' level credits in Mathematics.

μ_{CWCM} = Mean score of Chemistry students without 'O' level credits in Mathematics.

Table 4.12 gives a summary of the results for the analysis for both the sessional and I.J.M.B. examinations in Chemistry.

Table 4.12

Means and Standard Deviations of Chemistry Students who had Credits and Chemistry Students who had no credits in Mathematics

Exam.	Group**	Number of Students (N)	Mean Score* ($\bar{X}$)	Standard Deviation (S)	Calculated 't'
	MC	50	1.34	1.32	
Sessional					0.95
	WMC	50	1.12	0.98	
	MC	50	2.28	1.23	
I.J.M.B.					0.87
	WMC	50	1.98	1.22	

* The range of mean scores was between 0 and 5.

** MC = with '0' level Mathematics credits

WMC = without '0' level Mathematics credits

Findings:

i) Sessional Examinations

The calculated value of the student's 't' here is 0.95. This is less than 1.664, the tabulated value of 't' at 98 degrees of freedom and at 0.05 level of significance. The null hypothesis is therefore retained. The conclusion is that there is no significant difference between the academic performance of Chemistry students who had credits and Chemistry students who had no credits in Mathematics.

ii) I.J.M.B. Examinations

The calculated value of the student's 't' here is 0.87 which is again less than 1.664, the critical value of 't' at 98 degrees of freedom and at 0.05 level of significance. The null hypothesis is again retained. The conclusion is that there is no significant difference between the academic performance of Chemistry students who had credits and Chemistry students who had no credits in Mathematics.

Again there is a striking agreement between the findings from the sessional and I.J.M.B. examinations which is contrary to theoretical expectation. That there is no significant difference between the academic performance of the two groups of students might be attributed to the effects of the Remedial Mathematics course organised for science students without 'O' level credits in Mathematics.

(c) Geography

The hypothesis tested for Geography was:

H_o: There is no significant difference between the academic performance of Geography students who had credits and Geography students who had no credits in Mathematics.

H_1: The academic performance of Geography students with 'O' level credits in Mathematics is significantly higher than the academic performance of Geography students without 'O' level credits in Mathematics.

Symbolically:

$H_o: \mu_{GCM} - \mu_{GWCM} = 0$

$H_1: \mu_{GCM} > \mu_{GWCM}$

where H_o, H_1 are the null and alternative hypothesis respectively and:

μ_{GCM} = Mean score of Geography students with 'O' level credits in Mathematics

μ_{GWCM} = Mean score of Geography students without credits in Mathematics.

Table 4.13 gives a summary of the results for the analysis for both the sessional and I.J.M.B. examinations in Geography.

Table 4.13

Means and Stadard Deviations of Geography Students who had Credits and Geography Students who had no credits in Mathematics.

Exam.	Group**	Number of Students (N)	Mean Score*	Standard Deviation (S)	Calculated 't'
	MC	25	0.96	1.06	
Sessional					-0.26
	WMC	50	1.02	0.87	
	MC	14	1.07	1.00	
I.J.M.B.					-0.89
	WMC	50	1.34	1.00	

* The range of mean scores was between 0 and 5

** MC = with 'O' level Mathematics credits

WMC = without 'O' level Mathematics credits

Findings:

i) Sessional Examinations

The calculated value of the student's 't' here is -0.26 which is less than 1.669, the critical value of 't' at 73 degrees of freedom and at 0.05 level of significance. The null hypothesis is retained at this level of significance. The conclusion is that there is no significant difference between the academic performance of Geography students who had credits and Geography students who had no credits in Mathematics.

ii) I.J.M.B. Examinations

The calculated value of the student's 't' here is -0.89 which is less than 1.67, the critical value of 't' at 62 degrees of freedom and at 0.05 level of significance. The null hypothesis is therefore retained. The conclusion again is that there is no significant difference between the academic performance of Geography students who had credits and Geography students who had no credits in Mathematics.

Here again the findings from the sessional and I.J.M.B. examinations are in complete agreement. The lack of difference between the academic performance of students who had credits and students who had no credits in Mathematics can be attributed to the effects of the Remedial Mathematics which is compulsory for all science students.

(d) Physics

The hypothesis tested for Physics was:

H_o: There is no significant difference between the academic performance of Physics students who had credits and Physics students who had no credits in Mathematics.

