THE ROLE OF MEDIUM OF INSTRUCTIONS IN THE DEVELOPMENT OF THE CURRICULUM RELATED SCIENCE CONCEPTS IN MATRICULATE STUDENTS

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Approved by

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Supervisor

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TO

MY MOTHER & FATHER

WITH ALL MY LOVE AND GRATITUDE

C O N T E N T S

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ABSTRACT

The present study is aimed at understanding the role of medium of instruction in the development of scientific concepts in high school students. A random sample (202) of high school passed (matriculate) students, representing different types of medium of instructions were selected from Rawalpindi/Islamabad. Finally, the students belonging to Urdu medium (92) and English medium (89) were selected for the analysis of the data. the levels of attainment of scientific concepts were measured through a test developed for this purpose. For the analyses of the data t-test, and ANOVA techniques were used. The findings of this study indicate that scientific conceptual clarity of English medium students is better as compared to the Urdu medium students. This study also indicates that the students who have good marks in matric, have better conceptual clarity, as compared to those students, who have not good marks. Regarding the parental education, it is indicated by the study that the students, whose mother's education is high, have better conceptual clarity. This is also indicated that better socio-economic background does contribute in the conceptual clarity. Overall these factors does contribute in the conceptual clarity.

CHAPTER 1

INTRODUCTION

We are today on the threshold of information technology which is affecting every field of human activity and the world is witnessing the unfolding of the Third Industrial Revolution, the major landmarks of which are the extensive application of microprocessor, lasers, fibre optics, bio-genetics, computer aided manufacturing and designing etc. The world is clearly divided between the haves and have nots and what characterizes this difference between nations is essentially the level of their scientific and technological progress.

Science and technology has become an integral part of the blood stream of modern civilization and is the major driving force for economic growth and development. The power of science and technology has transformed the world and impacted every sphere of man's individual and collective activity, be it economic, political, cultural, military and educational. This scientific progression receives impetus from various sources. One major source is the education being imparted to children of any nation. By giving proper education to the children the future of the nation can be saved.

We are still unable in creating an environment which triggers off a scientific and technological revolution whereby a broad based self sustaining S&T structure is established. For

this to be brought about, education needs to be given the foremost priority.

In Pakistan a lot of emphasis is being laid upon scientific development, and efforts are being made to improve the quality of science education. But still our educational system locks many things. Unfortunately our educational system is geared to the suppression of creativity. It revolves around the medieval system of learning by route. All these things and other several factors are seriously undermining our educational system.

Concept of Education

The concept of education varies from nation to nation and from culture to culture because "every conception of education is the product of some ideal of life and every ideal of life has its own conception of education " (U Hayat, The News, 1994) . Education which does not take into account the cultural and regional realities will either fail to deliver the goods or do positive harm instead of facilitating development. The genesis of development must be indigenous to the cultural soil from which it springs, and cannot be imported or exported like rice and wheat. No nation can progress if it is not free to develop according to its own ideals and genius. The education which a country imparts to its generations must be in harmony with the goals and objectives that are to be achieved. A destination in the east

will never be arrived at if one faces the west. Unfortunately, this is the dilemma we are facing in Pakistan.

Western influence on education in Pakistan

Our education system dates back to the days when the British were masters of this land. As an imperialist government they needed an education system that would serve their interests, not their subjects.

Today, our education system is nothing but a remnant of insidious British legacy. It is based on borrowed ideas, on a foreign intellectual source and use of a foreign language. We are following the same ideas with little change, if any, for the last four decades. Basically, it is our own doing, but the British are equally to blame, known for their hostility to any set up not of their making.

According to Allama Iqbal education is the process of critically evaluating and effectively transmitting the cultural heritage, knowledge and ideas of a social groups to its young members, thereby securing the continuity of collective life and culture, and ensuring their intelligent and creative reconstruction. This is because any half grown philosophy of the rapid pace of development, and will be unable to satisfy the requirements of the present age. Only when the philosophy of

education finds its won identification, coherence and relevance can it generate enough energy to free itself from the restriction of uncertainty. The West boasts of its long conditioning to individualism and freedom of thought but it seems ironic when studied in its reflection of one particular ideal that pervades its education policy. It manifests itself in their notions about British nationalism, Americanism, Fascism or Communism that their citizens are forced to accept.

Our attitude should not be of collision but of collaboration for our mutual benefit. We cannot belittle the contribution of the West in science and technology. What we ought to do is bring it in harmony with our own environment and heritage. We must welcome their sciences, their quest for research, and their environment without it being at the cost of our own values.

SCHOOLING IN PAKISTAN

Pakistan at the time of independence, inherited an educational system installed a hundred years earlier by colonial rulers replacing the indigenous Muslim system which had served the country for nearly eight hundred years, beginning in the year 711 A.D.

The colonial system of education which was predominantly geared to meet the requirements of the colonial Government for

trained civil servants to run the public administration of the country, was basically alien to the society. As the system provided little education suitable for positions outside Government service, it brought disillusionment to the youth of the country.

Still Pakistan is having more or less the same educational system inherited by the Britishers.

In rural schools single teacher and two-teacher schools are common where the number of children may be very small but schools in big town and cities are generally over crowded and a large number of them are run on the double shift system.

Individual schools may have more than one educational level. A primary school will have only class 1 to 5 a middle school may have classes 1 to 8 or only class 6 to 8. A secondary (high) school may have classes 6 to 10 or only classes 9 and 10. Some high schools(higher secondary schools) may have the intermediate classes 11 and 12 (school education in Pakistan, 1977).

Compulsory subjects at the primary level, class 1 through 5, include Urdu, Islamiyat, Social studies, Mathematics and science and vocational courses. Curriculum is officially standardized throughout the country although some local variations are permissible if the school has resources. For example, English is

a compulsory subject from class 6 but schools may, if they wish and may do, introduce it as an elective subject from class 1.

At the end of class 10 comes the matriculation exam which is set by the Boards of Intermediate and Secondary Education (Hays, 1987). In class 9 and 10, there are broadly two groups of subjects. One is science group and other is arts group. In science group, Science subjects as Physics, Chemistry, Biology and Mathematics are taught. Where as in arts group there is more choice of subjects each for boys and girls students. In arts group there are subjects like general science, elective Mathematics, Home economics (for girls only), Civics, Political science, etc. English, Urdu, Pakistan studies and Islamiyat are taught as compulsory courses in matric.

In almost all big cities of Pakistan there are types of schools imparting education, Government ordinary schools; Model/Pilot/Comprehensive schools, both government funded but disproportionately and private English-medium schools. In Islamabad (the capital of Pakistan) the situation is almost the same. Here also three types of schools exit.

CONDITION OF SCIENCE EDUCATION AT SECONDARY LEVEL IN PAKISTAN

The state of secondary education is generally poor but it has come to be realized that science education in particular has

searched a critical law stage and needs to be improved urgently. There is an acute shortage of teachers, laboratories are poor and ill equipped, curriculum has little relevance to the present day needs. The text-books are also sub-standard and finally education system promotes rote-learning and gives little emphasis to understanding and to develop thinking.

PERFORMANCE OF ENGLISH MEDIUM SCHOOLS (SCIENCE GROUP)

The overall performance of english medium schools is better than the Urdu medium. To show it statistically, in 1984 and 1985, 34,903 students from 12 Boards took the examination (SSc) matriculation in the science group in the English medium. 17,551 passed in the first division. On the other hand 274263 students appeared in the 13 Boards in the Urdu stream of whom 55168 passed in the first class.

Another comparison of top positions in intermediate examination during 1985 shows that out of the total 112 top positions English medium students secured 75 positions.

This also a fact that the majority of students who opt for the English medium are those who later pursue studies at the college and University level.

This role of medium of education in Pakistan needs to be carefully seen. Because this difference of medium of education is seriously undermining our education unfortunately no serious steps have been taken so far to see this main problem an scientific bases. Basically this was the main driving force behind the present study. Other related psychological aspects of the study are discussed below.

CONCEPTS

We use concepts to deal with the world. We categorise our experience to bring order to it. Otherwise we would have to treat every stimulus encountered as unique. We would always be tied to our immediate situation, being unable to use our past experience in our assessment of the present. The world would be a confused, un analyzed set of stimuli. Our knowledge of the world is comprised of concepts and relationships among the concepts (Bourne, Dominowski, Loftus, and Healy, (1986).

The concept of concept

Concept is defined as a mental representation of a category. The definition can be expanded upon. A category is a class that stimuli are placed in according to some similarities. A concept is something in a person's head that allows him to place stimuli in or out of the category (Anglin, 1977). Thus, the category consists of the stimuli in the outside world and the concept of information in memory. A category is distinct from a concept.

The concept also might include much more knowledge than that

simply needed to categories instances (Anglin, 1977). Thus, a persons' concept of dog may include much data about their lifespan, habits, evolutionary ancestry, etc, as well as his emotions towards them. It should be noted that 'concept' is quite a vague term with many different definitions and uses (Flavell, 1970; Sigel, 1983). Sometimes 'concept' is used synonymously with 'category' and with 'word' In developmental psychology. 'concept' is sometimes used to refer to a competency or an ability to do some esoteric task. Thus, a child is said to have the concept of 'conservation', 'class inclusion' or 'transitivity' (Farah and Kosslyn, 1982). These concepts really refer to an ability to manipulate information but can be seen as reflecting a representation of a category (Halford, 1982). In daily life, 'concept' is often used to refer to an idea, e.g. 'Today we present some startling new concepts in fashion!'. 'This new washing machine is a brilliant concept years ahead of its time'.

Finally, there is a distinction between identity concepts and kind concepts (Clark, 1983; Anglin. 1977). Identity concepts pertain to the same object seen at different angles, orientations and distances. Thus a person has an identity concept of his dog Rover, his Uncle Jim and the space shuttle 'Columbia'. An identity concept is necessary to place different impressions of the same object into one category. Kind concepts place at least two distinct individual things into one category. Thus, a dog and a cat are instances of the kind concept animal, and a spider and a shark are instances of predator.

TYPES OF CONCEPT

Concepts can be divided into a number of types. However, there is no universally recognised taxonomy. Perhaps there never will be. Concepts are like people in this sense. People can be categorised in many different ways (tall/short, educated/not educated, interesting/uninteresting, blonde/redhead/other), and

how we categories on a given occasion depends on our purposes. Here are some useful categories of concepts.

Object and Event

Object concepts represent some physical thing at some location in real or imaginary space. Examples are planet, microbe, tree, car, galaxy, horse, and virus. Event concepts pertain to time. They represent a particular class or sequence of events. Examples are hour, holiday, geological age, lifetime, eating out, having a baby and running. Some event categories are represented by scripts, because they constitute a more or less fixed sequence of events. Object concepts have been studied much more than event concepts.

Eight Parts of Speech

One can divide words up into eight classes: noun, verb, adjective, adverb, pronoun, preposition, conjunction and article. It can be argued that these words label different types, prepositions label concepts of relative position, etc.

Concrete and Abstract

This distinction is known by several names: simple/complex, non-verbal/verbal and perceptual/abstract (Cohen, 1983). It is perhaps better considered a continuum than a dichotomy. Concrete concepts are very closely tied to our perceptions. they arise from direct experience. Examples are red, table, tree and dog. Little abstraction is needed to form them and their instances can usually be readily visualised. Abstract concepts are much harder to so pin down, because they are largely divorced from experience. Their component features may be quite obscure and variable to different people. Some examples are justice, freedom, genius, art, truth, beauty, and representation.

Abstract concepts are often built up from complex concepts (Cohen, 1983). An example is democracy. a thorough understanding of this concept requires the knowledge of component concepts, such as government, the social concept, the rule of law, will of the people, etc, each of which is itself a complex concept. Indeed, many school-taught concepts are quite abstract, which is one reason why students find some hard to learn. The subject of mathematics, for example, is based on a progressive accumulation of abstract concepts from component concept. Students who do not grasp an important component concept often get lost as a result (Skemp, 1971)

Many abstract concepts can only really be acquired through language. Words are needed to both define them and present exemplars.

Well-defined and Ill-defined

Well-defined concepts have a clear set of defining features that all instances there of share. Examples are square, number and molecule. Ill-defined concepts lack clear-cut defining features. An examples is artistic style, One may group a set of paintings into a certain category without being able to state any common features of the instances. Many concepts used in everyday life are ill-defined, while many acquired in school are well-defined.

Artificial and Natural

An artificial concept is constructed for a particular use, usually for an experiment. One may experiment with artificial concepts to study the learning of concepts that subjects have no prior experience of or that can be designed to answer some research question.

Natural concepts are existing ones that people in a given

culture have constructed and use. Examples are tree, chair, person, star, hand and dog. Some are more natural than others, however . There is evidence that we are strongly pre-disposed to form some concepts because of our evolutionary history, and such concepts seem very natural.

Conjunctive and Disjunctive

Exemplars of conjunctive concepts have two or more particular features To be an example of triangle, a stimulus must have three sides, and be a closed figure. Disjunctive concepts are based on or rather than and. To be an example, a stimulus must have three sides, and be a closed figure. Disjunctive concepts are based on or rather than and. To be an exemplar, a stimulus must only have one of several features.

Disjunctive concepts seem odd, and indeed are quite scarce in the real world. disjunctive concepts are harder to learn.

Categorisation of Concepts According to Stimulus Domain

People can also categorise concepts according to the stimulus domain they come from (Cohen, 1983). So, we have person concepts (extrovert, sister, voter), scientific concepts (ion, reptile, gravity, totalitarian state), legal concepts (tort, contract, drunk driver), mathematical concepts (prime number, limit, square root), etc. Obviously a given concept can be placed in several domains.

Different domains are likely to differ in the proportion of well-defined and ill-defined concepts and abstract and concrete ones. The social sciences, art and law tend to have many more ill-defined ones than do physics or mathematics. Mathematics has more abstract ones than art.

SCHEMATA

The nation of schema is a very important one and has many implications for education. Schemata are very closely related to concepts. It is some-what vague nation, which is used in different ways and which has related nations, such as 'frame'.

THE RELATIONSHIP BETWEEN CONCEPTS AND SCHEMATA

There are indeed many similarities between concepts and schemata. Both are mental representation used to categories stimuli as instances or non-instances of some category. Their uses also seem similar, and both concepts and schemata are learned by abstracting information from actual instances. How, then, are they different? this question is quite complex and it has several answers, which depend on how the two terms are defined and the theory of category representation adopted. One distinction is that a schema is a cluster of related concepts. Thus the schema for face consists of such component concepts as eyes, nose and chin, related in a certain way. The eating out schema consists of such parts as entering the restaurant and paying the bill. By one definition, the component concepts must be related by space or time for the structure to be a schema (Mandler, 1979). Thus, a class inclusion taxonomy by this definition would not be a schema.