H_1: The academic performance of Physics students with 'O' level credits in Mathematics is significantly higher than the academic performance of Physics students without 'O' level credits in Mathematics.

Symbolically:

H_o: $\mu_{PCM} - \mu_{PWCM} = 0$

H_1: $\mu_{PCM} > \mu_{PWCM}$

where H_o, H_1 are the null and alternative hypothesis respectively and:

μ_{PCM} = Mean score of Physics students with 'O' level credits in Mathematics,

μ_{PWCM} = Mean score of Physics students without 'O' level credits in Mathematics.

A summary of the results for the analysis for both the sessional and I.J.M.B. examinations in Physics is given in Table 4.14.

Table 4.14

Means and Standard Deviations of Physics Students who had Credits and Physics Students who had no Credits in Mathematics

Exam.	Group**	Number of Students (N)	Mean Score* ($\bar{X}$)	Standard Deviation (S)	Calculated 't'
	MC	50	1.49	1.38	
Sessional					1.71
	WMC	50	0.92	0.91	
	MC	46	1.91	1.38	
I.J.M.B.					1.66
	WMC	38	1.43	1.24	

* The range of mean scores was between 0 and 5.

** MC = with '0' level Mathematics credits.

WMC = without '0' level Mathematics credits.

Findings:

i) Sessional Examinations

The calculated value of the student's 't' is 1.71 which is greater than 1.664, the tabulated value of 't' at 98 degrees of freedom and at 0.05 level of significance. The null hypothesis is therefore rejected. From Table 4.14 the mean score of students with credits in Mathematics was 1.49 compared to 0.92 for those without credits in Mathematics. Hence the alternative hypothesis is accepted. The conclusion is that the academic performance of Physics students with 'O' level credits in Mathematics is significantly higher than that of Physics students without 'O' level credits in Mathematics.

ii) I.J.M.B. Examinations

The calculated value of the student's 't' here is 1.66 which is less than 1.668, the tabulated value of 't' at 82 degrees of freedom and at 0.05 level of significance. The null hypothesis is therefore retained. The conclusion is that there is no significant difference between the academic performance of Physics students who had credits and students who had no credits in Mathematics.

The apparent contradiction between the findings from the sessional and I.J.M.B. examinations might be explained by the effects of the Remedial Mathematics programme organised for science students without 'O' level

credits in Mathematics. In the sessional examinations the effects of the remedial course in mathematics did not seem to have had any significant effect on the performance of the two groups of students probably because of the high mathematical content in the Physics course. This can also explain the high 't' value obtained for the I.J.M.B. examinations which was very close to the critical value of 't'.

4.3 Analysis of Correlation Between Sessional and I.J.M.B. Examinations

The first part of the data analysis in this chapter delt with the comparison of the academic performance of two groups of students within each subject. The comparison was done for both the sessional and I.J.M.B. examinations and the findings from both examinations were compared. The comparison between the sessional and I.J.M.B. examinations for the findings pre-supposes that a relationship exists between the students' scores in the sessional and I.J.M.B. examinations. This study would therefore not be complete without an investigation of the correlation between the sessional and I.J.M.B. examinations in each subject. The scores of the randomly selected 50 students (who took the 1985 I.J.M.B. examinations) in both the sessional and I.J.M.B. examinations were used to compute the product moment correlation coefficient in each subject. Tests were also conducted for significant positive correlation in each subject. For the tests of

the appropriate hypotheses the student's 't' value was used because of the small size of the samples and the symmetrical distribution of academic ability. The calculated values of 't' were obtained for each subject using the number of students in each subject sample and the product moment coefficient of correlation for the subject.

For the tests of hypotheses here serial numbers were assigned to the subjects as follows: (1) Biology, (2) Chemistry, (3) Geography, (4) Mathematics and (5) Physics. Five separate tests were conducted, one for each subject. The hypothesis tested for subject number i was:

Ho_i: There is no significant positive correlation between the students scores in the sessional and I.J.M.B. examinations in subject number i.

$H1_i$: There is a significant positive correlation between the students' scores in the Sessional and I.J.M.B. examinations in subject number i.

Symbolically,

$Ho_i : \rho_i = 0$

$H1_i : \rho > 0,$

where: Ho_i = null hypothesis for subject number i,

$H1_i$ = alternative hypothesis for subject number i,

ρ_i = the population product moment correlation coefficient for subject number i,

and i = 1, 2, 3, 4, 5.

The 0.05 level of significance was used for the test of hypotheses here because, under normal circumstances it is expected that the students' scores in the sessional and I.J.M.B. examinations would have a significant positive correlation coefficient. Since the number of students in each subject sample was 50, the degrees of freedom for the student's 't' value for each test is 48. Table 4.15 gives a summary of the results for the correlational analysis.

Table 4.15

Correlation Coefficients between Students' Scores in the Sessional and I.J.M.B. Examinations in various Science Subjects

Subject	Number of Students (N)	Coefficient of Correlation (τ)	Calculated 't'
Biology	50	0.48	3.72
Chemistry	50	0.54	4.44
Geography	50	0.23	1.64
Mathematics	50	0.43	3.30
Physics	50	0.52	4.22

Findings:

1. Biology

The calculated value of the student's 't' here is 3.74 which is greater than the tabulated value of 1.67 for 't' at 48 degrees of freedom and at 0.05 level of significance. The null hypothesis is therefore rejected. From Table 4.15 the coefficient of correlation (r) for Biology was 0.48. On the basis of this evidence the alternative hypothesis is accepted. The conclusion is that there is a significant positive correlation between the sessional and I.J.M.B. scores of the students in Biology.

2. Chemistry

The calculated value of the students 't' here is 4.44 which is greater than 1.67, the critical value of 't' at 48 degrees of freedom and at 0.05 level of significance. The null hypothesis is therefore rejected. From Table 4.15 the coefficient of correlation (r) for Chemistry was 0.54. On the basis of this evidence, the alternative hypothesis is accepted. The conclusion is that there is a significant positive correlation between the students' scores in the sessional and I.J.M.B. examinations in Chemistry.

3. Geography

The calculated value of the student's 't' here is 1.64 which is smaller than 1.67, the tabulated value of

't' at 48 degrees of freedom and at 0.05 level of significance. The null hypothesis is retained and the conclusion is that there is no significant positive correlation between the students' scores in the sessional and I.J.M.B. examinations in Geography. This finding probably explains the difference in the findings for the sessional and I.J.M.B. examinations in the first part of the analysis of data in which the academic performance of students who had credits and students who had no credits in Geography were compared (see table 4.3). This situation in Geography could have resulted from the effects of external factors whose effects were assumed to be minimal on the findings of this study.

4. Mathematics.

The calculated value of the student's 't' here is 3.30 which is greater than 1.67, the tabulated value of 't' at 48 degrees of freedom and at 0.05 level of significance. The null hypothesis is therefore rejected. From Table 4.15 the coefficient of correlation for Mathematics was 0.43. On the basis of this evidence the alternative hypothesis is accepted. The conclusion is that there is a significant positive correlation between the students scores in the sessional and I.J.M.B. examinations in Mathematics.

5. Physics.

The calculated value of the student's 't' here is 4.22 which is higher than 1.67 the tabulated value of 't'

at 48 degrees of freedom and at 0.05 level of significance. The null hypothesis is therefore rejected. The coefficient of correlation for Physics was 0.52. Hence the alternative hypothesis is accepted. The conclusion is that there is a significant positive correlation between the students' scores in the sessional and I.J.M.B. examinations in Physics.

4.4 Summary of the Findings

1. Except in Chemistry, the academic performance of students with 'O' level credits in each subject was significantly higher than that of students without 'O' level credits in the subject for the sessional examinations. In Chemistry there was no significant difference between the academic performance of those with and without 'O' level credits in Chemistry.

2. There was no significant difference between the academic performance of students who had 'O' level credits and students who hadn't 'O' level credits in each subject in the I.J.M.B. examinations, for all the science subjects studied.

3. Except in Chemistry, the proportion of students with 'O' level credits who succeeded in the sessional examinations in each subject was significantly better than that of students without 'O' level credits. In Chemistry there was no significant difference between the proportion of passes

of students who had credits and students who had no credits, for the sessional examinations.

4. There was no significant difference between the proportion of passes of students who had credits and students who had no credits, for the I.J.M.B. examinations in Chemistry, Mathematics and Physics. A significantly greater proportion of students with 'O' level credits passed in Biology and Geography compared to those without 'O' level credits in these subjects.