The distinction above has some flaws. Firstly, each component concept of a schema can also be considered a schema by the definition. Thus, eyes can be considered a schema consisting of such component concepts as pupil, iris, eyelid etc. By the same token, schemata such as face and arm can be considered concepts when they are part of larger conceptual structures. Thus, face can be seen as a component of the body schema and is thus a concept.

Skemp (1979) suggests that a useful distinction is that a given representation can be considered a schema or a concept depending on what you want to do with it. For some purposes, it can be seen as a concepts and for others as a schema.

SOME WAYS IN WHICH CONCEPTS ARE ACQUIRED

Concepts are acquired in many different circumstances and they vary greatly in complexity. Concepts learning can be divided into learning from exemplars and from words (Ausubel, 1968). Concepts are often taught in the classroom from words, with perhaps some actual exemplars as well.

Acqusition From Instances

This mode has been the one most studied in laboratories. When one or more stimuli are repeatedly encountered, our minds seem to be attuned to picking out similarities between them and forming concepts around them. Thus, the repeated experience of certain stimuli may lead to an internal representation of them or their similarities. In some cases, the features of certain stimuli are so obvious to our senses that abstraction seems nearly automatic. Exemplars of star and cloud are so perceptually salient and so different from just about everything else that we can form concepts around them with great ease. In other cases, much effort be needed. Many scientific concepts, such as gravity, took many years to abstract from experience.

ACQUISITION THROUGH LANGUAGE

The possession of language greatly aids concept learning. Indeed, as children grow older they acquire concepts more and more through words (Ausubel, 1968; Klausmeier et al, 1974). The uses of language here are indeed many (Stones, 1984). First of all, as mentioned earlier, important concepts abstracted by great

thinkers can be rapidly communicated to people through words. As the experiences and abilities that lead to such abstraction would be beyond those of most people, such concepts would otherwise not have been learned. Secondly, language can speed up the learning of concepts that probably would have been acquired anyway. Thirdly, some concepts can only really be learned through language since no perceptible exemplars exist (Kalusmeier et al, 1974).

Some disciplines, such as philosophy and history, rely mainly on words to teach concepts, because perceptible instances do not exist or are too difficult to actually present (de Silva, 1979). A teacher can also use language to emphasise a concept's defining features, which may improve learning. Extensive literature documents research on the 'acquired distinctiveness of cues' phenomenon. Below, various ways of teaching concepts through words are described.

Definitions

Some concepts are acquired from an oral or dictionary definition. Indeed, a standard classroom method is to give a definition and one or more exemplars. A dictionary will reveal that a chromosome is a rod or thread-shaped body that exists in a cell nucleus and carries the genes. Language thus allows a person to learn a new concepts from his cognitive structure.

Studies indeed suggest that learners can readily acquire concepts from definitions (Johnson and Stratton, 1966) when they know the component concepts.

It is important to note, however, that a definition is just a small part of the knowledge contained in a concept (Wicklegren, 1979).

Synonyms

The teacher can provide some synonyms and will hope that the learner can abstract a new word's meaning from them. Indeed dictionaries often rely on this method, giving a set of synonyms and hoping the reader will extract a certain word's meaning from them. Indeed dictionaries often rely on this method, giving a set of synonyms and hoping the reader will extract a certain word's meaning from them.

Learning From Contexts in Which a Concept's Label Appears

Teachers often recommend wide reading to extend vocabulary. Such reading exposes a person to many new words, and may induce him to look up their meanings or infer them from their context. Though a concept may be acquired from a single context, it is usually best to give several. Just one may not be enough to ensure abstraction. Werner and Kaplan (1950) suggest that a person's ability to acquire word meanings from context improves with age.

Verbally Presented Exemplars

A study by Johnson and Stratton (1966) illustrates this method, which involves presenting exemplars in the form of words. They gave subjects a verbal exemplar of certain concepts and asked them to practise applying the right word to exemplars.

INDIVIDUAL DIFFERENCES

People differ in many ways, from physical traits such as height, weight, build and general health, to psychological

characteristics. Individual differences may affect concept learning. Some variables such as age, intelligence, expertise and cultural background. These may affect what concepts are actually learned, how categories are represented, and where the borders of categories are set. For example. Motivation can affect the persistence of the student and the time spent in trying to learn a given concept.

Cognitive Style

A cognitive style is a general way in which a person structures and uses information. Each person prefers certain ways of organising data. A cognitive style is not an ability. the latter is a capacity, or a power to do some task at maximum effort (Messick, 1976). A style is a preferred way in which a person does a task, not his power to actually do it. Research on these styles has suggested that they affect many areas of life. For instance, people tend to choose occupations and courses of study that are consistent with their styles (Messick, 1976). The following are some cognitive styles that seem to affect concept learning.

Field Dependence and Independence

Field-dependent (FD) persons are much affected by context by the field that a stimulus appears in. Field-independent (FI) persons are much better at separating a stimulus from its context. They are more likely to use their own frames of reference. They impose their own structure on material to be learned rather than accepting someone else's.

Breadth of Categorisation

persons with a wide breadth of categorization tend to

consistently over-generalise, preferring to form broad categories. thus, they are prone to errors of over-inclusion. Persons with a narrow breadth are prone to errors of under-inclusion. In practice, therefore those with a wide breadth may need more discrimination training with non-exemplars when learning a certain concept, and those with a narrow breadth may need training with a wider range of exemplars.

Conceptual Differentiation

This style is readily observed in free-sort tasks. People high on it tend to use many different bases for categorization and those low on it many fewer. In essence, they differ in what they will accept as similar (Gardner, 1953).

Scanning

This style refers to the way humans focus attention on stimuli. People high on it have a sharp focus of attention. They are able to easily focus on stimuli and resist distractions. Thus, they are thought to have a wider span of awareness, more vivid experience of stimuli, and to be more concerned with detail.

Reflection/Impulsiveness

This style refers to the speed of formulating hypotheses and processing information. Impulsive persons do so quickly without much thought, offering the first hypothesis that comes to mind in a concept identification paradigm. Reflective persons take more time, and may consider a variety of hypotheses before responding.

CONCEPT AND SCHEMA DEVELOPMENT

Concepts and schemata may develop. They may progressively

evloe with experience and thus a person's ability to deal with some domain may improve as well.

CONCEPT DEVELOPMENT IN GENERAL

Development of A Single Concepts

A variety of processes may be involved in development of one concept (Homa et al, 1979). Discrimination and generalization are clearly two. A concept may become narrower as non-instances are encountered or broader and more detailed as more exemplars are encountered and a person generalises to them.

Development of A Conceptual Structure

A conceptual structure such as a taxonomy also may develop. This evolution can occur in a number of ways. Concepts can be added or deleted, existing ones combined or broken up, attributes added to concepts, and new relations between them established. The over all pattern of relations in the structure can alter radically as the learner acquires knowledge of principles behind the structure and learns very abstract relations. Such evolution is very important in education. Students are continually organising and re-organising conceptual structures.

CONCEPT DEVELOPMENT IN CHILDREN

A child has the basic developmental task of acquiring concepts needed to make sense of the world and learning its culture's labels for important concepts (Sigel,1983). Children are more likely to learn concepts from words and their existing conceptual structure as they get older. Also, children get better at acquiring word meanings from contexts and their power to test hypotheses improveś (Spiker and Cantor, 1979). Ausubel (1968) cites the general trend of progression from more diffuse, ill-defined concepts to more specific ones.

Language Development And Concept Development

The course of language development is quite well mapped. The first word generally appears at about the age of one year. The early words typically refer to objects with which the child frequently interacts (Anglin,1977). These include proper names, such as 'Mama', word that refer to interaction with adults. By the age of 18 objects, such as animals and people. By the age of 18 months, the child knows as average of 50 words. Two-word utterances (e.g.'no eat') typically appear at about the age of two, and the child's vocabulary grows immensely from there. By the age of four or five, the child is speaking in grammatical sentences and by the age of six knows an estimated 14,000 words (Clark, 1983).

A major issue is the relation between language development and concept deveiopment. The issue can be framed as two opposing questions. Does the child learn concepts first and then later learn to attach words to them or, are concepts formed when a child tries to attach meanings to newly-encountered words (Kuczaj, 1982). Put another way, is the concept system built from words or is the word system built from concepts?

It seems likely that the answer lies somewhere in the middle. Concepts can be acquired from words and words may be attached to existing concepts (Kuczaj, 1982).

The onset of language introduces a major change in concept development (Ausubel, 1968, Sigel, 1983). The child has more ways of acquiring concepts. Markman (1984) suggests some further ways in which a child's knowledge of language can help it learn new concepts. She argues that children generally know that words refer to categories of stimuli and, so, when they hear a new word they look for a category.

Markman (1984) further argues that knowledge of language also helps children acquire taxonomical relations as well.

> *Whoever knows grammar in one language also knows it another so for as its substance is concerned. If he cannot, however, speak another language, or understand those who speak it, this is because of the difference of words and their formations which is accidental to grammar.*
>
> Anon, thirteenth century.

Language does not exist in a vacuum. It serves and is modeled by other systems in the human made. Because it is used for conveying ideas, its structure and function must reflect these ideas. Because it must be spoken and understood easily and efficiently, its structure and function force to stay within the limits imposed by people's processing capacities. Because it is used for communication within a complex social and cultural system, its structure and function are molded by these forces as well yet once people have learned how to use language, it wields a power of its own. It aids them in thinking about some ideas and hinders them in thinking about others. It molds many aspects of their daily affairs.

UNIVERSALS AND RELATIVITY

Over centuries these forces have been recognized and taken up within two fields of study, linguistic universals and linguistic relativity. If languages are molded in part by the ideas, processing capacities, and social factors all people have in common, they should have certain features in common-linguistic universals. Since people need to refer to objects, every language

has nouns. But to the extent that languages are molded by accidental properties of thought, technology, and culture, there will also be features that differ from language to language. In the opposite direction, if languages mold people's ideas and culture, these language-specific features should lead people who speak different languages to think differently. This is known as linguistic relativity.

WHORF'S HYPOTHESIS

Although linguistic relativity was proposed in the eighteenth century by Johann Herder and later refined by Wilhelm von Humboldt and Edward Sapir, it is most closely associated in the twentieth century with Benjamin Lee Whorf. Whorf claims that language influences the very way people perceive and organize the world around them. He also described about the relation between language and thought.

Logic, however, would not let us examine linguistic relativity without at the same time examining linguistic universals. Imagine how people would describe three shirts. They would probably stress their differences. Differences can only be described with respect to constancies. The same goes for languages. In short, linguistic relativity presupposes linguistic universals.

Linguistic universals, though of concern for centuries, have recently been taken up with renewed interest. The reasons are clear. The variation that occurs in languages has obvious limits, and these limits ought to tell us something about the nature of language.

Linguistic universals, according to Noam Chomsky (1965, 1968), have a special interest because they reflect the human's innate predisposition to learn language. His argument goes like this. In learning a language, children hear a sample of sentences that is quite inadequate for them to acquire the language in all its complexity. Many of its structures are un observable, and yet they some-how get learned. It must be that children have some "hypothesis " about what language is like, some innate predisposition to look for certain language features and not others. The features they look for will therefore be precisely those that are common to all languages.

EFFECT OF LANGUAGE ON THOUGHT AND THOUGHT ON LANGUAGE

Perhaps one of the most intriguing of all language-related topics is the relationship of language to thought and culture. Is it possible that thought is responsible for and causes language ? or is it possible that language is responsible for and causes thought ? or do language and thought perhaps influence each other.

The relationship between language and thought can be seen in the context of linguistic diversity and linguistic universals.

A years ago it was commonly believed that linguistic diversity naturally implied cognitive diversity. This argument ran roughly as follows. One's thought patterns are shaped to a considerable context by the structure of the language that one speaks. Therefore, speakers of divergent languages will have divergent cognitive systems. Present opinion does not fully agree with the notion that cognitive diversity follows from linguistic diversity.

LINGUISTIC DIVERSITY AND COGNITIVE CATEGORIES

Most classical theorists (e.g., Aristotle) argued that the categories of thought determine the categories of language. According to this view, words are symbols for mental experience. An opposite and, and more radical, view about the relationship between thought and language was expressed by the behaviourist John B. Watson (1930). According to Watson, thought is language. Watson believed that during development speech becomes sub-vocal (like a very quiet whisper to oneself) and then goes completely "underground ". Thought was said to be identical with this sub-vocal speech.

LANGUAGE DETERMINES THOUGHT: (linguistic determination)

This is less radical view as compared to the classical theory. The individual who did the most to popularize the " language-determines-thought " was Benjamin Lee Whorf (1897-1941). According to Whorf, the child's cognitive system is very plastic; that is , the system is susceptible of being organized in many different ways. The primary determinant of how it is organized is the structure of the language that the child acquires. Since , according to Whorf, linguistic structures are highly dissimilar. Thus, Whorf's views have two parts. The first claim is usually called the hypothesis of linguistic determinism. It says that linguistic structure determines cognitive structure. The second claim is called the hypothesis of linguistic relativity. It says that the resulting cognitive systems are highly different in speakers of different languages.

There are both strong and weak versions of linguistic determinism. The strong version, which says that perceptions and concepts are formed out of the categories of language, as little evidence to support it. The weak version of the hypothesis states that language structures can influence cognitive processes and categories.

Tests of the weak version have been carried out using reasoning problems and, more commonly, memory for colours. Probably the best evidence about the way in which speakers of different languages divide the colour spectrum was provided by Berlin and Kay (1969). The importance of the Berlin and Kay work is that it strongly argues against the hypothesis that languages are free to divide the world of experience in any convenient way. In the realm of colour, at least, there appear to be some basic constraints that limit the way in which this aspect of our experience is coded in the language. This means that language is more a reflection than a cause of basic cognitive and perceptual categories. This conclusion is, of course, directly contrary to Whorf's hypothesis.

Further evidence damaging to Whorf's thesis was gathered by Heider and Olivier (1979). These authors concluded that the nature of colour memory is not much influenced by language.

The results of research involving colour support the hypothesis that perceptual universals affect language. They do not support the hypothesis of linguistic relativity and linguistic determinism.

Defining the component concepts

The concept of bilingualism has been used in various ways by scholars and lay persons alike. It has been viewed as an individual-level mental concept a characteristic of individuals who possess or who use two linguistic systems. It has also been viewed as a social psychological concept, still a characteristic of individual but of individuals who organize the social world in teOrms of the different groups Bilingualism has also been used as a societal construct to describe the interactions between social groups and societal institutions, as well as among groups, in which the group and institutional boundaries correspond to linguistic boundaries. These different starting points for the definition of bilingualism have resulted in discrepancies in the kinds of statements that have been made about bilingualism and its relation with cognitive development.

Cognitive-level bilingualism

The concept of the "balanced" bilingual child was conceived by Peal and Lambert (1962) in an attempt to distinguish "pseudobilinguals" from truly bilingual children. Several formal definitions of balanced bilingualism have been formulated through the years, some more rigid than others. For the purpose of the present review,we assume the idealization that balanced bilingual child · who can function, age appropriately, in his or her two languages.

When Peal and Lambert compared their sample of French-English balanced bilingual fourth graders with a group of comparable monolinguals on a battery of intelligence tests, the results were surprisingly in the favour of the bilingual children.

In a detailed account of his daughter Hildegard's bilingual upbringing, Leopold (1949) not only adequate language development and minimal confusion between the child's two languages, but also suggested that bilingualism seemed to be an advantage in his daughter's mental development. Leopold noted Hildegard's special objective awareness of language, proposing that bilingual children, forced to make an early separation of word and referent, would develop an early awareness of the abstract and symbolic nature of language. According to Leopold, such awareness would free the child's thinking from the concreteness and "tyranny" of words. At present, such objective awareness of language is commonly referred to as "metalinguistic awareness.

A large numbers of studies have shown that, when compared with monolinguals, balanced bilingual children show definite advantages in measures of metalinguistic awareness. Cummins (1978) found that Irish-English and Ukrainian English bilingual children outperformed monolinguals on several measures of metalinguistic awareness, including the capacity to evaluate tautological and contradictory sentences.

The paradigm comparing balanced bilingual to monolingual children has also been used to assess bilingual advantage on measures other than metalinguistic awareness. Balanced bilingual children outperform their monolingual peers on measures of concepts formation (Bain, 1974; Liedtke & Nelson, 1968), divergent thinking skills and creativity (Torrance, Wu, Gowan, & Alliotti, 1970), and field independence and Piagetian conservation concepts (Duncan & De Avila, 1979), as will as in their capacity to use language to monitor cognitive performance (Bain & Yu, 1980). With unusual consistency, the findings suggest that bilingualism has a positive effect on a child's developing intelligence.

The investigators pointed out that the lack of a significant difference between partial bilingual, limited bilingual, and monolingual groups brings into question the "usual view of limited-English speaking children as being intellectually inferior to their monolingual peers" (p. 16). In addition, supporting Cummins's (1976) threshold hypothesis, they concluded that, after a certain threshold of proficiency in the two languages, bilingualism is clearly related to positive cognitive gains.

Hakuta and Diaz (1985a) reported several analyses of direction of causality between bilingualism and cognitive abilities. The analyses were done on short-term longitudinal data

with measures of language proficiency and cognitive ability at two points in time. Recognizing the limitations of their correlational data, the authors argued that, if bilingualism and intelligence are causally related, bilingualism is most likely the causal factor.

The issues of language and cognition aside, bilingualism has captured the interest of social scientists precisely because of its correlation with social psychological and phenomena of interest to them. Ethnographers such as John Gumperz (1982) take interest because of the roles that language plays in regulating social order by serving as a symbol of group identification and societal status. Sociologists such as Joshua Fishman (1971) take interest because language is correlated with the traditional institutional categories of the sociologist, such as the domains of society where language can be used.

In one of the early attempts to account for the contradictory findings on the effects of bilingualism, Lambert (1975) proposed a distinction between additive and subtractive bilingualism. Additive bilingualism is said to occur when an individual acquires a second language at the same time that all abilities in the first language are maintained. In such situations, there is no threat of loss of the first language. This is the type of bilingualism most often seen in situations where children of the dominant ethnolinguistic groups in a

society learn the minority language at school, it can also be found in situations where the maintenance of language minority children's first language, although societally subordinate, is strongly promoted at school. The effects of each of these types of bilingualism cannot be understood in isolation from an analysis of the environment of the individual. Additive bilingualism occurs when the society values both languages and sees acquisition of the second language as a positive aspect of the child's development. This type of bilingualism occurs in situations where the linguistic and cultural systems represented by the two languages exist in a complementary fashion. In contrast, subtractive bilingualism exists where these two systems are in competition or conflict. Schooling for ethnolinguistic minorities in a society may be available only in a language different from the home language. The society may not value the minority's language, and upward mobility may be possible only when the majority language is acquired. Such acquisition may be associated with a loss of the original home language. In sum, these variant social conditions are seen as leading to different types of individual level cognitive bilingualism.

There are probably as many valid reasons for people to learn a second language as there are language learners, but a few personal motivations stand out: desire to converse in native languages while travelling; to read scientific or other scholarly publications in the original; to under stand films, magazines, newspapers, and novels in another language; or to maximize the chance of economic, professional, or social success in a bilingual environment (e.g., Canada). Some reasons for foreign-language learning may be imposed by external authority: specific job requirements (e.g., civil service), a national school policy endorsing bilingualism, relocation of a family in a place where the home language is not the language of the school degree requirements (e.g., foreign-language proficiency in college).

Perhaps one of the reasons for the failure of most school-based instruction methods lies in their neglect of teaching language as behaviour. In a more natural situation, people soon learn what to say and when to say it to get what they want. This form of communication is pragmatic and geared to results. Many classroom patterns, on the other hand, emphasize drill, analysis, and other exercises involving little contact with language as behaviour. When a monolingual person is asked to learn another language in a school setting, that person is being asked to restructure experience temporarily while having little or no idea what the new experience may be.

Finally, when a person is actively engaged in even the most rudimentary social interaction with speakers of a second language group, he or she has temporarily become something of a member of a second linguistic-cultural group with all that entails for later motivation. This kind of social realism is very difficult to simulate in a standard school setting and may be one of the reasons for the growth of a milieu (environmental) approach to language education.

BILINGUALISM AS NATIONAL POLICY

In most other countries the motivations for putting a language in the school curriculum have much more to do with political or social realities. Most of these reasons centre on the need for widespread knowledge of a single language or two to facilitate communication or national unity in a multilingual country (Hebrew in Israel, Tagalog and English in the Philippines, and Swahili in Kenya) or to improve communication with other countries because the native language does not enjoy worldwide use (English taught in Japan). Another reason for the populations of some countries. In contrast to the Philippines and Kenya where there dozens of languages are spoken, some countries like Belgium, Canada, and Switzerland comprise only two or three large language groups with the privilege of language use enshrined in law. In all these situations the school systems, and the efficacy of bilingual education becomes an important governmental concern.

It is generally said that language is reporting of thought and culture which link the people's past with its presents. It also the part of nation-hood enabling the people to think about and act as a unified group. Also the language is the main vehicle in spreading of knowledge, propagation of culture and in the process of education.

Social and political friction among groups speaking different languages is a common phenomenon. In multilingual societies, choosing a "national language" and a language to serve as the medium of instruction in the educational system sometimes involves problems of serious dimension. While very few societies are linguistically homogeneous, most have a dominant language which is accepted and used, if not always enthusiastically, by all. In some there is officially sanctioned linguistic pluralism.

Many countries in the world have long been multilingual. Others have only recently become acquainted or confronted with multilingualism. However, they all realise that their educational system have to deal with multilingualism in one way or other.

Educational language policies usually translate into the choice of developed Urdu out of these and Indo-Aryan dialects of the Delhi area. The impact of the British on language was

profound in two ways. First they introduced English which came to replace Persian as the language of higher administration. Second as Mughal-Muslim political influence declined under the political and economic impact of the British, Hindu writers began to develop a form as Urdu written in a script derived from Sanskrit (Hindi).

After the independence of Pakistan Urdu was announced as a national language. While Urdu is today the national language, there is unfortunately, no one language common to all or even most Pakistanis. A large percentage of Urdu speakers were refugees from India. Among the Frontier people the use of Urdu is not widespread, English is limited to a small minority consisting of the political and economic elite and continues as the language of "official business", (Hays, 1987).

During the British rule a number of regional and local languages were spoken in the sub-continent Urdu being the most widely understood. The common link between the regions, however, was through this language that the movement for the independence of the sub-continent found its expression bringing together widespread parts of the country. The process continued for over a century giving rise to two important consequences, among others. In the first place, as english was the medium of instruction in schools and success in government service was available only to those possessing skill in english, a social gulf was created

between the small group who acquired this ability and the majority who had not. This happened at a most unfortunate period of History since the last hundred years have seen the most striking advances in practically all fields of human knowledge. The local languages, therefore, could not keep pace with the tremendous advances in the fields of science and technology, nor is their available in them the vast ranges of reference books, journals and periodicals so necessary for the scholars and the teachers.

CHAPTER II

REVIEW OF RELATED LITERATURE

After scanning the literature produced by psychologists and educationists on a large scale. One gets impression that no remarkable relevant literature is available which is directly related to the present study. For this purpose all available books and journals were scanned in the library of NIP. The psychological Abstracts of last four years were also carefully scanned.

While on the other hand the material on different concerning issues (i.e. bilingualism, concept acquisition science education) in the present study is frequently and separately available.

But it stands for the western and developed world alone, and not for the Pakistani context. These is a dearth of useful research work in this regard. One can hardly quote any worthwhile effort which was made for the studying the problem discussed in this present study.

ABOUT BILINGUALISM

Bilingual means the individual who knows two languages to the same extent and depth and is able to use them on any occasion

with the same effectiveness. Besides commanding two languages, what characterizes a bilingual person is the capacity to keep the two linguistic systems separate, so as to switch eerily from one to the other.

This definition refers to the perfect or ideal bilingual. What encounter in real life are individuals who approach this definition in varying degrees. Any study on bilingualism must start by determining the degree of bilingualism of the subjects understudy. The knowledge they have of each language, and the way they use them. Language tests specially designed for academic or clinical examinations and questionnaires can be used for that purpose. The subject's familiarity with each language can also be measured by laboratory techniques.

The oldest and to a certain extent most interesting studies on bilingualism by J. Ronjat (1913) and W.J. Leopold (1939-1949) refer to children learning to speak in two languages at the same time. The data show that a child who grows up in a bilingual context learns to speak the two languages without difficulty, although with some slow learners. These children very soon present the characteristics typical of bilinguals.

For many years studies on bilingualism have ought to determine whether bilingualism favours or impairs intellectual development. Sear's research (1923) with welsh children seemed to

prove it was harmful. Similar results were inferred from studies carried out in the United States with immigrant children. But in the 1960s. Peal and Lambert (1962) presented results which showed a favourable influence, and other research (L.Balkan 1970) confirms them. On the whole today it is thought that in well-balanced social circumstances and with a correct teaching, bilingualism is not detrimental and many even help certain intellectual aspects such help certain intellectual aspects such as flexibility and creativity.

Bicognition is a topic of interest for most urban educators, be it in the bilingual field or in the analysis of social class. Richard Beacher describes cognitive style as the consistent manner in which an individual comes to know the world and its relationships. The author uses the educational sciences as a vehicle to research and develop classroom prescriptions for the bilingual students. Some of the major conclusions are: (1) Bilingual-bicultural education can benefit from the common language and conceptual frame work of the educational sciences; (2) educational cognitive style analyses offers the teacher an effective diagnostic perspective strategy; (3) educational cognitive style "maps" can be generated for bilingual studies; (4) teacher-aides, peer-tutors, and volunteers, along with materials and media, can be matched a students cognitive style. (cited by Richard Baecher 1976).

Research on young second-language learners has shown that their language acquisition patterns in natural situations are similar in many ways to those of first-language learners (Hatch & Wagner Gough, 1975). For example, Hansen-Bede (1975) found that a 3 year 9 month old English speaker in Pakistan went through most of the same strategies in learning Urdu as do native speakers. The child had little apparent interference from English, even in word order. The only area of difficulty was in negation, where the child used those early negation rules that native English speakers use. Even research on primary-school-age second-language learners has shown that interference is not as significant a source of errors in second-language learning as is the developmental process that native speakers of the language also go through (Dulay & Burrt 1974; Cohen, 1975d, Chap.8).

Bilingualism and bilingual education has been facing a problem for the last several decades that how can on really assess the effects of bilingualism and bilingual education on pupil achievement and cognitive development?

In USA one of the many federally and locally funded bilingual programs is the lack of any hard data showing how well the bilingual child is functioning in terms of academic achievement and cognitive development (United States Commission on Civil Rights, 1975). Inventories have been made of the affective concerns of bilingual-bicultural schooling and the

positive gains in pupil self-confidence and school attitudes (Beatly, 1969).

Arsenian is one educator among many trying to probe the mysteries of cognitive style with relatively crude testing instruments. Arsenian selected over 2000 students aged 9 through 14 to take the Pintner and Spearman intelligence tests. Basing his decisions on their responses to the Hoffman questionnaire-Arsenion declared he could detect no significant cause-and-effect relationship between bilingualism and I.Q.

Another name associated with modern bilingual studies is that of John Macnamara, a specialist in evaluation measurements and intellectual development. In on study, Macnamara (1967) reviewed reports of linguistic interference, with especial reference to the work of Uriel Weinreich (1953). Weinreich held there was a strong possibility of conflict between two languages as dissimilar as Russian and English or between dialect and "standard" speech, Macnamara concluded that the causes of languages interference must remain a puzzle until a plausible theory was found to explain why individuals with similar levels of intelligence demonstrated such widely divergent levels of language competency.

Boehm (1976) has worked in the field of 'concept' in the past years. Apart from her earlier contribution of Boehm Test of Basic Concepts (1969), she prepared the Boehm Resource Guide for Basic concept Teaching (1976). Teachers can help children learn basic concepts with the help of this resource guide. The guide suggests materials and activities to teachers so that they can use them for facilitating children's mastery of concepts.

Some other work with reference to the acquisition of concepts has been done by Povey and Hill (cited in Cohen 1983). They tested 56 children aging from 2 years 4 months to 4 years 10 months. They wanted to see if the children were pre-operational and pre-conceptual. It was found that children of about 4 were perfectly well able to handle such concepts. It was claimed that these findings provided evidence against Piaget's view that very young children are unable to handle concepts.

Many investigations into the realm of concept learning have been designed according to the classical assumption carried by people like Bourne (1974). According to this assumption concepts can be described and learned in terms of a listing of their relevant attributes. As a result the research paradigm "involves a type of problem solving in which stimuli are chosen from combinations of several independent dimensions and in which the

subjects task is to sort or classify the stimuli according to simple rule.