5. In the sessional examinations there was no significant difference between the academic performance of students who had credits and students who had no credits in Mathematics, for all the science subjects studied except Physics. Those with 'O' level Mathematics credits performed better in Physics.

6. There was no significant difference between the academic performance of students who had credits and students who had no credits in Mathematics, for all the science subjects in the I.J.M.B. examinations.

7. Significant positive correlations were found between the students' scores in the sessional and I.J.M.B. examinations in all the science subjects

studied except Geography. There was no significant positive correlation between the students' scores in the sessional and I.J.M.B. examinations in Geography.

In the next chapter the summary of the whole study as well as the conclusions and recommendations based on the study are presented.

CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

The study was undertaken to find out the effects of entry qualifications on students' academic performance in science subjects. Specifically, the study set out to find out if the academic performance of students without 'O' level credits in their I.J.M.B. subjects compared favourably with that of students with 'O' level credits in their subjects. The study was also aimed at finding out if any measure of success was achieved in allowing students to offer science subjects at the I.J.M.B. level in which they had failed to secure credit passes at 'O' level. Towards this end the proportion of students who had credits and students who had no credits who succeeded in the examinations in each subject was also investigated. An investigation of the effects of 'O' level mathematics achievement on the academic performance of students in subjects other than Mathematics was also undertaken in the study. The study also sought to find out if there was any significant positive correl tion between the year I (sessional examination) results and the final (I.J.M.B.) results at the end of year II.

The study covered the academic performance of the 1983/84 year I science intake in the College of Advanced Studies, Zaria. The academic performance of the students

in Biology, Chemistry, Geography, Mathematics and Physics for two successive academic sessions were used for the study. The study started with 341 students during the 1983/84 session. Only 189 of these students passed the year I sessional examinations. Out of this number four students withdrew voluntarily from the college so that only 185 of the students were left for the 1984/85 academic session. The students' registration forms, personal files, sessional and I.J.M.B. results were used for the data collection. The students' scores used for the data analysis were in grade points. The study utilized both simple random sampling and stratified random sampling for data collection.

For the analysis of data, the academic performance of the students was assumed to be normally distributed, since academic ability is normally distributed for a large sample size. The standard normal variate $\pm$ was therefore used to test the hypotheses evolved for comparing the performance of students who had credits and students who had no credits in each subject. The standard normal variate $\pm$ was also used to test the hypotheses developed for comparing the proportion of these two groups of students who succeeded in the examinations in each subject. For the comparison of the academic performance of students who had credits and students who had no credits in Mathematics, for science subjects other than Mathematics, the student's 't' value was used. This was because of the small size of some of the samples involved, and the symmetrical nature of the distribution of academic ability.

The student's 't' value was also used to test for significant positive correlations between the student's scores in both the sessional and I.J.M.B. examinations in each subject. 0.05 level of significance was used for the tests of hypotheses throughout the study. This was in order to minimize the probability of accepting the null hypothesis when it is false (Type II Error).

5.2 Findings and Conclusions

The following findings were obtained from the study:

1. For the year I sessional examinations, the students with 'O' level credits in each subject performed significantly better than the students without 'O' level credits for all the science subjects studied except Chemistry. For Chemistry there was no significant difference between the academic performance of students who had credits and students who had no credits. Here the Chemistry students without 'O' level credits seemed to have benefitted more from any remedial assistance given to them in year I than the students without 'O' level credits in other subjects.

2. For the year II I.J.M.B. examinations there was no significant difference between the academic performance of students who had credits and students who had no

credits, for all the science subjects studied. This could have been due to the remedial assistance given to students without 'O' level credits in their subjects.

3. The proportion of students with 'O' level credits in their subjects who succeeded in the year I sessional examinations in each subject was significantly higher than that of students without 'O' level credits, in all the science subjects except Chemistry. In Chemistry there was no significant difference between the proportion of students who had credits and students who had no credits, who succeeded in the sessional examinations in Chemistry. These findings are in agreement with the findings in number (1) above, where a probable explanation was offered for the exceptional finding in Chemistry.