According to an alternative assumption, concepts are learned by prototype i.e., best example or clear case of a concept. Rosch (1978) objected to the traditionally held view that a set of clear cut attributes of any concept is borne by every example of that concept.

Tennyson & Park (1980), after reviewing educational research work, have suggested that learning concepts requires the acquisition of generalization and discrimination skills. And the development of such skills is best facilitated when examples of a concept: a; range from easy to difficult b: are divergent in variable attributes, and c: are matched to non-examples on the basis of similarity of variable attributes.

In another study, Tennyson, Chao, and Youngers (1981) studied concept learning effectiveness using prototype and skill development presentation forms. The propositions studied was that concept learning is a two fold process i.e. acquisition of a prototype and development of generalization and discrimination skills. The analysis of data led to the conclusion that a presentation form combining prototype acquisition and discrimination skills facilitated learning.

Hendrickson (1981) in one of his research papers has presented examples of if then and combinational reasoning situation that proved successful with college students, and that can be used with secondary students. According to Hendrickson "logical reasoning can be introduced by activities with attribute material". The activities described in the above mentioned paper were developed by the Elementary Science study as one of the units in that program. Hendrickson found out that 76% of the college students, many of those having had three years of high school science and mathematics, did not understand the meaning of 'and' or 'not', and/or' 'if-them', 'if, only if' some and all;. It was suggested that, when the processes used and the thinking employed in used and the thinking employed in selection and ordering are well developed in students, they have no need to memorize formulae that they may not understand.

Inhelder and Piaget were the first ones to focus attention on formal operational reasoning patterns, It was after their contribution that several researchers began to explore the extent to which students of age twelve and above were able to use proportional reasoning, combinational reasoning, if then reasoning, and analogy in thinking. These researchers also investigated how children manipulate and control the effects of variables (cited by Hendrickson, 1986).

G.M. Seddon and G. Wawerru (1987) has worked about the transferability of scientific concepts between different languages for kenyan students. Their investigation sets out to determine whether scientific concepts which have been previously acquired in one of the languages, English, Swahili or Ki Kuyu by multilingual Kenyan secondary school students can be transferred to the other languages. The investigation is based on practical lessons using work sheets translated into the three languages. The results demonstrate that transfer is possible to the vernacular languages from English and between the two vernacular languages.

While among the longitudinal studies of science concepts learning, Novak, Joseph D. & Musonda, Dismas, have done a remarkable research. They provided audio tutorial science lessons to 191 1st and 2nd grade children (instructed), and interviews were conducted periodically to assess changes in science concept understanding from grades 1 through 12.48 subjects not receiving audio tutorial lessons in Grades 1 and 2 (uninstructed) were also interviewed periodically from Grades 1 through 12. Instructed subject showed more valid concept understandings and fewer invalid concepts (misconceptions) than uninstructed subjects 2,7,10, and 12 concepts maps prepared from interview transcripts showed wide variation in knowledge for both groups, and concept maps scored using a scoring algorithm also showed significant differences favouring instructed subject. A discussion of concept maps as a tool to represent knowledge structures is included.

ABOUT SCIENCE EDUCATION

"Science should be taught to every student every day of every year that the student is in the school". This is what the manifesto, adopted by the National Science Teachers Association (NSTA) of the US at the 1982 meeting of its Board of Directors, stated about the new function for science in school program (cited by Brunkhorst & Yager, 1986).

According to Brunkhort and Yager (1986). The National Science Foundation (NDF) of US., funded a research effort namely, project synthesis, for developing criteria for excellence in science education and the use of criteria in determining the discrepancies between what is occurring what should be occurring in schools with respect to science education.

The NSTA (cited by Brunkhorst & Yager, 1986) in a position paper asserted that the major goal of science is to develop scientifically literate individuals who understand how science technology, and societal influence one another, and who are able to use this knowledge in everyday decision making.

The NSTA also adopted a list of attributes which describe a scientifically literate person. The list contains thirteen attributes with a top most attribute which in fact is an explanation of concept-clarity: "uses science concepts, process skills, and values in making responsible every day decisions".

The findings resulting from an investigation by champagne, and Klopfer (cited by Brrunkhorst & Yager, 1986) indicated that much of the science which is learned has no real meaning for large numbers of students. Students can respond to questions in examination, including the solution of mathematical problems. There is no relationship between this success and real world experience. For example, a student can define density, compute problems using formulae, and appear most successful in terms of the class room requirements. And yet the same student can be completely ignorant of the application of this knowledge, and can be shown to be incapable of dealing in any meaningful was with the concept of density.

AIMS AND OBJECTIVES OF THE STUDY

The major objective of the present study was to undertake a psychological study with a view to formulate policy options on the question of medium of instruction at high school level this work was planned specifically in the context of science education at the school and higher level of education. This study will provide insight into the role of language in acquisition of concepts in general but specifically scientific concepts. The methodology and psychometric instruments which have been adopted and developed for this research will make it possible to undertake further research in role of language in education and assessment of conceptual learning in contrast to existing examinations which tend to assess note memorisation. By the outcome of the present study a new area of psychological research in Pakistan and at NIP has been opened up.

Chapter IV METHODOLOGY

Methodology means , broadly, the formulation of systematic and logically coherent methods for the searh for knowledge. It is, strictly speaking, not concerned directly with the accumulation of knowledge or understanding but rather with the methods and procedures by which such knowledge and understanding are achieved. Specially, the actual procedures used in a particular investigation.

SAMPLE

The data was collected from 202 students of six intermediate colleges of Rawalpindi/Islamabad. All the students were males and belonged to first year, F.Sc., pre-medical group. These were the ex-regular science students of the high schools. Which were categorised into broadly five levels of medium of instruction being Urdu/English medium schools with the extremes being highly English medium and highly Urdu medium schools. Most of the English medium students fall on the category two. Which represnted those students who studied only science subjects in matric. And these students were 89. While at the other end Urdu medium students fall on the catogory five. Which meant that only English as a subject was taught in the institutions. Urdu medium students were 92. So, main analysis was done on these two groups of the students.

PHASE 1 : CONSRUCTION OF INSTRUMENTS

CONSTRUCTION OF A 'SET OF QUESTIONNAIRES'

Five psychometric instruments were used for the collection of data. These were:-

1) Family education.
2) Family's language prevalence.
3) School's medium of instruction on Urdu to English continuum.
4) Questions consisting the information about the students and their socio-economic back ground.
5) A test for the assessment of scientific concepts of matriculates.

First three and fifth one instruments were developed by the researcher and were pre-tested on a sample of 60 students. Where as fifth and last one was taken from a relevant study done by Humala Khalid (1986) at N.I.P., Quaid-i-Azam University, Islamabad.

First four pschometric instruments were included in a 'set of questionnaires'. In most of the cases, the students had to respond in 'yes,' or 'no', and they had to mark any of them in a mentioned box . In other cases, students had to write down the required information about a question in the left space. All the questions were in Urdu.

In the selection of questions help was taken from senior psychologists, school teachers and from the university students of the relevent subject. The first part 'family education' contained the information about the education of parents, sisters and brothers. Tow questions about their attainment in sciencce education were included. The questions were like this; "Who has got science education (minimum F.Sc.) in your family ? and "with whome consent did you choose the science group" ? the purpose of this questionnaire was to see the educational environement of the students.

The second part was of "Family Language". The questions about the spoken language in the home and about mother tongue were included. The purpose was to know the language patterns in the families of the students. To see how much these language patterns contribute in the development of scientific concepts of matriculates. But this part of the questionnaire has not been analysed because it was least contributing factor in the present study.

Third part had two sections. Section 'a', contained the questions related to the medium of instruction in matric. While section'b', had the questions related to the medium of instruction in F.Sc. The questions were in structured form and students had to mark the right answere in the mentioned boxes. Both the sections 'a', and 'b', had same questions. There were total five questions, each depicting the situation about the subjects taught in enghlish

and urdu languages. Each question carried another two sub-questions. Those sub-question were about the conversation patterns between students and teachers in classroom and in school,. there were four degrees from ' very much' to 'very less' to measure the intensity of conversation patterns. Again the students had to mark one of them. The purpose of these questions was to categories the different medium of instructions into high english medium to high urdu medium. These instruments were pretested on a group of 20 students in a college of Islamabad. With minor changes these questionnaires were accepted for the final data collection.

As it has been earlier mentioned that fourth questionnaire was taken from a relevant study already done at NIP. that questionnaire was comprised of nine questions except one statement which was specified for the total marks in matric of the students. That questionnaire had information about the students: like their educational and extra-curricular achievements; what subjects they liked and disliked; to what extent they wanted to study; what profession they wanted to join, and in which cities they had been living for more than six months. Question nine was a list of fifteen different house hold things. The students had to mark the relevant things being used in their houses. This socio-economic status was categorised into upper and lower levels. The students who possessed any one of three things, were considered as members belonging to the upper socio-economic status. These three things were as followed:

1. Telephone.
2. Car.
3. Air conditionar.

And the students who possessed a cluster of three things, but had not any of the three things mentioned above, were considered as members belonging to the lower socio-economic status. Those three things were as followed:

1. Sewing machine.
2. Radio-transistor.
3. Bicycle.

DEVELOPMENT OF A TEST FOR THE ASSESSMENT SCIENTIFIC CONCEPTS

A test for the assessment of acquisition of scientific concepts was developed. In the collection of items, help was taken from the experts, experienced teachers and also from foreign published books. Initially a pool of items was chosen. Every and each question was consulted with the experts. It was tried best to select such concepts given in the Pakistani text books which had reasoning and thought in it. Questions of basic information were avoided. Special care was taken not to include such questions which were out of syllabus. For this purpose each time text book and curriculum booklets published by the ministry of education was approached. The science subjects of matric i.e., chemistry, biology, and physics were included.

First of all a pool of items was pre-tested on a sample of 60 first year science students. In this pool of items each science subject had 60 to 75 items. After the pre-testing item analysis and difficulty level was done. Than questions were finally selected: twenty questions for each science subject. These questions had four possible answers having one correct answer. Studetns were asked to read each question carefully and to encircle only one answer which according to them was correct. This test was translated both in English and Urdu. The students were asked to attempt it in one language, either in enghlish or in urdu.

PROCEDURE

Intermediate colleges of Rawalpindi/Islamabad were approached. With the permission of college authorities first year pre-medical students were contacted. Though instructions were printed on questionnaires, even than verbal instructions were also given to the students. First of all, a set of questionnaire was given to the students which was printed in Urdu. That set comprised of questions about family education; family's languages prevalence; previous and present institution's medium of instruction on Urdu to English continuum; information about the students including total marks in matric; and socio-economic back ground. The students were asked to mark or write proper responses on each question. There was no time limit for the completion of this questionnair.

Once all the students had completed this task, than they were given a test for the assessment of science concepts of matriculates. Instructions and an example were printed on the front page of the test. The students were also verbally briefed. The option was left on the students to attempt this test whether in Urdu or in English. They were suggested to attempt only in one language. The students were asked to read each question carefully and to encircle only one answer that was according to them was correct. In this way the data was collected from the sample. Again there was no time limit for this test.

ANALYSIS OF THE DATA

Mainly the data was analysed on the variables studetns belonged to English and Urdu medium of instructions; ranges of total marks of the studetns in matric. these ranges were divided into two groups. One was a lower range which was 492 to 600. Other range belonged to those students who had marks in between 650 to 770. Another variable was the education of mother and father. Education-wise mothers and fathers were divided into two extreme groups. One extreme was less than primary and other extreme was above than graduation. As it has been earlier mentioned socio-economic level was also divided into upper and lower groups statistical measure like means scores, correlations, t-distributions and analysis of variance (ANOVA) was applied to get the results.

HYPTHSES OF THE STUDY

1. English medium students have better concecptual clarity as compared to the Urdu medium students.
2. Personal achievement, motivation, and hard-working contribute in the acquisition of concepts in a better way.
3. Highly educated parents provide better facilities and environment to thier children.
4. Socio-economic background of the children may affect the capability of the children in the acquisition of conceptual clarity.

RESULTS

The data was analyzed with the help of statistical Packages for Social Sciences (SPSS). It was analyzed as follows:

1. The t-test was computed on the test for the assessment of scientific concepts for determining the significant differences between the students belonging to Urdu and English medium of instructions, between two ranges of marks obtained in matric, between two levels of Father's and Mother's education, and two levels of socio-economic status of the students. The results are shown in table 1 to 20.

Table 1
Impact of medium of instruction on conceptual clarity.

Medium of Instructions	N	Mean	S.D	d.f.	t	p
English	89	29.85	6.35	179	4.34	.000
Urdu	92	25.95	5.72			

**P<.01 *P<.05

Table 1 shows, a significant difference between the students of English and Urdu medium regarding test for conceptual clarity. Mean score (29.85) of English medium students is greater than the mean score (25.95) of Urdu medium students. Which shows that English medium students have high conceptual clarity.

Table 2

Impact of medium of instruction on conceptual clarity for chemistry

Medium of Instructions	N	Mean	S.D	d.f.	t	p
English	89	11.39	3.07	179	5.66	.000
Urdu	92	8.92	2.78			

**P<.01 *P<.05

Significant differnce is found between the students of English and Urdu medium of instructions regarding test for conceptual clarity. Mean scores (11.39) of English medium students are greater than the mean scores (8.92) of Urdu medium students. Which indicates that English medium have high conceptual clarity of chemistry.

Table 3

Impact of Medium of Instrution on Conceptul Clarity Test For Biology.

Medium of Instructions	N	Mean	S.D	d.f.	t	p
English	89	9.46	2.41			
				179	2.45	.015
Urdu	92	8.54	2.63			

**P<.01 *P<.05

Table 3 shows, significant difference between English and Urdu medium institutions towards conceptual clarity of the students. The mean score (9.46) of English medium students is greater than the mean score (8.54) of Urdu medium students. Which shows that English medium students have high conceptual clarity of biology.

Table 4

Impact of Medium of Instruction on Conceptual Clarity Test For Physics.

Medium of Instructions	N	Mean	S.D	d.f.	t	p
English	89	9.00	2.52			
				179	1.49	.137
Urdu	92	8.48	2.17			

**P<.01 *P<.05

Table 4 shows, no significant difference in urdu and english medium institutions. Thus the mean scores of urdu and english medium students are not different.

Table 5

Marks obtained in matric and the conceptual clarity of the students.

Marks in matric	N	Mean	S.D	d.f.	t	p
492 to 600 (Group I)	65	24.35	4.32			
				147	-7.06	.000
650 to 770 (Group II)	84	30.74	6.67			

**P<.01 *P<.05

Table 5 shows, significant difference in the conceptual clarity of the students with different marks obtained in matric. Students belonging to group II, have greater mean scores (30.74) in

the conceptual clarity test than the mean scores (24.35) of group I. This indicates that the students of gourp II have better scientific conceptual clarity.

Table 6

Marks obtained in matric and the conceptual clarity test for chemistry.

Marks in matric	N	Mean	S.D	d.f.	t	p
492 to 600 (Gruop I)	65	8.42	2.51	147	-7.15	.000
650 to 770 (Gruop II)	84	11.67	3.04			

**P<.01 *P<.05

Table 6 shows, significant difference in the mean scores of conceptual clarity test of group I and gruop II. In this regard, group II, has greater mean scores (11.67) than the group 1 (Mean =8.42). Thus the group II has better conceptual clarity of chemistry.

Table 7

Marks obtained in matric and the conceptual clarity test for biology.

Marks in matric	N	Mean	S.D	d.f.	t	p
492 to 600 (Gruop I)	65	7.86	2.26	147	-4.79	.000
650 to 770 (Gruop II)	84	9.81	2.71			

**P<.01 *P<.05

Results of table 7 show, significant difference in the conceptual clarity of students of gruop I and group II. The students of group II, have greater mean scores (9.81) as compared to the mean scores (7.86) of group 1 in the conceptual clarity test of biology. Which shows better conceptual clarity for group II.

Table 8

Marks obtained in matric and the conceptual clarity test for physics.

Marks in matric	N	Mean	S.D	d.f.	t	p
492 to 600 (Gruop I)	65	8.08	1.92	147	-3.22	.002
650 to 770 (Gruop II)	84	9.26	2.58			

**P<.01 *P<.05

Significant difference is found in the conceptual clarity of group I, and group II. The average score (9.26) of group II, is greater than the evearage score (8.08) of group I. It means that students belonging to group II have high conceptual clarity of phisics.

Table 9

Mother's education and conceptual clarity of the students.

Mother education	N	Mean	S.D	d.f.	t	p
Less than primary (Group I)	53	26.85	5.02	89	-2.34	.022
Above than Graduation (Group II)	38	29.82	6.55			

**P<.01 *P<.05

Significant difference is found in the conceptual clarity of group I and group II. The mean scores (29.82) of group II, are better as compared to the mean scores (26.85) of group I. Thus, the group has better conceptual clarity.

Table 10

Mother's education and conceptual clarity of chemistry.

Mother education	N	Mean	S.D	d.f.	t	p
Less than primary (Group I)	53	9.36	2.85	89	-3.25	.002
Above tha Graduation (Group II)	38	11.37	2.96			

**P<.01 *P<.05

There is a significant difference in the mean scores of conceptual clarity of group I and group II. The mean scores (11.37)

of group II, are greater than the mean scores (9.36) of group I. Which shows high conceptul clarity of the studnets belonging to group II.

Table 11

Mother's education and conceptual clarity of biology.

Mother education	N	Mean	S.D	d.f.	t	p
Less than primary (Group I)	53	8.72	2.37	89	-.66	.514
Above than Graduation (Group II)	38	9.08	2.75			

**P<.01 *P<.05

The results of the table 11 show a significant difference between the mean scores of group I and group II. The group II has greater mean scores (9.08) as compared to the mean scores (8.72) of group I. Thus, the group II has high conceptual clarity of biology.

Table 12

Mother's education and conceptual clarity of physics.

Mother education	N	Mean	S.D	d.f.	t	p
Less than primary (Group I)	53	8.77	2.02	89	-1.23	.244
Above than Graduation (Group II)	38	9.37	2.61			

**P<.01 *P<.05

The results show, that there is no significant difference between the mean scores of group I and group II. It shows that the mean scores of group I and group II are not different.

Table 13

Father's education and conceptual clarity of the students.

Father education	N	Mean	S.D	d.f.	t	p
Less than primary (Group I)	12	26.08	5.04	113	-1.89	.078
Above than Graduation (Group II)	103	29.08	6.40			

**P<.01 *P<.05

Table 13 shows, that there is a significant difference between the mean scores of group I and group II. The mean scores (29.08) of group II are greater than the mean scores (26.08) of group I. Which shows that group II has high conceptual clarity.

Table 14

Father's education and conceptual clarity of chemistry.

Father education	N	Mean	S.D	d.f.	t	p
Less than primary (Group I)	12	9.33	3.50	113	-1.39	.189
Above than Graduation (Group II)	103	10.80	3.13			

**P<.01 *P<.05

This is found that there is no significant difference between the mean scores of group I and group II. It means that mean scores of group I and group II are not different.

Table 15

Father's education and conceptual clarity of biology.

Father education	N	Mean	S.D	d.f.	t	p
Less than primary (Group I)	12	8.00	2.70	113	-1.71	.111
Above than Graduation (Group II)	103	9.40	2.58			

**P<.01 *P<.05

The results show, that there is no significant difference between the mean scores of group I and group II. It indicates that the mean scores of group I and group II are not different.

Table 16

Father's education and conceptual clarity of physics.

Father education	N	Mean	S.D	d.f.	t	p
Less than primary (Group I)	12	8.75	1.42	113	-.28	.781
Above than Graduation (Group II)	103	8.88	2.39			

**P<.01 *P<.05

Table 16 shows, that there is no difference between the mean scores of group I and group II. Thus the mean scores of both the groups are not different.

Table 17

Socio-economic status and the conceptual clarity of the students.

Socio-economic status	N	Mean	S.D	d.f.	t	p
Lower SES	49	26.08	4.98			
				179	-2.67	.009
Upper SES	132	28.53	6.67			

**P<.01 *P<.05

The results show, that there is a significant difference between the mean scores of lower and upper socio-economic status. The mean scores (28.53) of upper socio-economic status is greater as compared to the mean scores (26.08) of lower socio-economic status. It indicate that the student belonging to upper socio-economic status, have better conceptual clarity.

Table 18

Socio-economic status and the conceptual clarity of chemistry.

Socio-economic status	N	Mean	S.D	d.f.	t	p
Lower SES	49	9.18	2.67			
				179	-2.75	.007
Upper SES	132	10.49	3.28			

**P<.01 *P<.05

There is a significant difference between the mean scores of lower and upper socio-economic status. The mean scores (10.49) of upper socio-economic status is greater than the mean scores (9.18) of lower socio-economic status. Thus, the students belonging to the families of upper socio-economic status, have better conceptual clarity of chemistry.

Table 19

Socio-economic status and the conceptual clarity of biology.

Socio-economic status	N	Mean	S.D	d.f.	t	p
Lower SES	49	8.22	2.44			
				179	-2.56	.012
Upper SES	132	9.28	2.55			

**P<.01 *P<.05

There is a significant difference between the mean scores of lower and upper socio-economic status. The upper socio-economic status has better mean scores (9.28) as compared to the mean scores (8.22) of lower socio-economic status. Which indicate that the students of upper socio-economic status have better conceptual clarity of biology.

Table 20

Socio-economic status and the conceptual clarity of physics.

Socio-economic status	N	Mean	S.D	d.f.	t	p
Lower SES	49	8.67	2.08			
				179	-.23	.818
Upper SES	132	8.76	2.46			

**P<.01 *P<.05

There is no significant difference between the mean scores of lower and upper socio-economic status. Thus the means scores of lower and upper socio-economic status are not different.

2. Analysis of variance (ANOVA) was computed on the test for the assessment of scientific concepts for determining the differences between the students who had studied with English as a medium of instruction and the students who had studied with Urdu as a medium of instruction, between the students having the two ranges of marks in matric, between the students belonging to the families with different socio-economic back-ground.

Table 1
Difference between conceptual clarity and medium of instructions, marks in matric, and socio-economic status.

Source of variation	SS	df	M.S.	F	P
Main effects	1696.469	3	565.490	7.206	.000**
Medium of Instruction	140.256	1	140.258	4.268	.041*
SES	21.146	1	21.146	.643	.424
Matric Marks	823.241	1	823.241	25.048	.000**
2-way interactions	42.087	3	14.029	.427	.734
MI SES	22.026	1	22.026	.670	.414
MI MM	15.491	1	15.491	.471	.494
SES MM	7.642	1	7.642	.233	.630
3-way interactions	9.991	1	9.991	.304	.582
MM SES MI	9.991	1	9.991	.304	.582
Explained	1748.547	7	249.792	7.600	.000**
Residual	4634.124	141	32.866		
Total	6382.671	148	43.126		

**P<.01 *P<.05

Table 1 shows, the overall significant effect of medium of instructions and marks in matric on the scientific conceptual clarity test. While the SES has no significant effect in the conceptual clarity of scientific concepts.

Table 2

Difference between conceptual clarity of chemistry and medium of instructions, marks in matric, and socio-economic status.

Source of variation	SS	df	M.S.	F	P
Main effects	475.728	3	158.576	21.024	.000**
Medium of Instruction	69.437	1	69.437	9.206	.003**
SES	4.238	1	4.238	.562	.455
Matric Marks	189.804	1	189.804	25.164	.000**
2-way interactions	16.466	3	5.489	.728	.537
MI SES	9.428	1	9.428	1.250	.265
MI MM	11.804	1	11.804	1.565	.213
SES MM	.535	1	.535	.071	.790
3-way interactions	.094	1	.094	.012	.911
MM SES MI	.094	1	.094	.012	.911
Eplained	492.288	7	70.327	9.324	.000**
Residual	1063.524	141	7.543		
Total	1555.812	148	10.512		

**P<.01 *P<.05

Table 2 shows, the overall significant effect of marks in matric and medium of instructions of students on the conceptual clarity for chemistry. While the SES has no significant effect on the conceptual clarity for chemistry.

Table 3

Difference between conceptual clarity of biology and medium of instructions, marks in matric, and socio-economic status.

ource of variation	SS	df	M.S.	F	P
ain effects	164.221	3	54.740	8.666	.000**
edium of Instruction	8.292	1	8.292	1.313	.254
S	10.421	1	10.421	1.650	.201
atric Marks	72.223	1	72.223	11.434	.001**
-way interactions	10.210	3	3.403	.539	.656
SES	4.044	1	4.044	.640	.425
MM	2.704	1	2.704	.428	.524
S MM	.034	1	.034	.005	.942
-way interactions	8.680	1	8.680	1.374	.243
SES MI	8.680	1	8.680	1.374	.243
lained	183.111	7	26.158	4.141	.000**
sidual	890.647	141	6.317		
tal	1073.758	148	7.255		

**P<.01 *P<.05

Table 3 shows, the overall significant effect of marks in matric on ie conceptual clarity of biology. While the medium of instructions and S has no significant effect on the conceptual clarity of biology.

Table 4

Difference between conceptual clarity of physics and medium of instructions, marks in matric, and socio-economic status.

ource of variation	SS	df	M.S.	F	P
ain effects	52.149	3	17.383	3.223	.025*
edium of Instruction	.398	1	.398	.074	.786
ES	.474	1	.474	.088	.767
atric Marks	41.176	1	41.176	7.635	.006**
-way interactions	25.716	3	8.572	1.589	.195
I SES	.155	1	.151	.028	.867
I MM	4.600	1	4.600	.853	.357
ES MM	13.536	1	13.536	2.510	.115
-way interactions	.008	1	.008	.002	.969
1 SES MI	.008	1	.008	.002	.969
plained	77.874	7	11.125	2.063	.051*
esidual	760.435	141	5.393		
otal	838.309	148	5.664		

**P<.01 *P<.05

Table 3 shows, the overall significant effect of marks in matric on ne conceptual clarity of physics. While the medium of instructions and ES has no significant effect on the conceptual clarity of physics.

HAPTER VI

DISCUSSION OF THE RESULTS

The main purpose of this study is to analyze the role of different medium of instructions (English and Urdu), and the scientific conceptual clarity of the students. In this regard, related variables like; total marks obtained in the matric, education of the parents, and socio-economic background of the students are also taken into account. In order to check the impact of these factors in affecting the conceptual clarity of science subjects, statistical hypothesis are formulated. The validity of these hypothesis has been checked by the use of t and F statistic. The simultaneous effect of all these variables in contributing the conceptual clarity of the students is captured by the analysis of various (ANOVA) technique.

In order to find the role of two medium of instructions in the concept development of the students, significant difference is found between the Urdu and English medium. English medium students have better conceptual clarity. This may not be only because of English as a medium of instruction. There may be other confounding variables. This is common in Pakistan that English medium schools are well equipped. The teaching staff is well qualified. These institutions provide better environment is school surroundings. English medium institutions are mostly nt over crowded. Thus, the teachers pay individual concentration to their students. Normally, the parents are well educated, and well off, so, they try their best to pay full concentration in the

studies of their children. And, they even can provide a special tutor for their children. All these and other related factors, may contribute the over all performance of the students belonging to the English medium institutions.

English medium students performed better in the subjects of chemistry and biology. In the case of chemistry the reasons could be the particular nature of equations. Because the concepts of chemistry are mostly described in equations. And English symbols are used for such equations. So, the Urdu medium students may feel it difficult to grasp these concepts. While on the other hand, English medium students are most inept in English. So, they feel no difficulty in the understanding of concepts related to chemistry. In the case of biology, the performance of Urdu medium students is not good. Because in Urdu medium most of the terminology has been taken from Arabic. That creates difficulty in understanding the concepts for Urdu medium students. In the subject of physics both the Urdu and English medium students have same performance. In the subject of physics most of the concepts are mathematical in nature. These concepts have causal relationships. So, the language plays a minimal role in the acquisition of the concepts. Overall, results are in the favour of English medium school. It may be concluded that role of medium of instruction plays an important role in the conceptual clarity of the students. It has great policy implications. Therefore, policy is in the favour of English as a medium of instruction, may improve the concept building of the students.

The effect of matriculation marks and the conceptual clarity of the students is in favour of higher grades in matric. On the basis of matriculation marks, students are divided into two groups. Students belonging to group II (650-770) have higher mean scores in the conceptual clarity test as compared to the mean scores of the group I (492-600). It indicates that the marks obtained in matric does contribute in the concept building of the students. And the difference in the matriculation marks significantly reflected in the conceptual clarity of the students. It is evident that better marks truly correlate with better conceptual clarity.

The t-test is also computed for determining the significant differences between the conceptual clarity of the students and the parent's education. It is found that there is a significant difference between the students having different parental education. For emperical analysis, the education variable is divided into two groups i.e., group I (less than primary) and group II (above than graduation). This study shows significant differences in the performance of both the groups. As for as mother's education is concerned, group II has performed better than the group I. Similarly, group II has higher mean scores in the conceptual clarity test for chemistry and biology, as compared to group I. However, no significant difference is found in the performance of group I and group II in case of physics.