4. For the I.J.M.B. examinations there was no significant difference between the proportion of students who had credits and students who had no credits who succeeded in Chemistry, Mathematics and Physics. A significantly greater proportion of students with 'O' level credits passed in Biology and Geography compared to those without 'O' level credits in these subjects. From finding number (2) above it can be seen that in terms of quality of performance there was no significant difference between the two groups of students in all the science subjects studied. The

finding for Biology and Geography here implies that in spite of the lack of significant difference in the quality of performance between the two groups of students, students with 'O' level credits in Biology and Geography still stand greater chances of passing in these subjects in the I.J.M.B. examinations than those without 'O' level credits.

5. For the sessional examinations there was no significant difference between the academic performance of students who had credits and students who had no credits in Mathematics, for Biology, Chemistry and Geography. For Physics the students with 'O' level credits in Mathematics performed significantly better than those without 'O' level credits in Mathematics. The finding for Physics is very likely due to the high mathematical content of the subject.

6. For the I.J.M.B. examinations there was no significant difference between the academic performance of students who had credits and students who had no credits in Mathematics, for Biology, Chemistry, Geography and Physics. This finding could be as a result of the compulsory remedial mathematics course organized for all the science students without 'O' level credits in Mathematics. This finding is an indication of the effectiveness of the programme.

7. Significant positive correlations were found between the students' scores in the sessional and I.J.M.B. examinations in all the science subjects studied except Geography. In Geography no significant positive correlation was found between the students' scores in the sessional and I.J.M.B. examinations. The finding in Geography could have been influenced by external factors, such as the teacher-effect, which were earlier assumed to have insignificant effects on this study.

The findings from the study showed that in the year 1 sessional examinations both the quality of performance and the proportion of successful students were significantly higher for the students with 'O' level credits in their subjects, for all the subjects studied except Chemistry where no significant difference was observed. From the tables for the comparison of proportions in chapter four, it is worth noting that the proportion of students without 'O' level credits in Biology, Chemistry and Geography who succeeded in the sessional examinations in these subjects was slightly more than 50%. This is a significant achievement if one realises that these students would have been denied the opportunity of pursuing these courses if the college authorities had insisted on a credit passin each subject as a minimum entry requirement. This level of success

must have been due to the effects of remedial assistance given to the students without 'O' level credits in these subjects. The proportion of students without 'O' level credits in Mathematics and Physics who succeeded in the year I sessional examinations was much lower than those of other subjects. This indicates the need to intensify the remedial assistance given to the year I students without credits in these two areas, namely Mathematics and Physics. By their nature Mathematics and Physics might need greater remedial assistance to enable a greater proportion of students without 'O' level credits to pass.

In the I.J.M.B. examinations no significant difference was observed between the proportion of students who had credits and students who had no credits in Chemistry, Mathematics and Physics, who succeeded in the I.J.M.B. examinations in these subjects. In Biology and Geography a greater proportion of the students with 'O' level credits passed in the examinations. However it is worth noting that more than 50% of the students without 'O' level credits passed each of the science subjects being studied. This is a significant improvement over the situation in the sessional examinations. This is even more so as there was no significant difference between the academic performance of students who had credits and students who had no credits in their subjects, for all the science subjects studied for the I.J.M.B.

examinations. The improvement in the situation must have been due to the remedial assistance given to those without 'O' level credits.

Judging by the performance of the students without credits in their subjects in both the sessional and I.J.M.B. examinations, it can be argued that the process of relaxing admission conditions for science students has been successful for the 1983/84 Science intake. With improved academic facilities and a longer period of stay in the college in their first year, it can be concluded that a greater success rate can be achieved with subsequent intakes without 'O' level credits in their subjects.

The findings from the study showed that there was no significant difference between the academic performance of students who had credits and students who had no credits in Mathematics, for Biology, Chemistry and Geography in the sessional examinations. However in Physics the performance of students with 'O' level credits in Mathematics was significantly higher than that of students without 'O' level credits in Mathematics. The result in Physics is not unexpected as there is a high correlation between Physics and Mathematics. For the I.J,M.B. examinations there was no significant difference between the academic performance of students who had credits and students who had no credits in Mathematics, for all the science subjects

covered by this study, (other than Mathematics). Thus, the findings here do not justify any requirement that students pursuing science courses at the I.J.M.B. level should possess 'O' level credits in Mathematics. Such a condition can be waved aside for students wishing to offer science courses if a remedial Mathematics programme is available for the students. The necessity to relax some of the requirements for our science courses is supported by Pryor and Gordon (1974) who suggested from the findings from their research that students with high grade point averages could be exempted from some or all the preliminary requirements of a course.