Father's education is also analyzed in the context of conceptual clarity of the students. In this regard the mean scores of group II is greater than the mean scores of group I. However, father's education is not a significant variable in the development of conceptual clarity of students when the subjects, chemistry, physics and biology are taken separately. On the other hand, conceptual clarity is significantly affected by the mother's education when chemistry and biology one individually analyses. It shows parent's education contribute in the conceptual clarity, particularly, it is mother's education, that matters. Because mothers are more near to the children. So, the children get influenced by the mothers. Mothers pay more attention to their children. While the fathers have to remain outside of their homes.

Socio-economic status and conceptual clarity of the students is also analysed. This study shows that students belonging to upper socio-economic status have greater mean score in the conceptual clarity test than the students having lower socio-economic status. The effect of socio-economic status and the conceptual clarity is mainly in favour of upper socio-economic status with the exception of physics, in which the difference is not significant. Here the results correlate with English medium students. Because, the students studying in English medium institutions belong to well off families. They enjoy better environment and facilities. This is why their overall performance

is better.

Analysis of variance is performed for determining the differences between students having different marks in matric, different medium of instructions and with different socio-economic status. The significant difference is found between students having different marks in matric. The differece is also significant for students having different medium of instructions. However, socio-economic status is not significant variable in affecting the conceptual clarity of the students. The overall effect of medium of instruction, socio-ecoonmic status and marks in matric is significant.

Analysis of variance (ANOVA) table 2, shows significant difference in the conceptual clarity of the students in chemistyr having different medium of instruction, socio-economic and different marks in matric. Socio-economic status does not affect significantly the performance of the studetns. The overall effect of medium of instruction, socio-economic status and marks in matric is significnat.

ANOVA table 3 shows, that overll effect of medium of instruction, socio-economic status and marks in matric significntly affect the performance of the students in biology. Of particular importance is the result of makrs in matric, that signifinctly affect the conceptual clarity of the students. The

impact of different medium of instruction, and socio-economic status is not significnat.

ANOVA table 4, is meant to analyze the conceptual ability of the students in the subject of physisc. It is found that ther is a significnat difference in the conceptual clarity of the students having different marks in matric. The other variables, medium of instruction, and socio-economic status are not significant. The overll effect of different medium of instructions, socio-economic status and marks in metric are significant.

Analysis of variance (ANOVA) technique indicates the importnace of marks obtained in matric as an important variable. Students having higher grades in matric consistantly performed better in either subject.

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APPENDIX 'A'

نام :-

موجودہ تعلیمی ادارے کا نام :.

گذشتہ تعلیمی ادارے کا نام (جہاں سے میٹرک پاس کیا) :.

مندرجہ ذیل باتوں میں سے آپ کے نزدیک جو بات سب سے زیادہ درست ہو اس کے خانے میں (✓) کا نشان لگائیں۔ اگر کہیں پر کچھ لکھنا ہو تو وہاں پر خود لکھیں۔

'حصہ اوّل'

FAMILY EDUCATION

۱۔ آپ کے والد کی تعلیم کتنی ہے . . . . . .

۲۔ آپ کی والدہ کی تعلیم کتنی ہے . . . . . .

۳۔ بھائی یا بہنیں جو تعلیم حاصل کر چکے ہیں اور ان کی تعلیمی قابلیت . . . . . .

۴۔ بھائی یا بہنیں جو تعلیم حاصل کر رہے ہیں اور ان کی تعلیمی قابلیت . . . . . .

۵۔ آپ کے اپنے گھر میں کسی اور نے سائنس کی تعلیم (کم از کم F.Sc.) حاصل کی ہے۔

ہاں ☐ نہیں ☐

اگر 'ہاں' تو والد کی تعلیم : . . . . . .

والدہ کی تعلیم . . . . . .

بھائی/بھائیوں کی تعلیم . . . . . .

بہن/بہنوں کی تعلیم . . . . . .

کوئی اور فرد . . . . . .

۶۔ آپ نے سائنس گروپ کا انتخاب کس کی مرضی سے کیا ؟

(i) اپنی مرضی سے ☐

(ii) والد کی مرضی سے ☐

(iii) والدہ کی مرضی سے ☐

(iv) بھائی/بھائیوں کی مرضی سے ☐

(v) بہن/بہنوں کی مرضی سے ☐

(vi) بھائی/بہنوں کی مرضی سے ☐

(vii) کسی اور فرد کی مرضی سے ☐

'حصہ سوم' (الف)

MEDIUM OF INSTRUCTION

یہ سوالنامہ میٹرک میں آپ کی 'ذریعہ تعلیم' سے متعلق ہے۔

ہدایات:۔ درج ذیل پانچ سوالوں میں سے کسی ایک سوال کا جواب 'ہاں' ہیں ہوگا۔ اس ایک 'جزو' کے علاوہ باقی سوال آپ کیلئے غیر متعلق ہونگے۔ اس لئے آپ انہیں خالی چھوڑ دیں۔

1۔ کیا اس درسگاہ میں جہاں سے آپ نے میٹرک پاس کیا۔ وہاں تمام مضامین (جن میں اردو لازمی بھی شامل تھی) انگریزی میں پڑھائے جاتے تھے؟

ہاں ☐ نہیں ☐

(i) کیا اساتذہ اور طالب علم کلاس میں انگریزی میں بات کرتے تھے؟

(i) بہت زیادہ ☐ (ii) زیادہ تر ☐ (iii) کم تر ☐ (iv) بہت کم تر ☐

(ii) کیا اساتذہ اور طالب علم کلاس کے بعد سکول میں انگریزی بات کرتے تھے؟

(i) بہت زیادہ ☐ (ii) زیادہ تر ☐ (iii) کم تر ☐ (iv) بہت کم تر ☐

2۔ کیا اس درسگاہ میں سائنس مضامین (فزکس، کیمسٹری، بیالوجی وغیرہ) انگریزی میں پڑھائے جاتے تھے؟

ہاں ☐ نہیں ☐

(i) کیا اساتذہ اور طالب علم کلاس میں انگریزی میں بات کرتے تھے؟

(i) بہت زیادہ ☐ (ii) زیادہ تر ☐ (iii) کم تر ☐ (iv) بہت کم تر ☐

(ii) کیا اساتذہ اور طالب علم کلاس کے بعد سکول میں انگریزی میں بات کرتے تھے؟

(i) بہت زیادہ ☐ (ii) زیادہ تر ☐ (iii) کم تر ☐ (iv) بہت کم تر ☐

3۔ کیا اس درسگاہ میں (اردو لازمی کے علاوہ) تمام مضامین انگریزی میں پڑھائے جاتے تھے؟

ہاں ☐ نہیں ☐

(i) کیا اساتذہ اور طالب علم کلاس میں انگریزی میں بات کرتے تھے؟

(i) بہت زیادہ ☐ (ii) زیادہ تر ☐ (iii) کم تر ☐ (iv) بہت کم تر ☐

(ii) کیا اساتذہ اور طالب علم کلاس کے بعد سکول میں انگریزی میں بات کرتے تھے؟

(i) بہت زیادہ ☐ (ii) زیادہ تر ☐ (iii) کم تر ☐ (iv) بہت کم تر ☐

'حصہ سوم' (ب)

یہ سوالنامہ، آپ کے موجودہ 'ذریعہ تعلیم' سے متعلق ہے۔

ہدایات:-

درج ذیل پانچ سوالوں میں سے کسی ایک سوال پر آپ کا جواب 'ہاں' میں ہوگا۔ اس ایک 'جزو' کے علاوہ باقی سوال آپ کیلئے غیر متعلق ہونگے۔ اس لئے آپ انہیں خالی چھوڑ دیں۔

1 - کیا اِس درسگاہ میں (جہاں آپ آج کل زیرِ تعلیم ہیں) وہاں تمام مضامین جس میں اردو لازمی بھی شامل ہے، انگریزی میں پڑھائے جاتے ہیں؟

ہاں ☐ ہیں ☐

(i) کیا اساتذہ اور طالب علم کلاس میں انگریزی میں بات کرتے ہیں؟

(i) بہت زیادہ ☐ (ii) زیادہ تر ☐ (iii) کم تر ☐ (iv) بہت کم تر ☐

(ii) کیا اساتذہ اور طالب علم کلاس کے بعد، انگریزی میں بات کرتے ہیں؟

(i) بہت زیادہ ☐ (ii) زیادہ تر ☐ (iii) کم تر ☐ (iv) بہت کم تر ☐

2 - کیا اِس درسگاہ میں تمام مضامین (ماسوائے اردو لازمی کے) انگریزی میں پڑھائے جاتے ہیں؟

ہاں ☐ ہیں ☐

(i) کیا اساتذہ اور طالب علم کلاس میں انگریزی میں بات کرتے ہیں؟

(i) بہت زیادہ ☐ (ii) زیادہ تر ☐ (iii) کم تر ☐ (iv) بہت کم تر ☐

(ii) کیا اساتذہ اور طالب علم کلاس کے بعد، انگریزی میں بات کرتے ہیں؟

(i) بہت زیادہ ☐ (ii) زیادہ تر ☐ (iii) کم تر ☐ (iv) بہت کم تر ☐

'حصہ چہارم'

ذاتی سوانح

آپ کے میٹرک میں کل نمبر . . . . . .

1. کیا آپ کبھی اپنی کسی کلاس میں اوّل، دوم یا سوم آئے؟ تفصیل سے لکھیے:.

2. کیا آپ کو کبھی غیر نصابی سرگرمیوں مثلاً مباحثہ، نظم پڑھنے، قرأت یا کھیلوں میں کوئی انعام ملا؟ تفصیل سے لکھیے:.

3. کیا آپ کبھی سالانہ امتحان میں فیل ہوئے؟ تفصیل سے لکھیے:.

4. سکول میں جو مضامین پڑھائے جاتے ہیں، ان میں سے آپ کو سب سے زیادہ کون سا مضمون پسند ہے۔

5. کون سا مضمون سب سے زیادہ ناپسند ہے۔

6. آپ کن جگہوں پر رہے ہیں۔ ان شہروں یا دیہاتوں کے نام لکھیے جہاں آپ چھ ماہ سے زائد رہے۔

7. آپ کتنی جماعت تک پڑھنا چاہتے ہیں۔

8. آپ بڑے ہو کر کون سا پیشہ اختیار کرنا چاہتے ہیں۔

APPENDIX 'B'

A TEST FOR
THE ASSESSMENT OF
SCIENTIFIC CONCEPTS
OF
MATRICULATES

سائنسی تصورات
کے
فہم کی آزمائش
برائے
میٹرک پاس طلباء و طالبات

قومی ادارہ نفسیات قائداعظم یونیورسٹی
اسلام آباد

قومی ادارہ نفسیات قائداعظم یونیورسٹی اسلام آباد میں ایک تحقیق کی جارہی ہے۔ جس کا مقصد ہمارے ملک میں ثانوی سطح کی سائنسی تعلیم کا فروغ ہے۔ اس مقصد کیلئے میٹرک کے سائنس مضامین کا ٹیسٹ بنایا گیا ہے۔ اس ٹیسٹ میں کل ساٹھ سوال ہیں۔ ہر سوال کے چار ممکنہ جوابات ہیں۔ جس میں صرف ایک جواب درست ہوگا۔ آپ سے گزارش ہے کہ ہر سوال کو غور سے پڑھیں اور ایسے جواب پر دائرہ لگائیں جو کہ آپ کے نزدیک درست ہو۔ ایک سے زیادہ جواب پر دائرہ نہ لگائیں۔ اگر ایک دفع دائرہ لگادیا ہے اور بعد میں اس کو تبدیل کرنے کی ضرورت محسوس ہو تو پہلے دائرہ کو کاٹ کر دوسرا دائرہ لگادیں۔ براہ مہربانی ہر سوال کا جواب دینے کی کوشش کریں۔

اب آپ ایک مثال ملاحظہ کریں:

مثال:-

س: نائٹروجن پودوں اور جانوروں کیلئے ضروری ہے۔ تاکہ

الف) کاربوہائیڈریٹس (CARBOHYDRATES) پیدا کی جاسکیں۔
ب) نشاستہ کو پیدا کیا جا سکے۔
(ج) پروٹین کو پیدا کیا جا سکے۔
د) اِنزائیمز (ENZYMES) کو پیدا کیا جا سکے۔

اس سوال میں جزو 'ج' سوال کا درست جواب ہے۔ لہٰذا درست جواب پر دائرہ لگایا گیا ہے۔

س 1 = مرکب بنانے والے عناصر

الف) ایک خاص مقررہ تناسب سے موجود ہوتے ہیں۔
ب) کے کیمیائی خواص یکساں ہوتے ہیں۔
ج) کو طبعی طریقوں سے الگ کیا جا سکتا ہے۔
د) کا مالیکیولی وزن ایک جیسا ہوتا ہے۔

س 2 = ریڈی کا دوسرا تجربہ اس لئے اہم تھا کیونکہ اس سے پتہ چلا کہ

الف) گوشت کے بند مرتبانوں میں کیڑے موجود تھے۔
ب) مکھیاں کیڑوں سے نہیں بنتیں۔
ج) کیڑے تب بھی نہیں بنے حتیٰ کہ ہوا جالی سے، گوشت کے بند مرتبانوں میں داخل ہوئی۔
د) کیڑے بے جان اشیاء سے بنتے ہیں۔

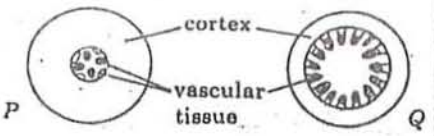
س 3 = جو اکائیاں لمبائی، کمیت اور وقت کی بنیادی اکائیوں کے ملانے سے بنتی ہیں وہ

الف) تجاذبی اکائیاں کہلاتی ہیں۔
ب) ماخوذ اکائیاں کہلاتی ہیں۔
ج) عملی اکائیاں کہلاتی ہیں۔
د) انجینئرنگ اکائیاں کہلاتی ہیں۔

س 4 = ایک عنصر کی کیمیائی بانڈ بنانے کی صلاحیت کو

الف) ایٹم کے اندر الیکٹرانوں کی کل تعداد سے بیان کیا جاتا ہے۔
ب) برقی مثبیت سے۔
ج) برقی منفیت سے بیان کیا جاتا ہے۔
د) ویلنسی سے بیان کیا جاتا ہے۔