That significant positive correlations were found between the students' scores in the sessional and I.J.M.B. examinations in Biology, Chemistry, Mathematics and Physics, is in agreement with the findings of Nisbeth and Welsh (1966) who contended from their own studies that the students' assessment at the end of their first year of training in an institution was a better predictor of their academic achievement than their pre-entry qualifications. As pointed out earlier the non observance of a significant positive correlation between the scores in Geography might have been influenced by the other external factors such as the teacher-effects, which were assumed to be of negligible effect on this study. For the other science subjects, it can be concluded that students

who succeed in the year 1 sessional examinations are likely to succeed in the I.J.M.B. examinations if their tempo of hardwork and devotion to school work is still maintained by their second year.

5.3 Recommendations

With the implemantation of the new 6-3-3-4 system of education just taking off in various states of the federation, another dimension has been added to the shortage of science and technical teachers. Under this system, the country needs large numbers of science and technical teachers to man both the junior and senior secondary schools. If our institutions of higher learning have to depend on their current admission policies whereby only students with four or more credits are allowed to offer science and technical courses the problem of shortage of teachers and other trained personnel in science and technical courses can never be solved. The need to relax the admission requirements for science and technical students has therefore much to recommend if adequate remedial programmes are available in their areas of specialization. As the findings from this study have shown, a lot of science manpower could be wasted by denying students opportunity to offer science courses only on the basis of their inability to secure credit passes at 'O' level in their subjects of interest. Another area of concern is the insistence by most higher institutions that students offering science and technical courses must have 'O' level credits in Mathematics. The

present study has shown that Mathematics achievement at 'O' level does not have any significant effect on the students' academic achievement in subjects other than Mathematics at the I.J.M.B. level, if a remedial mathematics programme is available. On the basis of this finding a review of such a policy is recommended. Where a remedial programme in Mathematics could be organized there is need to relax the admission requirements as far as the Mathematics aspect is concerned.

The governments in the country need to do a lot more in the area of science and science education than is presently the case. Improvement in science and mathematics education cannot be achieved by mere purchase of science equipment or by slogans. Concrete policies that will achieve realizable goals are needed. Such policies should include the provision of both human and material resources and guidelines for admission of science students and adequate provisions for the training of staff. The rigidity in the entry requirements for most of our institutions of higher learning is partly responsible for the large number of candidates wishing to go abroad for courses that are available locally. The federal government should encourage the higher institutions to evolve more flexible admission policies for science candidates. Adequate provision should also be made for

the employment of science graduates as well as the motivation of those already in employment.

The findings from this study do not in any way relegate the importance of Mathematics for the other sciences to the background. Rather, the importance of remedial Mathematics has been illustrated by the study. Mathematics educators should find ways of making mathematics a partner in progress with the other science subjects or courses rather than being a stumbling block. Better and easier ways of learning mathematics should be evolved to make the subject interesting to aspiring Scientists who may not necessarily want to be mathematicians. Practicing and experienced mathematics educators should be encouraged to write textbooks for our schools rather than the present practice of depending on foreign textbooks.

Further studies along the same lines as the present study should be undertaken in other institutions offering I.J.M.B. and other science courses. An evaluative study needs to be undertaken in C.A.S. to determine the overall success rate of the modifications in entry qualifications over a period of time. The differences occuring in a number of the findings between the year 1 and I.J.M.B. examinations need to be further investigated. Because of time and other constraints, the influence of the duration

of stay in the college on the students' academic performance was not investigated. More intensive studies need to be undertaken to determine the effects of remedial assistance given to students without 'O' level credits in their subjects.

Finally the researcher would like to recommend the establishment of special Science Secondary Schools where adequate attention could be given to science students. Such schools should be well equipped and adequately staffed to take care of both strong and weak science students. This study has illustrated that the average science student could perform well if adequate remedial assistance is given to him. The attention given to the science students at C.A.S. could also be given to them in special science secondary schools so as to catch them young. Such attention would go a long way in helping the students to improve their performance in W.A.E.C. Examinations. This will reduce the problem of shortage of science intakes to our institutions of higher learning.