س 5 = نیچے دیئے گئے ڈایاگرام میں 'P' اور 'Q' ، پودے کے دو مخصوص حصوں کو جوڑے رخ ظاہر کرتے ہیں۔



مندرجہ ذیل میں سے کونسا درست ہے؟

الف) 'P' ایک پرائمری جڑ ہے اور 'Q' ایک سیکنڈری جڑ ہے۔
ب) 'Q' ایک تنا ہے اور 'P' نہ ایک جڑ ہے نہ تنا ہے۔
ج) 'P' ایک جڑ ہے اور 'Q' ایک تنا ہے۔
د) 'P' ایک تنا ہے اور 'Q' ایک جڑ ہے۔

س 6 = درج ذیل میں سے کونسی مثال قیام توازن کی ہے۔

الف) اپنے پیندے پر کھڑا ہوا ایک مخروط (Cone)۔
ب) اپنے کشادہ سرے پر کھڑی ہوئی ایک قیف۔
ج) اپنے پہلو پر پڑی ہوئی ایک مکعب۔
د) مندرجہ بالا تمام مثالیں۔

س 7 = ایک کیمیائی تبدیلی کے دوران

الف) نئے عناصر بنتے ہیں۔
ب) نئے مرکبات بن سکتے ہیں۔
ج) کمیت کو ختم ہونے سے بچایا جا سکتا ہے۔
د) ایک محلول بنتا ہے۔

س 8 = ایک ماہی گیر نے کچھ مچھلیوں کے ساتھ ایک سمندری میمل پکڑا۔ مندرجہ ذیل میں سے کونسی ایسی خصوصیات ہیں جن کی بنا پر اسے سمندری میمل کے پہچاننے میں مدد ملی؟

الف) جسم کے تین حصوں کی موجودگی۔
ب) بالوں کا نہ ہونا۔
ج) بازو یا ٹانگوں کا الگ الگ طرح کا ہونا۔
د) مختلف قسم کے دانتوں کی موجودگی۔

س ۹ : مخفی توانائی (Potential Energy) وہ توانائی ہے جو کسی جسم میں

الف) اس کے موجودہ مقام کی وجہ سے پائی جاتی ہے۔
ب) اس کی مالیکیولی توانائی (Molecular Energy) کی وجہ سے پائی جاتی ہے۔
ج) اس کی حرکت کی وجہ سے پائی جاتی ہے۔
د) مندرجہ بالا تمام وجوہات سے پائی جاتی ہے۔

س ۱۰ : ایک آمیزہ، ایک مرکب سے اس طرح مختلف ہوتا ہے کہ

الف) اس کی ترکیب خاص نہیں ہوتی۔
ب) یہ صرف عناصر پر مشتمل ہوتا ہے۔
ج) اس میں ایک سے زیادہ عناصر ہوتے ہیں۔
د) اس کو کیمیائی طریقوں سے الگ نہیں کیا جا سکتا۔

س ۱۱ : سبز مادہ (Chlorophyll) کو نباتی تالیف میں خام مال کی حیثیت سے نہیں جانا جاتا۔ کیونکہ یہ

الف) گلوکوز بنتے وقت بہت زیادہ استعمال یا تبدیل نہیں ہوتا۔
ب) نباتی تالیف کو شروع کرنے کیلئے یہ کچھ کیمیائی توانائی جذب کرتا ہے۔
ج) دھوپ کو روشنی کی توانائی میں تبدیل کرتا ہے۔
د) گلوکوز کو کاربن ڈائی آکسائیڈ اور پانی میں تحلیل کرنے میں معاون ہوتا ہے۔

س ۱۲ : فولاد، ربڑ سے زیادہ لچکدار ہے۔ کیونکہ

الف) یہ ایک دھات ہے۔
ب) اس کی کثافت زیادہ ہے۔
ج) اس میں سٹریس (Stress) کی نسبت سے سٹرین (Strain) زیادہ ہے۔
د) اس میں سٹرین کی نسبت سے سٹریس زیادہ ہے۔

س 13 = جب ردر فورڈ نے الفا ذرات کی دھار کو سونے کی پتری پر ڈالا تو زیادہ تر الفا ذرات پتری میں سے سیدھے گذر گئے۔ لیکن کچھ چوڑے زاویوں سے مڑ گئے۔ اس سے ردر فورڈ نے نتیجہ اخذ کیا کہ

الف) ایٹم پروٹانوں اور نیوٹرانوں پر مشتمل ہوتے ہیں۔
ب) ایٹم کا نیوکلیس پروٹانوں اور نیوٹرانوں پر مشتمل ہوتا ہے۔
ج) ایٹموں کے درمیان کوئی خلا نہیں ہوتا۔
د) ایٹم کی زیادہ تر کمیت ایک چھوٹے سے مثبت نیوکلیس میں جمع ہوتی ہے۔

س 14 = تمام زندہ جانداروں میں توانائی کا منبع

الف) پودوں میں تلاش کیا جا سکتا ہے۔
ب) سورج میں تلاش کیا جا سکتا ہے۔
ج) پانی میں تلاش کیا جا سکتا ہے۔
د) کاربن ڈائی آکسائیڈ میں تلاش کیا جا سکتا ہے۔

س 15 = اگر ایک اکہرے مرتکز کرنے والے عدسے کو آنکھ کے قریب رکھا جائے تو پھر اُس کا یہ استعمال

الف) دوربین کہلائے گا۔
ب) Reading Glass یا پڑھنے میں مدد دینے والا شیشہ کہلائے گا۔
ج) سادہ خوردبین کہلائے گا۔
د) مرکب خوردبین کہلائے گا۔

س 16 = ایسے عناصر جو کہ 'دوری جدول' میں ایک ہی گروپ میں ہوتے ہیں

الف) ان کے نیوکلیس میں ایک جتنے نیوٹران ہوتے ہیں۔
ب) ان میں الیکٹرانوں کے ایک جتنے مدار ہوتے ہیں۔
ج) ان کے نیوکلیس میں ایک جتنے پروٹان ہوتے ہیں۔
د) ان کے سب سے باہر والے مدار میں الیکٹرانوں کی ترتیب ایک جیسی ہوتی ہے۔

س 17 = ان بیانات میں سے کون سا بیان پودوں میں پانی کے جڑ سے تنے میں چڑھاؤ سے تعلق نہیں رکھتا۔

الف) پانی کا چڑھاؤ دن رات جاری رہتا ہے۔
ب) پانی جڑ کے دباؤ کے ذریعے اوپر جاتا ہے۔
ج) پانی ٹرانسپائریشن پُل (TRANSPIRATION PULL) کے ذریعے اوپر کھینچا جاتا ہے۔
د) پانی کا چڑھاؤ زیادہ تر فلوئم ٹشو (PHLOEM TISSUE) میں ہوتا ہے۔

س 18 = روشنی کے ذراتی نظریے (CORPUSCULAR THEORY) نظریے کے مطابق، روشنی کثیف واسطے میں تر چھی داخل ہوتی ہوئی عمود کی طرف جھک جاتی ہے، کیونکہ

الف) اس کی مجموعی توانائی کم ہو جاتی ہے۔
ب) اس کی مجموعی توانائی میں اضافہ ہو جاتا ہے۔
ج) اس کی رفتار بڑھ جاتی ہے۔
د) اس کی رفتار کم پڑ جاتی ہے۔

س 19 = ایک کیمیائی بانڈ کے بننے کا عمل ہمیشہ

الف) الیکٹرانوں کے منتقل (انتقال) یا اشتراک میں ہونے پر مشتمل ہوتا ہے۔
ب) الیکٹرانوں کے حاصل ہونے یا ختم ہو جانے پر مشتمل ہوتا ہے۔
ج) آئن سازی پر مشتمل ہوتا ہے۔
د) ویلنس (VALENCE) میں تبدیلی پر مشتمل ہوتا ہے۔

س 20 = سبز پودوں کے پتے سانس لیتے ہیں۔

الف) صرف براہ راست سورج کی روشنی میں۔
ب) صرف ضیائی تالیف کے دوران میں۔
ج) صرف اندھیرے میں۔
د) براہ راست سورج کی روشنی اور اندھیرے دونوں میں۔

س 21 = سفید روشنی یا سورج کی روشنی بہت سی طول موجوں پر مشتمل ہوتی ہے۔ اور ہر ایک مختلف رنگ سے مطابقت رکھتی ہے۔ جب یہ منشور سے گزرتی ہے تو

الف) مختلف رفتار سے سفر کرتی ہے۔
ب) منتشر ہو جاتی ہے۔
ج) آہستہ ہو جاتی ہے۔
د) اوپر والی تمام وجوہات۔

س 22 = اس بات کی توقع نہیں کی جا سکتی کہ H_2 میں بانڈ آئنی ہو جائے۔ کیونکہ

الف) ہر ہائیڈروجن کے ایٹم میں دو الیکٹران ہوتے ہیں۔
ب) ہر ہائیڈروجن ایٹم ایک الیکٹران حاصل کرتا ہے۔
ج) دو ہائیڈروجن کے ایٹم الیکٹرالوں کیلئے ایک جیسی کشش رکھتے ہیں۔
د) ہر ہائیڈروجن کے ایٹم پر ایک جتنا مثبت چارج ہوتا ہے۔

س 23 = جب پسلیوں کو اُبھارا جاتا ہے اور ڈائیا فرام کو پھیلایا جاتا ہے، تو جو کچھ ہوتا ہے، مندرجہ ذیل میں سے کون اس کی بہترین وضاحت کرتا ہے۔

الف) ہوا کو اندر کھینچا جاتا ہے۔
ب) پھیپھڑے اپنے اصل حجم میں واپس آجاتے ہیں اور ہوا کو باہر نکالا جاتا ہے۔
ج) ہوا کو باہر نکالا جاتا ہے۔
د) پھیپھڑے پھیل جاتے ہیں اور ہوا کو اندر کھینچا جاتا ہے۔

س 24 = ایک نیوٹران، پروٹان کی نسبت زیادہ آسانی سے نیوکلیس میں داخل ہو سکتا ہے کیونکہ

الف) یہ ایک کم حرکتی ذرہ ہے۔
ب) یہ تیز حرکتی ذرہ ہے۔
ج) یہ ایک غیر چارج شدہ ذرہ ہے۔
د) یہ کم کمیت والا ذرہ ہے۔

س 25 = تمام الکلی دھاتیں ہائیڈروآکسائیڈ بناتی ہیں جو کہ

الف) تیزاب ہوتے ہیں۔
ب) اساس ہوتے ہیں۔
ج) پانی میں حل نہیں ہوتے۔
د) نیوٹرل ہوتے ہیں۔

س 26 اگر آپ کو بتایا جائے کہ ایک جاندار مغلوب خصوصیت کیلئے (HOMOZYGOUS) ہے۔ تو آپ جان جائیں گے کہ

الف) اس کی فینوٹائپ (PHENOTYPE) کیا ہے۔ لیکن یہ نہیں جان سکیں گے کہ اس کی جینوٹائپ (GENOTYPE) کیا ہے۔
ب) اس میں تبدیلی (MUTATION) کی شرح کیا ہے۔
ج) اس کی جینوٹائپ کیا ہے لیکن یہ نہیں جان سکیں گے کہ اس کی فینوٹائپ کیا ہے۔
د) اس کی جینوٹائپ کیا ہے اور فینوٹائپ کیا ہے۔

س 27 : چارج شدہ متوازی پلیٹوں والے کپیسٹر کی پلیٹوں کے درمیان ڈائی الیکٹرک داخل کیا جائے تو

الف) کپیسٹنس (CAPICITANCE) کم ہو جاتی ہے۔
ب) کپیسٹنس وہی رہتی ہے۔
ج) یہ پلیٹوں کے درمیان برقی شدت کو گھٹاتا ہے۔
د) یہ پلیٹوں کے درمیان وولٹیج بڑھاتا ہے۔

س 28 = جب ہلکے تیزاب کا محلول زیادہ پانی ملانے سے پتلا ہو جاتا ہے۔ تو

الف) تیزاب کی طاقت بڑھ جاتی ہے۔
ب) محلول میں آئن کا ارتکاز بڑھ جاتا ہے۔
ج) یہ ایک اساس کی طرح عمل کرتا ہے۔
د) آئیونائز ہونے والے مالیکیول کی فیصد بڑھ جاتی ہے۔

س29 = فطری چناؤ کی بنیاد یہ ہے کہ

الف) ایسے جاندار جو کسی ماحول کیلئے زیادہ موزوں ہوتے ہیں وہ زیادہ کامیابی سے اپنی نسل بڑھاتے ہیں۔
ب) ایک جاندار ماحول سے اپنی ضروریات کی چیزیں حاصل کر سکتا ہے۔
ج) ہر نوع اپنے رہنے کیلئے ماحول کا انتخاب کرتی ہے۔
د) ایک جاندار یہ فیصلہ کرتا ہے کہ اس نے کس ہیجیج (STIMULI) کو ردعمل کا اظہار کرنا ہے۔

س30 = اگر موصل کی مزاحمت بڑھائی جائے تو کرنٹ

الف) بڑھ جائیگا۔
ب) کم ہو جائیگا۔
ج) وہی رہیگا۔
د) پہلے بڑھے گا، پھر کم ہو جائے گا۔

س31 = ان میں سے کون سے عوامل کیمیائی عمل کی شرح پر اثر نہیں کرتے۔

الف) وقت۔
ب) درجہ حرارت۔
ج) دباؤ۔
د) عمل انگیزی۔

س32 = فوسل کے ساتھ ساتھ ایسے ہتھیار اور اوزار جو ابتدائی انسان استعمال کرتا تھا اس لئے اہم ہیں کہ ان سے ہمیں پتہ چلتا ہے۔

الف) آگ کے استعمال کا۔
ب) پودوں کی قسموں کا جو کہ پیدا ہوتے تھے۔
ج) ماحول میں موجود چٹانوں کی اقسام کا۔
د) ہمارے آباؤ اجداد کی ثقافت کا۔

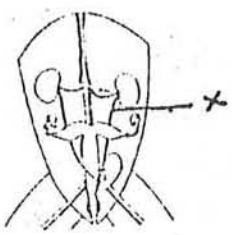
س 33 = متوازی مزاحم میں ایک جیسی مزاحمت ہمیشہ

الف) جدا مزاحمتوں کے ریسی پروکل (RECIPROCAL) (باہم) کے مجموعے سے کم ہوتی ہے۔
ب) کبھی بھی ایک جدا مزاحم کی مزاحمت سے کم ہوتی ہے۔
ج) مزاحم کی کم اور زیادہ قیمتوں (VALUES) کے درمیان ہوتی ہے۔
د) جدا مزاحم کے مجموعے کے برابر ہوتی ہے۔