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Appendix A

Admission Registration Form - Year 1 1983/84

Surname ----------Student Number ------

Other Names ----------Future Career ----------

Course Number ----------

O/L Results	Grade	Year	
----------	------	------	
----------	------	------	Parent/Guardian's
----------	------	------	Name and Address
----------	------	------	----------
----------	------	------	----------
----------	------	------	----------
----------	------	------	Telephone Number
----------	------	------	(if any)
----------	------	------	----------

Student's Signature

Registration Officer's Signature

Course ----------

Date ----------19---------

Appendix B

List of Subject Combinations In The School Of Science

S.1	Biology	/	Chemistry	/	Geography
S.2	Chemistry	/	Mathematics	/	Physics
S.3	Biology	/	Chemistry	/	Physics
S.4	Chemistry	/	Geography	/	Geology
S.5	Chemistry	/	Geology	/	Physics
S.6	Geology	/	Mathematics	/	Physics
S.7	Geography	/	Mathematics	/	Physics
S.8	Biology	/	Mathematics	/	Physics
S.9	Biology	/	Geography	/	Physics
S.10	Biology	/	Geography	/	Mathematics
S.11	Biology	/	Chemistry	/	Geology
S.12	Chemistry	/	Geography	/	Physics
S.13	Biology	/	Geography	/	Geology
S.14	Biology	/	Chemistry	/	Mathematics
S.15	Biology	/	Geology	/	Physics
S.16	Chemistry	/	Geology	/	Mathematics
S.17	Geography	/	Geology	/	Mathematics
S.18	Chemistry	/	Geography	/	Mathematics

Appendix C

Part A Subject List For Geography**

S/No.	College Number	Course Combination	O/L Maths Result	O/L Geog. Result	Sessional* Result	I.J.M.B.* Result
1.	830022	S1	P7	A1	3	2
2.	830028	S13	P7	A2	0	-
3.	831248	S13	P7	A2	0	-
4.	830048	S13	F9	A3	2	2
5.	830062	S17	C6	C5	3	1
6.	380068	S1	P7	C6	3	3
7.	830078	S10	C6	C4	4	3
8.	830090	S13	P8	C6	1	2
9.	830098	S13	F9	C6	0	-
10.	830132	S13	P8	A3	2	2
11.	830159	S13	P8	A3	0	1
12.	830163	S4	C6	C5	0	-
13.	830169	S7	P7	C6	0	-
14.	830172	S1	P8	C6	0	-
15.	830183	S4	P7	A2	1	0
16.	830184	S7	P8	C5	0	-
17.	830189	S1	F9	C5	1	0
18.	830200	S1	F9	A3	1	0
19.	830192	S13	C6	A3	1	1
20.	830230	S13	F9	C4	0	-
21.	830241	S18	C6	A1	1	-
22.	830257	S1	P7	C6	1	1
23.	830266	S1	P8	A3	2	3
24.	830270	S18	P8	A4	0	-
25.	830274	S13	P8	C6	1	0
26.	820227	S13	F9	C6	1	1
27.	830298	S17	P7	A3	0	3

S/No.	College Number	Course Combination	O/L Maths Result	O/L Geog. Result	Sessional* Result	I.J.M.B. Result
28.	830300	S4	F9	C6	1	1
29.	830301	S1	P7	A3	2	1
30.	830304	S12	P7	A2	1	1
31.	830306	S13	C6	C6	0	-
32.	830313	S1	P8	A4	1	1
33.	830325	S10	C6	C6	1	1
34.	830340	S7	P7	A3	0	-
35.	830359	S13	F9	C6	3	1
36.	830361	S12	C4	A3	0	-
37.	830375	S17	P7	A3	0	-
38.	830376	S13	F9	C5	1	0
39.	830396	S10	P8	C6	1	-
40.	820762	S13	P8	C5	0	-
41.	831250	S18	P8	C5	2	0
42.	830424	S13	C6	C6	0	-
43.	830429	S1	P7	A3	1	2
44.	830452	S1	P8	C6	1	2
45.	830453	S18	P8	A3	0	-
46.	830456	S1	P8	C5	1	1
47.	830468	S1	F9	C6	1	1
48.	820390	S13	P8	C6	1	0
49.	830485	S13	F9	C6	0	-
50.	830488	S4	F9	C5	1	1
51.	830494	S10	P8	C4	1	0
52.	830495	S7	C6	A1	3	1
53.	830634	S1	P7	C5	1	1
54.	830511	S13	P8	A2	1	0
55.	830513	S18	P7	A2	0	-
56.	830516	S1	P7	C6	1	1
57.	830529	S1	P8	C5	2	0
58.	830534	S1	P7	C6	0	-