س 34 = کیمیائی عمل $N_2 + 3H_2 \rightleftharpoons 2NH_3$ میں، اگر توازن کی حالت میں سسٹم پر دباؤ ڈالا جائے تو

الف) زیادہ ہائیڈروجن استعمال ہوگی۔
ب) زیادہ امونیا گیس بنے گی۔
ج) امونیا بننے کے بعد کوئی تبدیلی رونما نہیں ہوگی۔
د) توازن میں عمل کرنے والے اور بننے والے مرکبات کی مقدار تبدیل نہیں ہوگی۔

س 35 = تصویر میں ہیمل کا یورینری سسٹم دکھایا گیا ہے۔



مندرجہ ذیل میں سے کونسا لیبل نالی (X) کیلئے موزوں ہے۔

الف) یورییٹر (URETER)
ب) یوریتھرا (پیشاب کی نالی)
ج) مثانہ
د) یورینری ٹیوبلز (URINARY TUBLES)

س 36 = جب فصیل کی سطح پر پانی کی موجیں حرکت کرتی ہیں تو موج کے زیر آزمائش پانی کے مالیکیول

الف) اوپر نیچے تقریباً موسیقائی حرکت (HARMONICALLY) کرتے ہیں۔
ب) آگے پیچھے تقریباً موسیقائی حرکت کرتے ہیں۔
ج) اپنے اصل مقام کے گرد تقریباً دائروی مدار بناتے ہیں۔
د) موجی توانائی کو ساتھ لیتے ہوئے، موجی حرکت کی سمت میں مختلف دلاسٹی کے ساتھ حرکت کرتے ہیں۔

س 37 = جب خون گردوں میں گردش کرتا ہے تو خون کے کچھ اجزاء گردوں کی نالیوں میں اس عمل کی وجہ سے چلے جاتے ہیں۔

الف) فلٹریشن (تقطیر)
ب) صاف کرنا۔ (PURIFICATION)
ج) منتخب دوبارہ انجذاب (SELECTIVE REABSORPTION)
د) انجذاب۔ (ABSORPTION)

س 38 = ایٹمی وزن کے بڑھانے سے، ہم جائی اثر

الف) بڑا ہوجاتا ہے۔
ب) کم ہوجاتا ہے، بھاری عناصر کیلئے برائے نام رہ جاتا ہے۔
ج) ممکن حد تک بڑھ کر، پھر کم ہوجاتا ہے۔
د) غیر تبدیل شدہ رہتا ہے۔

س 39 = جب پانی کی دو موجیں ایک دوسرے پر دخل انداز ہوتی ہیں، تو وہ

الف) ایک دوسرے کو ضائع کرتی ہیں۔
ب) ایک دوسرے کی تنسیخ (CANCEL) کرتی ہیں۔
ج) ایک دوسرے کو تقویت پہنچاتی ہیں۔
د) ایک دوسرے پر کوئی اثر نہیں ڈالتیں۔

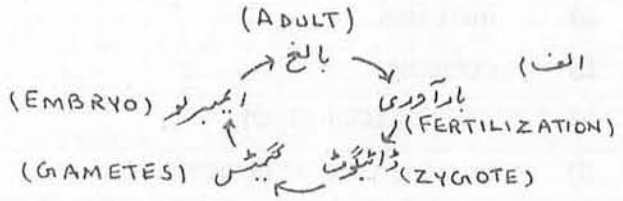
س40 = جنسی تولید ، غیر جنسی تولید سے مختلف ہے کیونکہ

الف) قدیم جاندار صرف جنسی تولید کے ذریعے سے بنے ہوتے ہیں۔
ب) ایک ہی جنسی مادہ ، جنسی تولید کے دوران نسل در نسل منتقل ہوتا ہے۔
ج) جنسی تولید سے متعلق خلیوں (GERM CELLS) میں تبدیلیاں ، جن کی وجہ سے نسلوں میں اختلاف ہوتا ہے ، صرف جنسی تولید کی وجہ سے ہی ہوتی ہیں۔
د) جنسی خلیے ، جنسی تولید میں ایک سے نظر نہیں آتے جیسا کہ وہ غیر جنسی تولید میں ہوتے ہیں۔

س41 = ایک ہی جیسے درجہ حرارت اور دباؤ کے حالات میں آواز

الف) خشک ہوا کی نسبت ، نم (MOIST) ہوا میں سست سفر کرتی ہے۔
ب) خشک ہوا کی نسبت ، نم ہوا میں تیز سفر کرتی ہے۔
ج) نم ہوا اور خشک ہوا میں ایک ہی رفتار سے سفر کرتی ہے۔
د) خشک ہوا کی نسبت نم ہوا میں بعض ادوات سست اور بعض ادوات تیز سفر کرتی ہے۔

س42 = مندرجہ ذیل A, B, C, اور D میں سی ڈائیا گرام ، مینڈل میں عمل تولید کی صحیح ترتیب یا اہم مراحل کو ظاہر کرتی ہے؟

الف)


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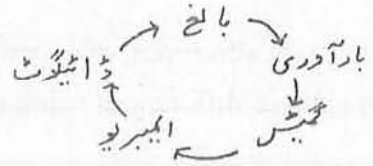
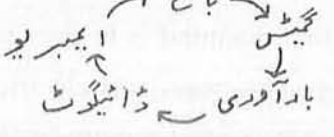
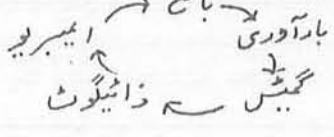


ج)


د)


س 43 = کاربن مونو آکسائیڈ ایک زہریلی گیس ہے۔ جو کہ جلنے کے عمل کے نامکمل ہونے کا نتیجہ ہے۔ اس خطرے کو کس طرح کم کیا جا سکتا ہے؟

الف) اس بات کا یقین کرلیں کہ ہمیشہ جلنے کیلئے وافر مقدار میں آکسیجن ہو۔
ب) اس بات کا یقین کرلیں کہ جلنے کیلئے کاربن کی مقدار مناسب ہو۔
ج) اس بات کا یقین کرلیں کہ جلنے کیلئے ایندھن کی مقدار مناسب ہو۔
د) اس بات کا یقین کرلیں کہ جلنے کیلئے ہمیشہ کاربن مونو آکسائیڈ وافر مقدار میں ہو۔

س 44 = اینڈوکرائن غدود ایک نظام بناتے ہیں۔ کیونکہ وہ تمام

الف) تمام نالیاں رکھتے ہیں۔
ب) سب کسی نہ کسی طرح مرکزی نظام عصبی سے جڑے ہوتے ہیں۔
ج) سب ایک جیسے ہارمون بناتے ہیں۔
د) کیمیائی توازن پیدا کرنے کیلئے باہم عمل کرتے ہیں۔

س 45 = جب کیفیچی ہیٹی تار کی لمبائی اور قطر بڑھایا جائے تو اس کا تعدد (FREQUENCY)

الف) کم ہوجاتا ہے۔
ب) بڑھ جاتا ہے۔
ج) وہی رہتا ہے۔
د) کم یا زیادہ ہوسکتا ہے۔

س 46 = کاربن کی دو قلمی شکلیں (ALLOTROPES) ہیرا اور گریفائیٹ ہیں، ان کے طبعی خواص میں واضح فرق ہے۔ یہ فرق اس وجہ سے ہے کہ

الف) ایٹموں کے آپس میں جڑے ہونے میں فرق ہے۔
ب) ہیرا قلمی شکل میں ہے۔
ج) گریفائیٹ بجلی کا موصل ہے جبکہ ہیرا نہیں ہے۔
د) گریفائیٹ میں کاربن زیادہ آزاد حالت میں موجود ہوتی ہے۔

س ۴۶ = اگر پانی کا ایک برتن تنگ سی جگہ میں رکھا جائے تو ہوا جلد ہی بخارات سے اس وجہ سے بھر جائیگی۔ جس کی وجہ

الف) تکثیف ہوگی۔
ب) کھولاؤ ہوگا۔
ج) تبخیر ہوگی۔
د) جذبیت ہوگی۔

س ۴۸ = ان میں سے کون سا بیان اس چیز کی زیادہ بہتر وضاحت کرتا ہے کہ گریفائیٹ اور ھیرا، کاربن کی دو مختلف قلمی شکلیں ہیں۔

الف) دونوں ٹھوس قلمی شکلیں ہیں۔
ب) گریفائیٹ سے بجلی گذرتی ہے جبکہ ھیرے سے نہیں۔
ج) دونوں سبز رنگ کے ہوتے ہیں۔
د) بہت زیادہ درجہ حرارت پر گریفائیٹ، ھیرے میں تبدیل ہو جاتا ہے۔

س ۴۹۔ بہت بڑے خزنے (REPTILES) جیسا کہ ڈائنوسارز میں جسم کا درجہ حرارت یکساں رہا ہوگا۔ کیونکہ

الف) وہ اپنی خوراک تیزی سے جلانے (ہضم) کرتے تھے۔
ب) وہ بہت چست ہوتے تھے۔
ج) ان کا جسم اتنا بڑا تھا کہ ان کے جسم کی سطح سے بہت کم حرارت خارج ہوتی تھی۔
د) ماحول کا درجہ حرارت بہت زیادہ تھا۔

س 50 = برف پگھلنے پر سکڑتی ہے۔ جب اس پر دباؤ بڑھایا جائے تو نقطہ پگھلاؤ

الف) صرف کم ہوتا ہے۔
ب) صرف بڑھتا ہے۔
ج) غیر تبدیل شدہ رہتا ہے۔
د) کم یا زیادہ ہو سکتا ہے۔

س 51 = کاربن مونو آکسائیڈ کو ریڈیوسنگ ایجنٹ (REDUCING AGENT) کیوں کہا جاتا ہے۔

الف) یہ آکسیجن کو آئرن (III) آکسائیڈ سے جدا کرتی ہے۔
ب) یہ آکسیجن کو آئرن (III) آکسائیڈ سے جدا نہیں کرتی۔
ج) یہ آئرن آکسائیڈ (III) کو آکسیجن سے جدا کرتی ہے
د) اوپر والوں میں سے کوئی نہیں۔

س 52 = کچھ بیج کئی سالوں تک اگانے کے قابل رہیں گے۔ اگر

الف) اپنی خوراک خود بنانا شروع کر دیں۔
ب) انہیں اگنے دیا جائے۔
ج) انہیں ٹھنڈی اور خشک جگہ پر ذخیرہ کیا جائے۔
د) انہیں گرم اور مرطوب (نمی والی) جگہ پر رکھا جائے۔

س 53 = محدود درجہ حرارت کی حد میں انسان نسبتاً "گرمائش" اور "ٹھنڈک" کو

الف) حرارت مخصوصہ کی وجہ سے جانچ لیتے ہیں۔
ب) کیلوری میٹر کی وجہ سے جانچ لیتے ہیں۔
ج) ڈالٹن کے قانون کی وجہ سے جان لیتے ہیں۔
د) حلقہ کی محسوس کرنے کی حس کی وجہ سے جانچ لیتے ہیں۔

س 54 = سلفر مونو کلینک اور معین نما بہروپی اشکال بناتی ہیں۔ یہ ایک مثال ہے۔

الف) ایلوٹراپی (ALLOTROPY) کی۔
ب) آئسو ٹراپی (ISOTROPY) کی۔
ج) آئسومارفزم (ISOMORPHISM) کی۔
د) ایمارفزم (AMORPHISM) کی۔

س 55 = مندرجہ ذیل میں سے کونسی غالباً زیادہ موزوں غذائی زنجیر ہے۔

الف) چھوٹی مچھلی، پانی کی سطح پر تیرنے والے چھوٹے پودے اور آبی بگلے۔
ب) پانی میں اُگے ہوئے جڑوں والے پودے، پانی کی سطح پر تیرنے والے چھوٹے جانور اور آبی بگلے۔
ج) پانی کی سطح پر تیرنے والے چھوٹے پودے، پانی کی سطح پر تیرنے والے چھوٹے جانور اور چھوٹی مچھلیاں۔
د) پانی میں اُگے ہوئے جڑوں والے پودے، پانی کی سطح پر تیرنے والے چھوٹے جانور اور چھوٹی مچھلیاں۔

س 56 = ایک سیب سورج کی روشنی میں سرخ نظر آتا ہے۔ کیونکہ

الف) اس کے چھلکے میں سرخ روشنی ہے۔
ب) سرخ روشنی اس پر پڑ رہی ہے۔
ج) صرف سرخ روشنی اس پر پڑ رہی ہے۔
د) سرخ روشنی اس سے منعکس ہو رہی ہے۔

س 57 = جب آکسیجن گیس کو بہت زیادہ وولٹیج کے برقی میدان سے گزارا جاتا ہے تو آکسیجن کے کچھ مالیکیول

الف) ریڈیکل میں تبدیل ہو جاتے ہیں۔
ب) آئسوٹوپ میں تبدیل ہو جاتے ہیں۔
ج) ہائیڈروجن پر آکسائیڈ میں تبدیل ہو جاتے ہیں۔
د) اوزون میں تبدیل ہو جاتے ہیں۔

س 58 = پرندے بہت زیادہ کھاتے ہیں۔ کیونکہ

الف) وہ بہت چھوٹے بیج کھاتے ہیں۔
ب) اڑان کیلئے زیادہ توانائی کی ضرورت ہوتی ہے۔
ج) وہ سرد خون والے (COLD BLOODED) ہوتے ہیں۔
د) وہ زیادہ خوراک ہضم کر سکتے ہیں۔

س 59 = اگر ایک جسم کو مقعر کروی آئینے کے ماسکہ خاص پر رکھا جائے تو اس کی شبیہ

الف) مرکز انحناء پر بنتی ہے۔
ب) ماسکہ خاص پر بنتی ہے۔
ج) لا متناہی فاصلے پر بنتی ہے۔
د) آئینے کے پیچھے بنتی ہے۔

س 60 = صنعتی طریقے اشیاء کو کم سے کم ممکن لاگت میں تیار کرنے کیلئے ڈیزائن کیے جاتے ہیں۔ اس میں

الف) آپریشن (عمل) کی رفتار اور لاگت کو مدنظر رکھا جاتا ہے۔
ب) مارکیٹ کی قیمتوں کے خلاف مقابلے کا خیال رکھا جاتا ہے۔
ج) چور بازاری کا روک تھام کیلئے کوشش کی جاتی ہے۔
د) کم لاگت اور زیادہ منافع کمانے کیلئے کوشش کی جاتی ہے۔