S/No.	College Number	Course Combination	O/L Maths Result	O/L Geog. Result	Sessional* Result	I.J.M.B. Result
59.	820794	S1	P8	C5	1	3
60.	830558	S13	F9	A3	1	0
61.	830560	S13	P8	A1	1	2
62.	830566	S7	C6	C6	1	1
63.	830589	S13	F9	C4	1	3
64.	830625	S13	C6	C4	1	0
65.	830637	S13	F9	C6	0	-
66.	830660	S7	C6	C6	0	-
67.	830664	S1	P7	C5	0	-
68.	830675	S13	F9	A3	1	3
69.	830677	S1	F9	C5	2	2
70.	830694	S13	P7	A2	0	-
71.	830706	S1	P7	A3	2	-
72.	830713	S7	A3	C6	2	3
73.	830730	S13	F9	C6	2	2
74.	830736	S13	P7	A3	1	1
75.	830751	S1	P8	C5	1	0
76.	830760	S13	P7	A2	1	0
77.	830792	S4	P7	C5	2	2
78.	830795	S13	F9	C5	1	0
79.	830814	S9	F9	C4	2	2
80.	830823	S7	P8	A3	1	-
81.	830844	S7	C5	C6	1	-
82.	830860	S13	P8	A1	0	-
83.	830877	S1	P8	A3	1	1
84.	830879	S1	P8	A3	1	1
85.	830888	S13	P7	C4	0	-
86.	830895	S13	F9	C5	1	1
87.	831256	S1	P8	C6	1	1
88.	830910	S1	P8	A3	0	-

Part B

S/No.	College Number	Course Combination	O/L Maths Result	O/L Geog. Result	Sessional* Result	I.J.M.B. Result
89.	820010	S4	P7	P7	1	1
90.	830020	S13	F9	P8	1	-
91.	830061	S4	P7	P8	1	-
92.	830070	S1	F9	P7	0	-
93.	830103	S17	C6	P7	1	0
94.	820758	S17	P8	F9	0	-
95.	830140	S13	P7	P8	0	-
96.	830156	S17	C5	P7	0	-
97.	830165	S13	F9	F9	1	0
98.	820216	S10	P8	P8	1	3
99.	830350	S13	C6	P8	0	-
100.	830352	S7	C6	P7	2	1
101.	830353	S13	F9	F9	0	-
102.	814676	S13	C6	P8	0	1
103.	820305	S13	P8	P7	3	1
104.	830402	S1	P8	P7	0	-
105.	820788	S1	F9	P8	0	-
106.	830457	S4	F9	P8	1	0
107.	830518	S17	C5	P8	1	3
108.	830519	S1	P7	P7	2	0
109.	830528	S4	P7	P8	1	0
110.	830635	S13	F9	P7	2	2
111.	820804	S4	F9	F9	0	-
112.	830621	S17	C6	P8	0	-
113.	830653	S1	F9	P7	0	-
114.	830777	S1	F9	F9	0	-
115.	820189	S7	P8	P8	0	-
116.	830781	S13	P8	P8	0	-
117.	830801	S13	C6	P7	1	2

S/No.	College Number	Course Combination	O/L Maths Result	O/L Geog. Result	Sessional* Result	I.J.M.B. Result
118.	830819	S18	C6	P8	1	-
119.	830849	S1	P8	P7	0	-
120.	830893	S7	C6	P7	1	0
121	830904	S13	F9	P8	0	-
122.	830831	S13	P7	P8	1	0
123.	830935	S13	F9	P7	1	0

** This Geography list is a sample of the subject lists used for the data collection.

* The range of marks for the Sessional and I.J.M.B. Examination results are as follows:

Range of Marks (%)	Grade	Grade Points
70-100	A	5
60-69	B	4
50-59	C	3
45-49	D	2
40-44	E	1
0 -39	F	0